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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Derry		Shribman	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Tel Aviv	Country of Residence [i]	IL

Mailing Address of Inventor:

Address 1	9/6 Beylinson St.,		
Address 2			
City	Tel Aviv	**State/Province**	
Postal Code	6356709	**Country** [i]	IL

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ofer		Vilenski	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Moshav Hadar Am	Country of Residence [i]	IL

Mailing Address of Inventor:

Address 1	8 Hahollandim Street		
Address 2			
City	Moshav Hadar Am	**State/Province**	
Postal Code	42935	**Country** [i]	IL

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
1 of 789

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence information of this application.**

Customer Number	131926		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION		
Attorney Docket Number	HOLA-005-US2	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	15	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	131926		

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Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/025109	Division of	12/836059	2010-07-14	8560604	2013-10-15

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/836059	Claims benefit of provisional	61/249624	2009-10-08

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(●) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:	
If the Applicant is an Organization check here.	☒
Organization Name	~~HOLA NEWCO LTD.~~ WEB SPARK LTD.

Mailing Address Information For Applicant:

Address 1	3 Hamahshev St.,		
Address 2			
City	Netanya	**State/Province**	
Country	IL	Postal Code	42507
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yehuda Binder/			Date (YYYY-MM-DD)	2019-01-27 ~~2018-01-26~~
First Name	Yehuda	Last Name	BINDER	Registration Number	73612

Additional Signature may be generated within this form by selecting the Add button.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
8 of 789

Electronic Acknowledgement Receipt

EFS ID:	34971321
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder/Dorit Binder
Filer Authorized By:	Yehuda Binder
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	28-JAN-2019
Filing Date:	12-SEP-2013
Time Stamp:	03:38:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	ADS-005-14025109.pdf	320821 1a3627384db1f0da8a8d9cdf40a71fb005472744	no	8

Warnings:

Information:	
This is not an USPTO supplied ADS fillable form	
Total Files Size (in bytes):	320821

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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United States Patent and Trademark Office
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/04/2018	10069936	HOLA-005-US2	6194

131926 7590 08/20/2018

May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 485 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Derry Shribman, Tel Aviv, ISRAEL;
HOLA NEWCO LTD., Netanya, ISRAEL;
Ofer Vilenski, Moshav Hadar Am, ISRAEL;

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

/M.N/	9	4937781	A	1990-06-26	Lee , et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.N/	1	20150067819	A1	2015-03-05	Shribman, et al. ~~Hola Networks Ltd.~~	
	2	20120254456	A1	2012-10-04	Visharam Zubair et al.	
	3	20080222291	A1	2008-09-11	Weller et al.	
	4	20100235438	A1	2010-09-16	Narayanan et al.	
	5	20120124239	A1	2012-05-17	Shribman et al.	
Change(s) applied to document, /J.E.B./ 7/9/2018	6	20130166768	A1	2013-06-27	Gouache, et al. ~~Thomson Licensing~~	
	7	20020065930	A1	2002-30-05	Rhodes, David L.	
	8	20030204602	A1	2003-10-30	Hudson Michael D.	

PTO/SB/08a (03-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.N/	1	8479251	B2	2013-07-02	Feinleib et al	
	2	8499059	B2	2013-07-30	Stoyanov	
Change(s) applied to document. /J.E.B./ 7/9/2018	3	7970835	B2	06/2011 ~~2011-28-01~~	St. Jacques ~~Xerox Corporation~~	
	4	8832179	B2	2014-09-09	Owen , et al.	
	5	6173330	B1	2001-09-01	Guo , et al.	
	6	8769035	B2	2014-01-07	Resch , et al.	
	7	8171101	B2	2012-05-01	Gladwin , et al.	
	8	7558942	B2	2009-07-07	Chen , et al.	

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Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	NGUYEN, MINH CHAU

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
Change(s) applied to document, /J.E.B./ /M.N./ 7/9/2018	1	7970835	B2	06/2011 ~~2011-26-01~~	St. Jacques ~~Xerox Corporation~~	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.N./	1	20080109446	A1	2008-05-08	Wang Matrix XIN	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
/M.N./	1	2007280388	JP		2007-25-10	Xerox Corporation		
/M.N./	2	1020090097034	KR		2009-15-09	KT Corporation		X

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Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
14 of 789

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

131926 7590 08/06/2018

May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

EXAMINER	
NGUYEN, MINH CHAU	

ART UNIT	PAPER NUMBER
2459	

MAIL DATE	DELIVERY MODE
08/06/2018	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Oxylabs LT, UAB v. Bright Data Ltd.
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Supplemental ***Notice of Allowability***	**Application No.** 14/025,109	**Applicant(s)** Shribman et al.	
	Examiner MINH CHAU N NGUYEN	**Art Unit** 2459	**AIA Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to Rush, 07/09/2018.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 11/18/14.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☑ Other 1449 - 03/17/16.

/MINH CHAU NGUYEN/
Primary Examiner, Art Unit 2459

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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Continuation of 3. The allowed claim(s) is/are: 26-36,39-48,53-58 and 60-66

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	Art Unit
	MINH CHAU N NGUYEN	2459

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017	09/04/2017	03/28/2018	06/10/2018	08/02/2018		
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-	2	-	-	-	-	-	-	-		
-	3	-	-	-	-	-	-	-		
-	4	-	-	-	-	-	-	-		
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-	6	-	-	-	-	-	-	-		
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1	26	✓	✓	✓	✓	✓	=	=		
6	27	✓	✓	✓	✓	✓	=	=		
7	28	✓	✓	✓	✓	✓	=	=		
8	29	✓	✓	✓	✓	✓	=	=		
9	30	✓	✓	✓	✓	✓	=	=		
10	31	✓	✓	✓	✓	✓	=	=		
11	32	✓	✓	✓	✓	✓	=	=		
12	33	✓	✓	✓	✓	✓	=	=		
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14	35	✓	✓	✓	✓	✓	=	=		
15	36	✓	✓	✓	✓	✓	=	=		
-	37	✓	✓	✓	✓	✓	-	-		
-	38	✓	✓	✓	✓	O	-	-		
16	39	✓	✓	✓	✓	✓	=	=		
17	40	✓	✓	✓	✓	✓	=	=		
18	41	✓	✓	✓	✓	✓	=	=		
19	42	✓	✓	✓	✓	✓	=	=		

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	Art Unit
	MINH CHAU N NGUYEN	2459

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017	09/04/2017	03/28/2018	06/10/2018	08/02/2018		
2	43	✓	✓	✓	✓	✓	=	=		
3	44	✓	✓	✓	✓	✓	=	=		
20	45	✓	✓	✓	✓	✓	=	=		
4	46	✓	✓	✓	✓	✓	=	=		
5	47	✓	✓	✓	✓	✓	=	=		
21	48	✓	✓	✓	✓	✓	=	=		
-	49	✓	✓	✓	✓	✓	-	-		
-	50	✓	✓	✓	✓	✓	-	-		
-	51	✓	✓	✓	✓	✓	-	-		
-	52	✓	✓	✓	✓	✓	-	-		
22	53	✓	✓	✓	✓	✓	=	=		
23	54	✓	✓	✓	✓	✓	=	=		
24	55	✓	✓	✓	✓	✓	=	=		
25	56	✓	✓	✓	✓	✓	=	=		
26	57	✓	✓	✓	✓	✓	=	=		
27	58	✓	✓	✓	✓	✓	=	=		
-	59	✓	✓	✓	✓	O	-	-		
28	60	✓	✓	✓	✓	✓	=	=		
29	61	✓	✓	✓	✓	✓	=	=		
30	62	✓	✓	✓	✓	✓	=	=		
31	63	✓	✓	✓	✓	✓	=	=		
32	64	✓	✓	✓	✓	✓	=	=		
33	65	✓	✓	✓	✓	✓	=	=		
34	66	✓	✓	✓	✓	✓	=	=		

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	**Art Unit**
	MINH CHAU N NGUYEN	2459

CPC								
Symbol							**Type**	**Version**
H04L	/	67	/	42			F	2013-01-01
H04L	/	41	/	046			I	2013-01-01
H04L	/	67	/	22			I	2013-01-01
H04L	/	67	/	1063			I	2013-01-01
H04L	/	67	/	2814			I	2013-01-01
H04L	/	67	/	2819			I	2013-01-01
H04L	/	67	/	1002			I	2013-01-01
H04L	/	67	/	1023			I	2013-01-01
H04L	/	67	/	108			I	2013-01-01
H04L	/	67	/	02			A	2013-01-01

CPC Combination Sets								
Symbol							**Type**	**Set**	**Ranking**	**Version**
	/		/							

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	34	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	02 August 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	26	1

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	**Art Unit**
	MINH CHAU N NGUYEN	2459

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04L	/	29	/	06
H04L	/	29	/	08
H04L	/	12	/	24

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 34	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459 (Primary Examiner) 02 August 2018 (Date)	O.G. Print Claim(s) 26	O.G. Print Figure 1

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	**Art Unit**
	MINH CHAU N NGUYEN	2459

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	-	10	-	19	7	28	-	37	4	46	24	55	32	64
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-	5	-	14	-	23	11	32	18	41	-	50	-	59		
-	6	-	15	-	24	12	33	19	42	-	51	28	60		
-	7	-	16	-	25	13	34	2	43	-	52	29	61		
-	8	-	17	1	26	14	35	3	44	22	53	30	62		
-	9	-	18	6	27	15	36	20	45	23	54	31	63		

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	34	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	02 August 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	26	1

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

U.S.PATENTS

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/M.N./	1	2007-280388	JP	A	2007-10-25	XEROX CORPORATION		☐

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Peter A. Nieves/	Date (YYYY-MM-DD)	2014-11-18
Name/Print	Peter A. Nieves	Registration Number	48173

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	19459-6105P

/M.N/	1	~~KEI SUZUKI, a Study on Cooperative Peer Selection Method in P2P Video Delivery, Vol 109, No . 37, IEICE Technical Report, The Institute of Electronics, Information and Communication Engineers, May 14, 2009, Vol 109~~	☐

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EXAMINER SIGNATURE

Examiner Signature	/Minh Chau Nguyen/	Date Considered	03/07/2016

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Oxylabs LT, UAB v. Bright Data Ltd.
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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	1					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.N/	1	20080109446	A	2006-05-08	Wang	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
/M.N/	1	2007-280388	JP	A	2007-10-25	XEROX CORPORATION		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
27 of 789

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

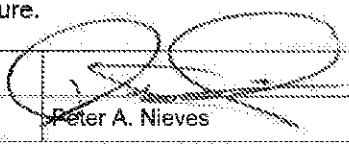
☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature		Date (YYYY-MM-DD)	2014-11-18
Name/Print	Peter A. Nieves	Registration Number	48173

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
28 of 789

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	19459-6105P

/M.N/	1	KEI SUZUKI, a Study on Cooperative Peer Selection Method in P2P Video Delivery, Vol 109, No . 37, IEICE Technical Report, The Institute of Electronics, Information and Communication Engineers, May 14, 2009, Vol 109	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/MINH CHAU NGUYEN/	Date Considered	07/31/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
30 of 789

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

May Patents Ltd.
c/o Dorit Shem-Tov
P.O.B. 7230
Ramat-Gan 5217102,
Israel

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

TITLE OF INVENTION:

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0	$0	$500	10/01/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 May Patents Ltd. c/o Dorit Shem-Tov
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: HOLA NEWCO LTD.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Netanya, Israel 4250713

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ■ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☑ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 601895 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Yehuda Binder/ Date July 8, 2018

Typed or printed name Yehuda BINDER Registration No. 73,612

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2020-00393, EX 2028
31 of 789

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	14025109
Filing Date:	12-Sep-2013
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Filer:	Yehuda Binder
Attorney Docket Number:	HOLA-005-US2

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**500**

Electronic Acknowledgement Receipt

EFS ID:	33114411
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	08-JUL-2018
Filing Date:	12-SEP-2013
Time Stamp:	08:28:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$500
RAM confirmation Number	070918INTEFSW00005991601835
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	ptol85b.pdf	75009 83b98e2ef27fcdcd77319cdbf68514dce777cae7	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30041 d610494731d9ab5d911edc840edfc174399e7543	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	105050		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

131926 7590 06/29/2018

May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

EXAMINER
NGUYEN, MINH CHAU

ART UNIT	PAPER NUMBER
2459	

DATE MAILED: 06/29/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

TITLE OF INVENTION: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	10/01/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
37 of 789

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

131926 7590 06/29/2018
May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

TITLE OF INVENTION: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	10/01/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, MINH CHAU	2459	709-202000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

131926 7590 06/29/2018

May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

EXAMINER	
NGUYEN, MINH CHAU	
ART UNIT	PAPER NUMBER
2459	

DATE MAILED: 06/29/2018

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Notice of Allowability	Application No. 14/025,109	Applicant(s) Shribman et al.	
	Examiner MINH CHAU N NGUYEN	Art Unit 2459	AIA Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to Amendment, filed 04/09/2018.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MINH CHAU NGUYEN/
Primary Examiner, Art Unit 2459

Continuation of 3. The allowed claim(s) is/are: 26-36,39-48,53-58 and 60-66

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Remarks

Applicant's response dated April 9, 2018 responding to March 29, 2018 Office Action provided in the rejection of claims 26-37, 39-58, 60-66; and the objection of claims 38, 59; wherein the claims 37-38, 49-52 and 59 have been canceled. **Claims 26-36, 39-48, 53-58, 60-66** remain pending in the application and which have been fully considered by the Examiner.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance:

Claims 26-36, 39-48, 53-58, 60-66 are considered allowable since when reading the claims in light of the specification, as per MPEP §2111.01 or Toro Co. v. White Consolidated Industries Inc., 199 F.3d 1295, 1301,53 USPQ2d 1065, 1069 (Fed. Cir. 1999), none of the references of record alone or in combination disclose or suggest the combination of limitations specified in **independent claims 26 and 53.**

For example, the independent claims contain limitations, *data communication between a second web server storing a second content and having an identifier in the Internet and one of the clients via requesting client; the requesting client sending its identifier to first server; one of the clients sending a second web server identifier to the first server; the first server sending the identifier of the requesting client to the one of the clients; the requesting client receiving second content form the second web server and the one of the clients receiving the second content from*

the requesting client. Therefore, the Examiner agrees that the limitations of the independent claims, within its environment, is allowable subject matter over the prior art, in light of the specification.

Because **claims 27-36, 39-48, 54-58, 60-66** depend directly or indirectly on claims 26 and 53, these claims are considered allowable for at least the same reasons noted above with respect to **claims 26 and 53.**

To the extent that these features are not found in the prior art cited by Examiner, the present case is held allowable over the art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MINH CHAU N NGUYEN whose telephone number is (571)272-4242. The examiner can normally be reached on M-F 8am-4pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JEFFREY NICKERSON can be reached on (571)270-3631. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MINH CHAU NGUYEN/

Primary Examiner, Art Unit 2459

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	Art Unit
	MINH CHAU N NGUYEN	2459

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017	09/04/2017	03/28/2018	06/10/2018			
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1	26	✓	✓	✓	✓	✓	=			
6	27	✓	✓	✓	✓	✓	=			
7	28	✓	✓	✓	✓	✓	=			
8	29	✓	✓	✓	✓	✓	=			
9	30	✓	✓	✓	✓	✓	=			
10	31	✓	✓	✓	✓	✓	=			
11	32	✓	✓	✓	✓	✓	=			
12	33	✓	✓	✓	✓	✓	=			
13	34	✓	✓	✓	✓	✓	=			
14	35	✓	✓	✓	✓	✓	=			
15	36	✓	✓	✓	✓	✓	=			
-	37	✓	✓	✓	✓	✓	-			
-	38	✓	✓	✓	✓	O	-			
16	39	✓	✓	✓	✓	✓	=			
17	40	✓	✓	✓	✓	✓	=			
18	41	✓	✓	✓	✓	✓	=			
19	42	✓	✓	✓	✓	✓	=			

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	MINH CHAU N NGUYEN	2459

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017	09/04/2017	03/28/2018	06/10/2018			
2	43	✓	✓	✓	✓	✓	=			
3	44	✓	✓	✓	✓	✓	=			
20	45	✓	✓	✓	✓	✓	=			
4	46	✓	✓	✓	✓	✓	=			
5	47	✓	✓	✓	✓	✓	=			
21	48	✓	✓	✓	✓	✓	=			
-	49	✓	✓	✓	✓	✓	-			
-	50	✓	✓	✓	✓	✓	-			
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26	57	✓	✓	✓	✓	✓	=			
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29	61	✓	✓	✓	✓	✓	=			
30	62	✓	✓	✓	✓	✓	=			
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32	64	✓	✓	✓	✓	✓	=			
33	65	✓	✓	✓	✓	✓	=			
34	66	✓	✓	✓	✓	✓	=			

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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CPC - Searched*		
Symbol	Date	Examiner
H04L 67/42	9/4/2017	MN
H04L 41/046	9/4/2017	MN
H 04L 67/1002	9/4/2017	MN

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	201-203, 207	3/7/2016	MN

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Search on EAST	3/7/2016	MN
Update search on EAST	1/8/2017	MN
Update search on EAST	9/4/2017	MN
update search on EAST	03/28/2018	MN
update search on EAST, Google patents	06/10/2018	MN

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
USPAT, USPG-Pub text search	Independent claim search	06/10/2018	MN

/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
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CPC						
Symbol					**Type**	**Version**
H04L	/	67	/	42	F	2013-01-01
H04L	/	41	/	046	I	2013-01-01
H04L	/	67	/	22	I	2013-01-01
H04L	/	67	/	1063	I	2013-01-01
H04L	/	67	/	2814	I	2013-01-01
H04L	/	67	/	2819	I	2013-01-01
H04L	/	67	/	1002	I	2013-01-01
H04L	/	67	/	1023	I	2013-01-01
H04L	/	67	/	108	I	2013-01-01
H04L	/	67	/	02	A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	34	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	10 June 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	26	1

U.S. Patent and Trademark Office

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
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INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04L	/	29	/	06
H04L	/	29	/	08
H04L	/	12	/	24

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 34	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459 (Primary Examiner) 10 June 2018 (Date)	O.G. Print Claim(s) 26	O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No.: 20180610

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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	-	10	-	19	7	28	-	37	4	46	24	55	32	64
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-	6	-	15	-	24	12	33	19	42	-	51	28	60		
-	7	-	16	-	25	13	34	2	43	-	52	29	61		
-	8	-	17	1	26	14	35	3	44	22	53	30	62		
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NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	34	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	10 June 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	26	1

U.S. Patent and Trademark Office

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	6002	((web near servers) with (transfer$4 provid$4 transmit$4 send$4 forward$4) with (content$1 file$1 document$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:15
L2	495	1 and ((peer$1 client$1) with (send$4 transmit$4 forward$4) with (address$2 id$1 identifier$1 identification$1) with server$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:29
L3	39	2 and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with peer$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:29
L4	398	2 and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with (client$1 peer$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:30
L5	352	4 and (server with (receiv$4 stor$4 maintain$4) with (id$1 identifier$1 identification$1 address$2 port$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:30
L6	352	5 and (server with (send$4 transmit$4 forward$4) with (id$1 identifier$1 identification$1 address$2 port$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:30
L7	352	6 and (server with (return$4 send$4 transmit$4 forward$4) with (id$1 identifier$1 identification$1 address$2 port$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:31
L8	322	7 and (request$4 same (url$1 (web near server$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:32
L9	144	8 and @ad<"20091008"	US-PGPUB; USPAT;	OR	OFF	2018/06/10 23:32

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
L10	36	9 and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with (client$1 peer$1) with (geographic$4 location$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:33
L11	0	10 and (((second other another differen$4) near web near server) with (return$4 send$4 transmit$4 forward$4) with (content$1 document$1 page$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:35
L12	3	10 and (((second other another differen$4) near1 server) with (return$4 send$4 transmit$4 forward$4) with (content$1 document$1 page$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:36
L13	3	12 and (server with (send$4 transmit$4 forward$4) with (id$1 identifier$1 identification$1 address$2 port$1) with ((differen$4 another other destinat$4 receiv$4 second) near (peer$1 client$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:37
L14	129091	(H04L67/42 H04L41/046 H04L67/108 H04L67/22 H04L67/02).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:42
L15	868	14 and 1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:42
L16	17	15 and ((peer$1 client$1) with (send$4 transmit$4 forward$4) with ((peer$1 client$1) near (address$2 id$1 identifier$1 identification$1)) with server$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:43
L17	16	16 and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with (client$1 peer$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:43
L18	0	17 and (server with (send$4 transmit$4 forward$4) with (id$1 identifier$1 identification$1 address$2 port$1) with ((differen$4 another other destinat$4 receiv$4 second) near (peer$1 client$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:43
L19	11	17 and (request$4 same (url$1 same (web near server$1)))	US-PGPUB; USPAT;	OR	OFF	2018/06/10 23:44

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
L20	0	19 and (((second other another differen$4) near web near server) with (return$4 send$4 transmit$4 forward$4) with (content$1 document$1 page$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:44
L21	3	19 and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with (client$1 peer$1) with (geographic$4 location$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:45
L22	1	21 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/06/10 23:45

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L23	0	(((peer$1 client$1) with (send$4 transmit$4 forward$4) with ((peer$1 client$1) near (address$2 id$1 identifier$1 identification$1)) with server$1) and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with (client$1 peer$1)) and (server with (send$4 transmit$4 forward$4) with (id$1 identifier$1 identification$1 address$2 port$1) with ((differen$4 another other destinat$4 receiv$4 second) near (peer$1 client$1))) and (((second other another differen$4) near web near server) with (return$4 send$4 transmit$4 forward$4) with (content$1 document$1 page$1))).clm.	US-PGPUB; USPAT	OR	OFF	2018/06/10 23:47
L24	5	(((peer$1 client$1) with (send$4 transmit$4 forward$4) with ((peer$1 client$1) near (address$2 id$1 identifier$1 identification$1)) with server$1) and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with (client$1 peer$1)) and (server with (send$4 transmit$4 forward$4) with (id$1 identifier$1 identification$1 address$2 port$1) with ((differen$4 another other destinat$4 receiv$4 second request$4) near1 (peer$1 client$1))) and ((web near server) with (return$4 send$4 transmit$4 forward$4) with (content$1 document$1 page$1))).clm.	US-PGPUB; USPAT	OR	OFF	2018/06/10 23:48
L25	3	24 and @ad<"20091008"	US-PGPUB; USPAT	OR	OFF	2018/06/10 23:49
L26	0	25 and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with (client$1 peer$1) with (geographic$4 location$1))	US-PGPUB; USPAT	OR	OFF	2018/06/10 23:49

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6/ 10/ 2018 11:51:32 PM
C:\ Users\ mnguyen2\ Documents\ EAST\ Workspaces\ 14025109_03.wsp

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: HOLA-005-US2

In re Application of:	)	Confirmation No. 6194
	)	
Derry Shribman *et al.*	)	Art Unit: 2459
	)	
Appln. No.: 14/025,109	)	Examiner: Nguyen, Minh Chau
	)	
Filed: September 12, 2013	)	Washington, D.C.
	)	
For: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	)	April 9, 2018
	)	

RESPONSE / AMENDMENT:

Honorable Commissioner for Patents
U.S. Patent and Trademark Office
Randolph Building, Mail Stop Amendments
401 Dulany Street
Alexandria, VA 22314

Sir:

In response to the Office Action of March 29, 2018 ("Action"):

Amendments to the Claims appear in the Listing of Claims that begins on page **2** of this paper.

Remarks/Arguments begin on page **10** of this paper.

Amendments to the claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1-25. (Cancelled)

26. (Currently amended) A method for use with a group of clients for data communication between a web server storing a content and a requesting client via one or more clients selected from the group, for use with a first server, and where the web server, the requesting client, the first server, and the clients in the group are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, and further for data communication between a second web server storing a second content and having an identifier in the Internet and a one of the clients via the requesting client, the method comprising the steps of:

(a) each of the clients in the group sending its identifier to the first server;

(b) the first server receiving and storing the identifiers of the clients in the group;

(c) the requesting client sending its identifier and the web server identifier to the first server;

(d) the first server selecting one of the clients from the group based on associating the identifiers of the clients with the web server identifier;

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(e) the first server sending the identifier of the selected client to the requesting client;

(f) the selected client receiving the content from the web server; ~~and~~

(g) the requesting client receiving the content from the selected client~~.~~;

(h) the requesting client sending its identifier to the first server;

(i) the first server storing the requesting client identifier;

(j) one of the clients sending the second web server identifier to the first server;

(k) the first server sending the identifier of the requesting client to the one of the clients;

(l) the requesting client receiving the second content from the second web server; and

(m) the one of the clients receiving the second content from the requesting client.

27. (Previously presented) The method according to claim 26, wherein the steps are sequentially executed.

28. (Previously presented) The method according to claim 26, wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected client.

29. (Previously presented) The method according to claim 26, wherein the first server is HTTP server and responds to HTTP requests from the requesting client or the.

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30. (Previously presented) The method according to claim 26, wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and communicates based on, or according to, using TCP/IP protocol or connection.

31. (Previously presented) The method according to claim 26, wherein the first server is a TCP / IP server and communicates based on, or according to, using TCP/IP protocol or connection.

32. (Previously presented) The method according to claim 26, wherein the content includes web-page, audio, or video content.

33. (Previously presented) The method according to claim 26, wherein the first server selecting one of the clients is based on the web server IP address or URL.

34. (Previously presented) The method according to claim 26, wherein the first server selecting one of the clients is based on the selected client IP address.

35. (Previously presented) The method according to claim 26, wherein the selected client further storing the content received from the web server.

36. (Previously presented) The method according to claim 26, wherein the requesting client sending its identifier and the web server identifier to the first server as part of browser or email application execution.

37-38. (Cancelled)

39. (Previously presented) The method according to claim 26, wherein the communication with the web server or the requesting first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

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40. (Previously presented) The method according to claim 26, wherein the communication with the requesting client or the selected client is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

41. (Previously presented) The method according to claim 26, wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL).

42. (Previously presented) The method according to claim 26, wherein the web server identifier, the first server identifier, the requesting client identifier, or any of the client's identifier is using Internet Protocol (IP) address.

43. (Previously presented) The method according to claim 26, wherein in step (d) the first server selecting two or more of the clients based on associating the identifiers of the clients with the web server identifier; and in step (e) the first server sending the identifiers of the selected two or more clients to the requesting client.

44. (Previously presented) The method according to claim 43, further comprising the step of the requesting client selecting one of the clients as the selected client.

45. (Previously presented) The method according to claim 26, further comprising the steps of the requesting client sending a communication port number to the selected client, followed by communication between the requesting client and the selected client using the communication port number.

46. (Previously presented) The method according to claim 26, further comprising the step of the requesting client sending the web server identifier to the selected client.

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47. (Previously presented) The method according to claim 46, further comprising the step of the selected client communicating with the web server.

48. (Previously presented) The method according to claim 26, wherein step (d) the first server selecting one of the clients based on the geographical location of the clients.

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49-52. (Cancelled)

53. (Currently amended) A method for data communication between a requesting client and a web server storing a content via a second client, for use with a first server and a second client, and where the web server, the requesting client, the first server, and the second client are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, and further for data communication with a second web server storing a second content and having an identifier in the Internet and the second clients via the requesting client, the method comprising the steps of:

(a) sending its identifier and the web server identifier to the first server;

(b) receiving from the first server the identifier of the second client;

(c) sending the web server identifier to the second client; ~~and~~

(d) receiving the content associated with the web server from the second client~~.~~;

(e) receiving the second content from the second web server; and

(f) sending the second content to the second client.

54. (Previously presented) The method according to claim 53, wherein the steps are sequentially executed.

55. (Previously presented) The method according to claim 53, wherein the first server is HTTP server and responds to HTTP requests.

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56. (Previously presented) The method according to claim 53, wherein the first server is a TCP / IP server and communicates based on, or according to, using TCP/IP protocol or connection.

57. (Previously presented) The method according to claim 53, wherein the content includes web-page, audio, or video content.

58. (Previously presented) The method according to claim 53, wherein the steps are part of browser or email application execution.

59. (Cancelled)

60. (Previously presented) The method according to claim 53, wherein the communication with the web server or the first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

61. (Previously presented) The method according to claim 53, wherein the communication with the second client is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

62. (Previously presented) The method according to claim 53, wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL).

63. (Previously presented) The method according to claim 53, wherein the web server identifier, the first server identifier, the requesting client identifier, or the second client identifier is using Internet Protocol (IP) address.

64. (Previously presented) The method according to claim 53, wherein step (b) comprising the receiving from the first server

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the identifiers of two or more second clients, and further comprising the step of selecting one out of second clients based on associating the identifiers of the second clients with the web server identifier.

65. (Previously presented) The method according to claim 53, further comprising the steps of sending a communication port number to the second client, followed by communication with the second client using the communication port number.

66. (Previously presented) The method according to claim 53, further comprising the step of sending the web server identifier to the second client.

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REMARKS / ARGUMENTS

The examiner's action dated March 29, 2018 ("Action") has been received and its contents carefully noted.

The allowance of claims 38 and 59 is thankfully noted.

Former claims 37-38 are cancelled and their limitations incorporated into claim 26.

Former claim 59 is cancelled and its limitations incorporated into claim 53.

Former claims 49-52 are cancelled.

An allowance is respectfully requested.

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The absence of a reply to a specific rejection, issue, or comment, does not signify agreement with that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims that have not been expressed.

Nothing in this reply should be understood as conceding any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claims does not necessarily signify concession of unpatentability to the claim before its amendment.

In view of the foregoing, it is requested that all of the rejections be reconsidered and withdrawn and that the claims be considered allowable.

If the above arguments should not now place the application in the condition for allowance, the examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

By /Yehuda Binder/

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Electronic Acknowledgement Receipt

EFS ID:	32275777
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	09-APR-2018
Filing Date:	12-SEP-2013
Time Stamp:	08:51:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		4-2018-Third-Non-Final-response.pdf	236443 ff2fc1453812004460fe5cc732db21666e7da5be	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	9
	Applicant Arguments/Remarks Made in an Amendment	10	11
Warnings:			
Information:			
	Total Files Size (in bytes):	236443	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/025,109	Filing Date 09/12/2013	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **04/09/2018**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 34	Minus	** 40	= 0	X $50 =	0
Independent (37 CFR 1.16(h))	* 2	Minus	***4	= 0	X $230 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
TRINA STEPTOE

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	Art Unit
	MINH CHAU N NGUYEN	2459

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017	09/04/2017	03/28/2018				
	1	-	-	-	-	-				
	2	-	-	-	-	-				
	3	-	-	-	-	-				
	4	-	-	-	-	-				
	5	-	-	-	-	-				
	6	-	-	-	-	-				
	7	-	-	-	-	-				
	8	-	-	-	-	-				
	9	-	-	-	-	-				
	10	-	-	-	-	-				
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	24	-	-	-	-	-				
	25	-	-	-	-	-				
	26	✓	✓	✓	✓	✓				
	27	✓	✓	✓	✓	✓				
	28	✓	✓	✓	✓	✓				
	29	✓	✓	✓	✓	✓				
	30	✓	✓	✓	✓	✓				
	31	✓	✓	✓	✓	✓				
	32	✓	✓	✓	✓	✓				
	33	✓	✓	✓	✓	✓				
	34	✓	✓	✓	✓	✓				
	35	✓	✓	✓	✓	✓				
	36	✓	✓	✓	✓	✓				
	37	✓	✓	✓	✓	✓				
	38	✓	✓	✓	✓	O				
	39	✓	✓	✓	✓	✓				
	40	✓	✓	✓	✓	✓				
	41	✓	✓	✓	✓	✓				
	42	✓	✓	✓	✓	✓				

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	**Art Unit**
	MINH CHAU N NGUYEN	2459

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017	09/04/2017	03/28/2018				
	43	✓	✓	✓	✓	✓				
	44	✓	✓	✓	✓	✓				
	45	✓	✓	✓	✓	✓				
	46	✓	✓	✓	✓	✓				
	47	✓	✓	✓	✓	✓				
	48	✓	✓	✓	✓	✓				
	49	✓	✓	✓	✓	✓				
	50	✓	✓	✓	✓	✓				
	51	✓	✓	✓	✓	✓				
	52	✓	✓	✓	✓	✓				
	53	✓	✓	✓	✓	✓				
	54	✓	✓	✓	✓	✓				
	55	✓	✓	✓	✓	✓				
	56	✓	✓	✓	✓	✓				
	57	✓	✓	✓	✓	✓				
	58	✓	✓	✓	✓	✓				
	59	✓	✓	✓	✓	O				
	60	✓	✓	✓	✓	✓				
	61	✓	✓	✓	✓	✓				
	62	✓	✓	✓	✓	✓				
	63	✓	✓	✓	✓	✓				
	64	✓	✓	✓	✓	✓				
	65	✓	✓	✓	✓	✓				
	66	✓	✓	✓	✓	✓				

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Notice of References Cited	Application/Control No. 14/025,109	Applicant(s)/Patent Under Reexamination Shribman et al.	
	Examiner MINH CHAU N NGUYEN	Art Unit 2459	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20070073878-A1	03-2007	Issa; Alfredo C.	H04L67/104	709/225
*	B	US-20090319502-A1	12-2009	Chalouhi; Olivier	H04L67/104	1/1
*	C	US-20060212584-A1	09-2006	Yu; Mingjian	G06F17/30902	709/227
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14/025,109	Shribman et al.
	Examiner	Art Unit
	MINH CHAU N NGUYEN	2459

CPC - Searched*		
Symbol	Date	Examiner
H04L 67/42	9/4/2017	MN
H04L 41/046	9/4/2017	MN
H 04L 67/1002	9/4/2017	MN

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	201-203, 207	3/7/2016	MN

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Search on EAST	3/7/2016	MN
Update search on EAST	1/8/2017	MN
Update search on EAST	9/4/2017	MN
update search on EAST	03/28/2018	MN

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

131926 7590 03/29/2018

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EXAMINER	
NGUYEN, MINH CHAU	

ART UNIT	PAPER NUMBER
2459	

MAIL DATE	DELIVERY MODE
03/29/2018	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 14/025,109	Applicant(s) Shribman et al.	
	Examiner MINH CHAU N NGUYEN	Art Unit 2459	AIA Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 10 December 2017.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 26-66 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 26-37,39-58 and 60-66 is/are rejected.

8) ☑ Claim(s) 38 and 59 is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Remarks

Applicant's amendment dated December 10, 2017 responding to the September 19, 2017 Office Action provided in the rejection of claims 26-66. **Claims 26-66** remain pending in the application and which have been fully considered by the examiner.

Applicant's arguments filed December 10, 2017 have fully considered; however the arguments are moot in view of the new ground(s) of rejection. See rejections below for details.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 26-37, 39-58, 60-66 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Yu et al. (US 2006/0212584) hereinafter "**Yu**", and in view of Chalouhi et al. (US 2009/0319502) hereinafter "**Chalouhi**".

Claim 26

Yu teaches a method for use with a group of clients [i.e. peer nodes 403, 406, 410 etc.] for data communication between a web server [i.e. web server 405 or content source 332] storing a content and a requesting client [i.e. peer node 403] via one or more clients selected from the

group, for use with a first server [i.e. indexing server 404 or control server 331], and where the web server, the requesting client, the first server, and the clients in the group are communicatively coupled via the Internet and each is identified in the internet using a distinct identifier (Yu, figures 2-4), the method comprising the steps of:

(b) the first server receiving and storing the identifiers of the clients in the group [i.e. the control server 331 or the indexing server 404 maintains connectivity information/identifications, such as network addresses and port numbers of respective peer clients that are connected within the network 260 (e.g. Internet)] (Yu, figures 3-4; 0017, 0022, 0024, 0028);

(c) the requesting client sending the web server identifier to the first server [i.e. peer node 403 sends a request/query which comprises a URL in an address filed of web browser to the indexing server 404; and the URL of the requested content specifies an address hosted by web server 405] (Yu, 0026, 0033-0034);

(d) the first server selecting one of the clients from the group based on associating the identifiers of the clients with the web server identifier [i.e. the indexing server 404 generating (e.g. includes a selection step) a peer list that currently maintain (associated) the requested content specified by the URL identifier in the query submitted by peer node 403] (Yu, 0022, 0026, 0030, 0033);

(e) the first server sending the identifier of the selected client to the requesting client [i.e. the peer list is returned/sent to the peer node 403 from indexing server 404] (Yu, 0026, 0030, 0037);

(f) the selected client receiving the content from the web server [i.e. if no peer is available in the returned query response, the peer node 403 connects to the source server or web server to receive the content] (Yu, 0026, 0029, 0033-0034, 0037); and

(g) the requesting client receiving the content from the selected client [i.e. if the peer list does identify peer nodes that have the requested content, then the peer node 403 connects to the peer node identified in the peer list and retrieve/receive the requested content thereform] (Yu, 0022, 0026, 0029, 0030-0031, 0033, 0035, 0037).

Yu fails to teach (a) each of the devices sending its identifier to the first server; and (c) the requesting client sending its identifier to the first server.

However, in an analogous art, **Chalouhi** teaches (a) each of the devices sending its identifier to the first server [i.e. each P2P client 104 of client machines 102, 111, etc. sends its IP address and port information to tracker server 114 which will adds the information to peer list 118] and (c) the requesting client sending its identifier to the first server [i.e. the P2P client 104 of the client machine also sends its IP address and port information to tracker server 114] (Chalouhi, 0023, 0030).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of (a) each of the devices sending its identifier to the first server; and (c) the requesting client sending its identifier to the first server, as disclosed by Chalouhi, into the teachings of Yu. One would be motivated to support content/file transfers within a group of clients/peers over a network/Internet.

Claim 27

Yu in combination with Chalouhi teach the method according to claim 26 wherein the steps are sequentially executed (Yu, figures 7-8, 0047).

Claim 28

Yu in combination with Chalouhi teach the method according to claim 26 wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected client (Yu, figure 7, 0026, 0029, 0030-0035, 0037, 0045).

Claim 29

Yu in combination with Chalouhi teach the method according to claim 26 wherein the first server is HTTP server and responds to HTTP requests from the requesting client (Yu, figure 7, 0026, 0030, 0037, 0045).

Claim 30

Yu in combination with Chalouhi teach the method according to claim 26 wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and

communicates based on, or according to, using TCP/IP protocol or connection (Yu, figures 3-4, 0024, 0026).

Claim 31

Yu in combination with Chalouhi teach the method according to claim 26 wherein the first server is a TCI / IP server and communicates based on, or according to, using TCP/IP protocol or connection (Yu, figures 3-4, 0024, 0026).

Claim 32

Yu in combination with Chalouhi teach the method according to claim 26 wherein the content includes web-page, audio, or video content (Yu, 0017, 0021, 0026).

Claim 33

Yu in combination with Chalouhi teach the method according to claim 26 wherein the first server selecting one of the clients is based on the web server IP address or URL (Yu, 0022, 0026, 0030, 0033).

Claim 34

Yu in combination with Chalouhi teach the method according to claim 26 wherein the first server selecting one of the clients is based on the selected client IP address (Yu, 0022, 0026, 0030, 0033).

Claim 35

Yu in combination with Chalouhi teach the method according to claim 26 wherein the selected client further storing the content received from the web server (Yu, 0026, 0029-0030, 0033-0035).

Claim 36

Yu in combination with Chalouhi teach the method according to claim 26 wherein the requesting client sending the web server identifier to the first server as part of browser [i.e. browser 401] or email application execution (Yu, 0026, 0033-0034); and the requesting client sending its identifier (Chalouhi, 0023, 0030).

Claim 37

Yu in combination with Chalouhi teach the method according to claim 26 further comprising the step of the first server storing the requesting client identifier (Yu, 0017, 0022, 0024, 0028); and the requesting client sending its identifier (Chalouhi, 0023, 0030).

Claim 39

Yu in combination with Chalouhi teach the method according to claim 26 wherein the communication with the web server or the requesting first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Yu, 0024, 0045).

Claim 40

Yu in combination with Chalouhi teach the method according to claim 26 wherein the communication with the requesting client or the selected client is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Yu, 0024, 0033-0037, 0045).

Claim 41

Yu in combination with Chalouhi teach the method according to claim 26 wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL) (Yu, 0026, 0028).

Claim 42

Yu in combination with Chalouhi teach the method according to claim 2.6 wherein the web server identifier, the first server identifier, the requesting client identifier, or any of the client's identifier is using Internet Protocol (IP) address (Yu, 0026, 0037, 0045).

Claim 43

Yu in combination with Chalouhi teach the method according to claim 26 wherein in step (d) the first server selecting two or more of the clients based on associating the identifiers of the clients with the web server identifier [i.e. the indexing server 404 generating (e.g. includes a selection step) a peer list that currently maintain (associated) the requested content specified by the URL identifier in the query submitted by peer node 403] (Yu, 0022, 0026, 0030, 0033); and in step (e) the first server sending the identifiers of the selected two or more client to the requesting [i.e. the peer list is returned/sent to the peer node 403 from indexing server 404] (Yu, 0026, 0030, 0037).

Claim 44

Yu in combination with Chalouhi teach the method according to claim 43 further comprising the step of the requesting client selecting one of the clients as the selected device (Yu, 0022, 0026, 0029, 0030-0031, 0033, 0035, 0037).

Claim 45

Yu in combination with Chalouhi teach the method according to claim 26 farther comprising the steps of the requesting client sending a communication port number to the selected device, followed by communication between the requesting client and the selected client using the communication port number (Yu, 0026, 0030, 0035).

Claim 46

Yu in combination with Chalouhi teach the method according to claim 26 further comprising the step of the requesting client sending the web server identifier to the selected client (Yu, 0026, 0029, 0030-0031, 0033, 0035, 0037).

Claim 47

Yu in combination with Chalouhi teach the method according to claim 46 further comprising the step of the selected client communicating with the web server (Yu, figures 3-4; 0022, 0026, 0033-0037).

Claim 48

Yu in combination with Chalouhi teach the method according to claim 26 wherein step (d) the first server selecting one of the clients based on the geographical location of the clients (Chalouhi, 0028, 0043-0045).

Claim 49

Yu teaches a method for use with a group of clients [i.e. peer nodes 403, 406, 410 etc.] for data communication between a web server [i.e. web server 405 or content source 332] storing a content and a requesting client [i.e. peer node 403] via one or more clients selected from the group, for use with a first server [i.e. indexing server 404 or control server 331], and where the web server, the requesting client, the first server, and the clients in the group are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier (Yu, figures 2 & 4), the method comprising the steps of:

(b) the first server receiving and storing the identifiers of the clients in the group [i.e. the control server 331 or the indexing server 404 maintains connectivity information/identifications, such as network addresses and port numbers of respective peer clients that are connected within the network 260 (e.g. Internet)] (Yu, figures 3-4; 0017, 0022, 0024, 0028);

(c) the requesting client sending the web server identifier to the first server [i.e. peer node 403 sends a request/query which comprises a URL in an address filed of web browser to the indexing server 404; and the URL of the requested content specifies an address hosted by web server 405] (Yu, 0026, 0033-0034);

(d) selecting one of the clients from the group [i.e. the indexing server 404 generating (e.g. includes a selection step) a peer list that currently maintain (associated) the requested content specified by the URL identifier in the query submitted by peer node 403] (Yu, 0022, 0026, 0030, 0033);

(e) the first server sending the identifier of the selected client to the requesting client [i.e. the peer list is returned/sent to the peer node 403 from indexing server 404] (Yu, 0026, 0030, 0037);

(f) the selected client receiving the content from the web server [i.e. if no peer is available in the returned query response, the peer node 403 connects to the source server or web server to receive the content] (Yu, 0026, 0029, 0033-0034, 0037); and

(g) the requesting client receiving the content from the selected client [i.e. if the peer list does identify peer nodes that have the requested content, then the peer node 403 connects to the peer node identified in the peer list and retrieve/receive the requested content thereform] (Yu, 0022, 0026, 0029, 0030-0031, 0033, 0035, 0037).

Yu fails to teach (a) each of the clients in the group sending its identifier to the first server; (c) the requesting client sending its identifier to the first server (d) the one of the clients from the group is selected based on the geographical location of the clients.

However, in an analogous art, **Chalouhi** teaches (a) each of the clients in the group sending its identifier to the first server [i.e. each P2P client 104 of client machines 102, 111, etc. sends its IP address and port information to tracker server 114 which will adds the information to peer list 118] and (c) the requesting client sending its identifier to

the first server [i.e. the P2P client 104 of the client machine also sends its IP address and port information to tracker server 114] (Chalouhi, 0023, 0030); and (d) the one of the clients from the group is selected based on the geographical location of the clients (Chalouhi, 0028, 0043-0045).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of (a) each of the clients in the group sending its identifier to the first server; (c) the requesting client sending its identifier to the first server (d) the one of the clients from the group is selected based on the geographical location of the clients, as disclosed by Chalouhi, into the teachings of Yu. One would be motivated to support content/file transfers within a group of clients/peers over a network/Internet.

Claim 50

Yu in combination with Chalouhi teach the method according to claim 49 wherein in step (d) the first server is selecting one of the clients (Yu, 0022, 0026, 0030, 0033).

Claim 51

Yu in combination with Chalouhi teach the method according to claim 49 wherein in step (d) the requesting client is selecting one of the clients (Yu, 0026, 0029-0031, 0033, 0035, 0037).

Claim 53

Yu teaches a method for data communication between a requesting client [i.e. peer node 403] and a web server [i.e. web server 405 or content source 332] storing a contempt via a second client [i.e. peer nodes 406, 410 etc.], for use with a first server and a second client, and where the web server, the requesting client, the first server, and the second client are communicatively coupled via the Internet mid each is identified in the Internet using a distinct identifier (Yu, figures 2 & 4), the method comprising the steps of:

(a) sending the web server identifier to the first server [i.e. peer node 403 sends a request/query which comprises a URL in an address filed of web browser to the indexing server 404; and the URL of the requested content specifies an address hosted by web server 405] (Yu, 0026, 0033-0034);

(b) receiving from the first server the identifier of the second client [i.e. the peer list is returned/sent to the peer node 403 from indexing server 404] (Yu, 0026, 0030, 0037);

(c) sending the web server identifier to the second client [i.e. if the peer list does identify peer nodes that have the requested content, then the peer node 403 connects to the peer node identified in the peer list and retrieve/query the requested content] (Yu, 0022, 0026, 0029, 0030-0031, 0033, 0035, 0037);

(d) receiving the content associated with the web server from the second client [i.e. if the peer list does identify peer nodes that have the requested content, then the peer node 403

connects to the peer node identified in the peer list and retrieve/receive the requested content thereform] (Yu, 0022, 0026, 0029, 0030-0031, 0033, 0035, 0037).

Yu fails to teach (a) sending its identifier to the first server.

However, in an analogous art, **Chalouhi** teaches (a) sending its identifier to the first server [i.e. each P2P client 104 of client machines 102, 111, etc. sends its IP address and port information to tracker server 114 which will adds the information to peer list 118] (Chalouhi, 0023, 0030).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of (a) sending its identifier to the first server, as disclosed by Chalouhi, into the teachings of Yu. One would be motivated to support content/file transfers within a group of clients/peers over a network/Internet.

Claim 52 does not teach or define any new limitation other than above claim 38. Therefore, claim 52 is rejected for similar reasons.

Claims 54-58, 60-66 do not teach or define any new limitation other than above claims 27, 29, 31-32, 36, 39-43, 45-46. Therefore, claims 54-58, 60-66 are rejected for similar reasons.

Allowable Subject Matter

Claims 38 and 59 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MINH CHAU N NGUYEN whose telephone number is (571)272-4242. The examiner can normally be reached on M-F 8am-4pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JEFFREY NICKERSON can be reached on (571)270-3631. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MINH CHAU NGUYEN/
Primary Examiner, Art Unit 2459

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5113	(peer$ near1 peer$1) with ((transfer$4 provid$4) near3 (content$1 file$1 document$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/03/28 16:18
L2	464	1 and (web near servers)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/03/28 16:24
L3	214	2 and @ad< "20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/03/28 16:25
L4	16	3 and ((peer$1 client$1) with (send$4 transmit$4 forward$4) with (address$2 id$1 identifier$1 identification$1) with server$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/03/28 16:26
L5	1	3 and ((peer$1 client$1) with (send$4 transmit$4 forward$4) with (address$2 id$1 identifier$1 identification$1) with url$1 with server$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/03/28 16:26
L6	15	4 and (location$1 geographic$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/03/28 16:53

EAST Search History (Interference)

< This search history is empty>

3/ 28/ 2018 4:53:47 PM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: HOLA-005-US2

In re Application of:	)	Confirmation No. 6194
	)	
Derry Shribman *et al.*	)	Art Unit: 2459
	)	
Appln. No.: 14/025,109	)	Examiner: Nguyen, Minh Chau
	)	
Filed: September 12, 2013	)	Washington, D.C.
	)	
For: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	)	December 10, 2017
	)	

RESPONSE / AMENDMENT:

Honorable Commissioner for Patents
U.S. Patent and Trademark Office
Randolph Building, Mail Stop Amendments
401 Dulany Street
Alexandria, VA 22314

Sir:

In response to the Office Action of September 19, 2017 ("Action"):

Remarks/Arguments begin on page **2** of this paper.

REMARKS / ARGUMENTS

The examiner's action dated September 19, 2017 ("Action") has been received and its contents carefully noted.

Office Action, pages 2-16

Claims 26-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves *et al.* (US 2002/0007413 – "Garcia") in view of Yu *et al.* (US 2006/0212584 – "Yu").

Combining Garcia with Yu

a. The Action fails to explain WHY the Garcia and Yu are combinable. If the Examiner contends that they are analogous art being in the same field, **a clear definition stating that field is requested, as required in the rules.**

b. The rationale for combining the Garcia and Yu references is "… *to support content delivery system*". Since both Garcia and Yu describe a 'content delivery system', the rationale provides no linking to the present application, as required in MPEP 2143 that clearly states that "*Any rationale employed must provide* ***a link between the factual findings and the legal conclusion of obviousness.***" (Emphasis added). Further, this rationale amounts to nothing more than a conclusory statement, while the Office cannot rely solely on common knowledge or common sense to support its findings. Further, it is settled that the Office should provide a "satisfactory explanation" for the motivation finding that includes an express and **"rational" connection with the evidence presented.** Further, the same rationale was used in former Action to combine Garcia with the Harrow reference, hence further suggesting no linkage to the actually cited references.

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c. Further, since 'supporting content delivery' is long desired, the rationale, in fact, confirms that the modification based on the combination amounts to a solution to a long-felt solution that serves as a secondary consideration further supporting non-obviousness.

d. Furthermore, BOTH Garcia and Yu clearly teach schemes for the stated motivation of '… *to support content delivery system.*'. Since the inventions in Garcia and Yu are each self-contained and independently operate effectively to reach at the rationale motivation:

> *Because each device independently operates effectively, a person having ordinary skill in the art, who was merely seeking to create a better device to drain fluids from a wound, would have no reason to combine the features of both devices into a single device.*

Kinetic Concepts v. Smith and Nephew, 688 F.3d 1342, at 1369 (CAFC, 2012).

e. **Teaching away**: The Garcia reference is silent, and affectively teaches away, from using clients as content source for other clients.

1. There is clear distinction in the art and as taught by the Garcia reference between clients and servers. Client devices, such as client 105 in the Garcia reference, are end-units that request information from servers, use client-related software such as Web browser software, communicate over the Internet using ISP connection, and are typically consumer owned and operated (see Figures 1 and 2 in Garcia, as well as paragraphs 0010 and 0085). As shown in Figure 2, a client device typically connects to the Internet via an ISP using a single connection.

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2. In contrast, server devices are known in the art to be dedicated devices to store information objects, to be provided to clients upon request (See paragraph 0012 in Garcia, for example).

3. The Garcia invention is directed to introducing a new type of information-object / client mapping device referred to as "Web router". The Web router is a backbone device (see Figure 2), and as taught in paragraph 0082, the 'Web router' communicates with 'its neighbor Web routers' via point-to-point links (paragraph 0091), and may be co-located with another server, such as '… *a Web-server, a web cache, a hosting server, a DNS server or an original content server*' (paragraph 0082). While retaining the client-server basic architecture (See paragraph 0153), the Garcia reference teaches a mapping method for affectively addressing caches, in order to allow low latency in the Internet.

4. The Garcia disclosure is silent, and affectively teaches away, from caching or retrieving information objects from clients, such as by using peer-to-peer scheme. The Garcia reference only teaches caching in servers or backbone-embedded Web routers. The Garcia disclosure is silent, and affectively teaches away, from implementing 'web router' functionality in clients. Further, caching information in clients clearly changes the way of operation of the Garcia network, and since clients are inherently sources limited, such as in bandwidth and storage capability, the latency of fetching information object is expected to be increased, rather than being reduced as intended by the Garcia invention.

5. The Garcia disclosure describes four distinct and non-interoperable selection mechanisms, detailed in paragraph 0104 as follows:

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> *[0104] In a further embodiment, one of the following four mechanisms, or, a combination of some of the following four mechanisms, is or may be used to communicate the best Web cache or content server, or the set of Web caches (more generally the information object repository(ies)), which should serve a client's request:*
> *[0105] (1) direct cache selection;*
> *[0106] (2) redirect cache selection;*
> *[0107] (3) remote DNS cache selection; and*
> *[0108] (4) client DNS cache selection.*

However, the Action improperly 'pick and choose' from the different mechanisms. For example, the rejection is based on paragraph 0113 that is part of the "*(1) direct cache selection*" mechanism, and paragraphs 0119-0121 that are part of the "*(2) redirect cache selection*" mechanism.

Regarding claim 26.

Claim 26 recites that "*(d)* ***the first server selecting*** *one of the clients from the group based on associating the identifiers of the clients with the web server identifier; (e)* ***the first server sending*** *the identifier of the selected client to the requesting client; …*". The claim explicitly discloses that it is the first server (assumed to be equated to the Control Server 331 in Yu) that makes the selecting, and sends the information about the selection to the requested client device. In contrast, as described in the cited paragraph 0022 and steps 512 & 514 in Figure 5, the Yu reference teaches that **the selection is made by the client device**, after receiving the whole list from the server.

Regarding claim 27.

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Claim 26 recites that "*(e) the first server sending the identifier of the selected client to the requesting client; (f) the selected client receiving the content from the web server;* …". According to claim 27, the selected client fetch the information from the web server AFTER being selected. In contrast, the Yu reference is based on selecting a client device ONLY based on this client storing in its cache memory the requested information.

Regarding claims 28-29 and 55.

The cited paragraph 0010 in the Garcia reference explicitly teaches HTTP with regard to Internet communication in a server/client scheme, hence further remote from combining with Yu that focuses on peer-to-peer communication.

Regarding claims 30-31 and 56.

The cited paragraph 0096 in the Garcia reference explicitly teaches TCP/IP with regard to WILD scheme between Web routers, hence further remote from combining with Yu that focuses on clients peer-to-peer communication.

Regarding claim 41.

The cited paragraph 0010 in the Garcia reference explicitly teaches URL with regard to Internet communication in a server/client scheme, hence further remote from combining with Yu that focuses on peer-to-peer communication.

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The absence of a reply to a specific rejection, issue, or comment, does not signify agreement with that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims that have not been expressed.

Nothing in this reply should be understood as conceding any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claims does not necessarily signify concession of unpatentability to the claim before its amendment.

In view of the foregoing, it is requested that all of the rejections be reconsidered and withdrawn and that the claims be considered allowable.

If the above arguments should not now place the application in the condition for allowance, the examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

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Electronic Acknowledgement Receipt

EFS ID:	31179884
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	10-DEC-2017
Filing Date:	12-SEP-2013
Time Stamp:	09:37:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Second-NF-Response.pdf	282623 d4ae5e3787d7366ded7da7124ae6750d8be284bc	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	7
Warnings:			
Information:			
	Total Files Size (in bytes):	282623	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/025,109	09/12/2013	2459	1810	HOLA-005-US2	25	4

CONFIRMATION NO. 6194

CORRECTED FILING RECEIPT

131926
May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

OC000000093717476

Date Mailed: 11/28/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Derry Shribman, Tel Aviv, ISRAEL;
Ofer Vilenski, Moshav Hadar Am, ISRAEL;

Applicant(s)

HOLA NEWCO LTD., Netanya, ISRAEL;

Power of Attorney: The patent practitioners associated with Customer Number 131926

Domestic Priority data as claimed by applicant

This application is a DIV of 12/836,059 07/14/2010 PAT 8560604
which claims benefit of 61/249,624 10/08/2009

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 09/27/2013

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/025,109**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

Preliminary Class

709

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2

CONFIRMATION NO. 6194

131926
May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

POA ACCEPTANCE LETTER

OC000000095717587

Date Mailed: 11/28/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/17/2017.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/ewodaje/

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PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	[redacted] HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Derry		Shribman	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Postal Code	[redacted] 6356709 — Country: IL

Inventor 2 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ofer		Vilenski	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Mailing Address of Inventor:

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City	[redacted] Moshav Hadar Am — State/Province:
Postal Code	[redacted] 42935 — Country: IL

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

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PTO/AIA/14 (03-13)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~19456-6165P~~ HOLA-005-US2
	Application Number	14/025,109

Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	~~67440~~ 131926		
Email Address	[redacted]	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION		
Attorney Docket Number	~~19456-6165P~~ HOLA-005-US2	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	15	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	~~67440~~ 131926		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Division of	12836059	2010-07-14
Prior Application Status	Expired		Remove

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~19439-0195P~~ HOLA-005-US2
	Application Number	14/025,109

Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
12836059	non provisional of	61249624	2009-10-08

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~40450-6105P~~ HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(•) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☒

Organization Name	~~Hola Networks Ltd.~~ HOLA NEWCO LTD.

Mailing Address Information For Applicant:

Address 1	~~7 Giborei Israel Street, PO BOX 8025~~ 3 Hamahshev St.,		
Address 2	~~Poleg Industrial Center~~		
City	Netanya	**State/Province**	
Country	IL	Postal Code	42507
Phone Number		Fax Number	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
110 of 789

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yehuda Binder/			Date (YYYY-MM-DD)	2017-11-16
First Name	Yehuda	Last Name	BINDER	Registration Number	73612

Additional Signature may be generated within this form by selecting the Add button.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US2
	Application Number	14/025,109
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
113 of 789

Electronic Acknowledgement Receipt

EFS ID:	30978457
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	17-NOV-2017
Filing Date:	12-SEP-2013
Time Stamp:	04:10:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	aia0096-005-US2.pdf	119535 08460170c61b86aeaa45172bf7056c3923ea1651	no	3

Warnings:

Information:					
2	Power of Attorney	signed_uspto_poa_hola_newco.pdf	802990 5731a23b64e3aa397cad68ca1fa83cbb1544987a	no	2
Warnings:					
Information:					
3	Application Data Sheet	ADS-with-TC.pdf	1024671 d324f5530e2defb496b39a8c8f543b78db7f32ec	no	7
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
			Total Files Size (in bytes):	1947196	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Hola Networks Ltd.

Application No./Patent No.: 14/025,109 Filed/Issue Date: 09-12-2013

Titled: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

HOLA NEWCO LTD., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Derry Shribman, Ofer Vilenski To: HOLA NETWORKS LTD.

   The document was recorded in the United States Patent and Trademark Office at

   Reel 031415, Frame 0428, or for which a copy thereof is attached.

2. From: HOLA NETWORKS LTD. To: HOLA NEWCO LTD.

   The document was recorded in the United States Patent and Trademark Office at

   Reel 043977, Frame 0335, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Yehude Binder/	November 15, 2017
Signature	Date
Yehude Binder	US Patent Agent 73,612
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 131926

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[x] The address associated with Customer Number: 131926

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: HOLA NEWCO LTD
3 Hamelshlev St.
Netanya 42507,
Israel

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature	Date
Name Derry Shribman	Telephone
Title CEO of HOLA NEWCO LTD.	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

131926 7590 09/19/2017

May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

EXAMINER	
NGUYEN, MINH CHAU	

ART UNIT	PAPER NUMBER
2459	

MAIL DATE	DELIVERY MODE
09/19/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 14/025,109	Applicant(s) SHRIBMAN ET AL.	
	Examiner MINH-CHAU NGUYEN	Art Unit 2459	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04/02/2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *26-66* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *26-66* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *08/17/2017*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

Remarks

Applicant's amendment dated April 2, 2017 responding to the January 10, 2017 Office Action provided in the rejection of claims 26-66. **Claims 26-66** remain pending in the application and which have been fully considered by the examiner.

Applicant's arguments filed April 2, 2017 have fully considered; however the arguments are moot in view of the new ground(s) of rejection. See rejections below for details.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 26-66 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves et al. (US 2002/0007413) hereinafter "**Garcia**", and in view of Yu et al. (US 2006/0212584) hereinafter "**Yu**".

Claim 26

Garcia teaches a method for use with a group of clients for data communication between a web server storing a content and a requesting client via one or more clients selected from the group, for use with a first server, and where the web server, the requesting client, the first server, and the clients in the group are communicatively coupled via the Internet and each is identified in the internet using a distinct identifier, the method comprising the steps of:

(c) the client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) the first server selecting one of the devices based on associating the identifiers of the clients with the web server identifier (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the requesting client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach a group of clients for data communication; (a) each of the devices sending its identifier to the first server; (b) the first server receiving and storing the identifiers of the devices; (d) the first server selecting one of the clients from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving the content from the selected client.

However, in an analogous art, **Yu** teaches a group of clients for data communication (Yu, figures 2 & 4); (a) each of the devices sending its identifier to the first server (Yu, 0022-0023, 0026); (b) the first server receiving and storing the

identifiers of the devices (Yu, 0022-0023); (d) the first server selecting one of the clients from the group (Yu, 0022, 0026, 0033, 0035); and (f) the selected client receiving the content from the web server (Yu, 0026, 0033-0037); and (g) the requesting client receiving the content from the selected client (Yu, 0026, 0031, 0035-0037).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of a group of clients for data communication; (a) each of the devices sending its identifier to the first server; (b) the first server receiving and storing the identifiers of the devices; (d) the first server selecting one of the clients from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving the content from the selected client, as disclosed by Yu, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 27

Garcia in combination with Yu teach the method according to claim 26 wherein the steps are sequentially executed (Yu, 0047).

Claim 28

Garcia in combination with Yu teach the method according to claim 26 wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected client (Garcia, 0010).

Claim 29

Garcia in combination with Yu teach the method according to claim 26 wherein the first server is HTTP server and responds to HTTP requests from the requesting client (Garcia, 0010).

Claim 30

Garcia in combination with Yu teach the method according to claim 26 wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 31

Garcia in combination with Yu teach the method according to claim 26 wherein the first server is a TCI / IP server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 32

Garcia in combination with Yu teach the method according to claim 26 wherein the content includes web-page, audio, or video content (Garcia, 0113, 0153).

Claim 33

Garcia in combination with Yu teach the method according to claim 26 wherein the first server selecting one of the devices is based on the web server IP address or URL (Garcia, 0010); and selecting client(s) (Yu, 0022, 0026, 0033-0037).

Claim 34

Garcia in combination with Yu teach the method according to claim 26 wherein the first server selecting one of the devices is based on the selected device IP address (Garcia, 0102-0103, 0121, 0153); and selecting client(s) (Yu, 0022, 0026, 0033-0037).

Claim 35

Garcia in combination with Yu teach the method according to claim 26 wherein the selected device fresher storing the content received from the web server (Garcia, 0102-0103, 0121, 0153); and selecting client(s) (Yu, 0022, 0026, 0033-0037).

Claim 36

Garcia in combination with Yu teach the method according to claim 26 wherein the device sending its identifier and the web server identifier to the first server as part of browser or email application execution (Garcia, 0010, 0102-0103); and requesting client (Yu, 0033-0037).

Claim 37

Garcia in combination with Yu teach the method according to claim 26 further comprising the step of the device sending its identifier to the first server, and the first server storing the device identifier (Garcia, 0102, 0113); and requesting client(s) (Yu, 0033-0037).

Claim 38

Garcia in combination with Yu teach the method according to claim 37 further for data communication between a second, web server storing a second content and having an identifier in the Internet and a one of the clients via the requesting client, the method further comprising the steps of:

(h) one of the devices sending the second web server identifier to the first server (Garcia, 0102, 0113);

(i) the first server sending the identifier of the client to the one of the devices (Garcia, 0113-0114, 0119-0121, 0153);

(j) the client receiving the second content from the second web server (Garcia, 0113-0114, 0119-0121, 0153); and

(k) the one of the devices receiving the second content from the client (Garcia, 0113-0114, 0119-0121, 0153).

Yu teaches the selected client and the requesting client receiving the content from the selected client (Yu, 0022, 0026, 0033-0037).

Claim 39

Garcia in combination with Yu teach the method according to claim 26 wherein the communication with the web server or the requesting first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126).

Claim 40

Garcia in combination with Yu teach the method according to claim 26 wherein the communication with the client or the selected device is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126); and requesting client(s) (Yu, 0033-0037).

Claim 41

Garcia in combination with Yu teach the method according to claim 26 wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL) (Garcia, 0010).

Claim 42

Garcia in combination with Yu teach the method according to claim 2.6 wherein the web server identifier, the first server identifier, the client identifier, or any of the device's identifier is using Internet Protocol (IP) address (Garcia, 0102, 0113); and requesting client(s) (Yu, 0033-0037).

Claim 43

Garcia in combination with Yu teach the method according to claim 26 wherein in step (d) the first server selecting two or more of the device based on associating the identifiers of the devices with the web server identifier [i.e. selecting a best cache server based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0114, 0121, 0153). Even though the best cache server is selected, but besides this, Yu does disclose the selected device receives the content (Yu, 0033-0037); and in step (e) the first server sending the identifiers of the selected two or more client devices to the requesting (Yu, 0022, 0026, 0033-0037).

Claim 44

Garcia in combination with Yu teach the method according to claim 43 further comprising the step of the client selecting one of the devices as the selected device [i.e. selecting a best cache server based the received IP address of client with using WILD

table] (Garcia, 0102-0103, 0114, 0121, 0153). Even though the best cache server is selected, but besides this, Yu does disclose the selected client device receives the content and requesting client(s) (Yu, 0022, 0026, 0033-0037).

Claim 45

Garcia in combination with Yu teach the method according to claim 26 farther comprising the steps of the client sending a communication address to the selected device, followed by communication between the client and the selected device using the communication address [i.e. sending the IP address of the client 300 to a Web router 304] (Garcia, 0113, 0119-0120). Besides this, Yu does disclose the feature of communication port number (Yu, 0022); and selecting and requesting clients (Yu, 0033-0037).

Claim 46

Garcia in combination with Yu teach the method according to claim 26 further comprising the step of the requesting client sending the web server identifier to the selected device (Garcia, 0113-0114, 0119-0121); and selecting client (Yu, 0022, 0026, 0033-0037).

Claim 47

Garcia in combination with Yu teach the method according to claim 46 further comprising the step of the selected device communicating with the web server (Garcia, 0113-0114, 0119-0121); and selecting client (Yu, 0022, 0026, 0033-0037).

Claim 48

Garcia in combination with Yu teach the method according to claim 26 wherein step (d) the first server selecting one of the devices based on the geographical location of the clients (Garcia, 0102); and selecting client (Yu, 0022, 0026, 0033-0037).

Claim 49

Garcia teaches a method for use with a group of clients for data communication between a web server storing a content and a requesting client via one or more clients selected from the group, for use with a first server, and where the web server, the requesting client, the first server, and the clients in the group are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(c) the requesting client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) selecting one of the devices based on the geographical location of the devices (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the requesting client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach a group of clients for data communication; (a) each of the clients in the group sending its identifier to the first server; (b) the first server receiving and storing the identifiers of the clients in the group; (d) selecting one of the clients from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving the content from the selected client.

However, in an analogous art, **Yu** teaches a group of clients for data communication (Yu, figures 2 & 4); (a) each of the clients in the group sending its identifier to the first server (Yu, 0022-0023, 0026); (b) the first server receiving and storing the identifiers of the clients in the group (Yu, 0022-0023); (d) selecting one of the clients from the group (Yu, 0022, 0026, 0033, 0035); and (f) the selected client receiving the content from the web server (Yu, 0026, 0033-0037); and (g) the requesting client receiving the content from the selected client (Yu, 0026, 0031, 0035-0037).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of a group of clients for data communication; (a) each of the clients in the group sending its identifier to the first server; (b) the first server receiving and storing the identifiers of the clients in the group; (d) selecting one of the clients from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving the content from the selected client, as disclosed by Yu, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 50

Garcia in combination with Yu teach the method according to claim 49 wherein in step (d) the first server is selecting one of the devices (Garcia, 0102-0103, 0121, 0153); and selecting client (Yu, 0022, 0026, 0033-0037).

Claim 51

Garcia in combination with Yu teach the method according to claim 49 wherein in step (d) the requesting client is selecting one of the devices (Garcia, 0102-0103, 0121, 0153); and selecting client (Yu, 0022, 0026, 0033-0037).

Claim 53

Garcia teaches a method for data communication between a requesting client and a web server storing a contempt via a second client, for use with a first server and a second client, and where the web server, the requesting client, the first server, and the second client are communicatively coupled via the Internet mid each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) sending its identifier and the web server identifier to the first server (Garcia, 0102, 0113, 0119-0121, 0153);

(b) receiving from the first server the identifier of the device (Garcia, 0113-0114, 0119-0121, 0153);

(c) sending the web server identifier to the device (Garcia, 0113, 0119-0120).

Garcia fails to teach second device and (d) receiving the content associated with the web server from the second client.

However, in an analogous art, **Yu** teaches second device and (d) receiving the content associated with the web server from the second client (Yu, Yu, 0026, 0033-0037).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of second device and (d) receiving the content associated with the web server from the second client, as disclosed by Yu, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 59

Garcia in combination with Yu teach the method according to claim 53 further for data communication with a second web server storing a second content and having an identifier in the Internet and the devices via the client, the method further comprising the steps of: (e) receiving the second content from the second web server (Garcia, 0113-0114, 0119-0121, 0153); and (f) sending the second content to the second client and requesting client (Yu, 0022, 0026, 0033-0037).

Claim 52 does not teach or define any new limitation other than above claim 38. Therefore, claim 52 is rejected for similar reasons.

Claims 54-58, 60-66 do not teach or define any new limitation other than above claims 27, 29, 31-32, 36, 39-43, 45-46. Therefore, claims 54-58, 60-66 are rejected for similar reasons.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MINH-CHAU NGUYEN whose telephone number is (571)272-4242. The examiner can normally be reached on 9AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JEFFREY L. NICKERSON can be reached on (571) 270-3631. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MINH-CHAU NGUYEN/
Primary Examiner, Art Unit 2459

Notice of References Cited	Application/Control No. 14/025,109	Applicant(s)/Patent Under Reexamination SHRIBMAN ET AL.	
	Examiner MINH-CHAU NGUYEN	Art Unit 2459	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2006/0212584 A1	09-2006	Yu; Mingjian	G06F17/30902	709/227
*	B	US-2003/0074403 A1	04-2003	Harrow, Ivan P.	G06F17/30206	709/203
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	E	US-				
	F	US-				
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.N/	1	3922494	A	1975-11-25	Cooper , et al.	
/M.N/	2	5758195	A	1998-05-26	Balmer; Keith	
/M.N/	3	6061278	A	2000-05-09	Kato , et al.	
/M.N/	4	6466470	B1	2002-10-15	Houn Chang	

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/M.N/	1	20030009518	A1	2003-01-09	Harrow, Ivan P. ; et al.	
/M.N/	2	20030074403	A1	2003-04-17	Harrow, Ivan P. ; et al.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

/M.N/	3	20140082260	A1	2014-03-20	OH; HakJune ; et al.	
	4	20110314347	A1	2011-12-22	NAKANO; Rikizo ; et al.	
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	9	20080025506	A1	2008-01-31	Muraoka; Jochiku	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

/M.N/	14	20160021430	A1	2016-01-21	LaBosco; Mark ; et al.	

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Examiner Signature	/MINH CHAU NGUYEN/	Date Considered	09/17/2017

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2017-08-16
Name/Print	Yehuda BINDER	Registration Number	73612

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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Oxylabs LT, UAB v. Bright Data Ltd.
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14025109	SHRIBMAN ET AL.
	Examiner	Art Unit
	MINH-CHAU NGUYEN	2459

CPC- SEARCHED		
Symbol	Date	Examiner
H04L 67/42	9/4/2017	MN
H04L 41/046	9/4/2017	MN
H 04L 67/1002	9/4/2017	MN

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	201-203, 207	3/7/2016	MN

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
Search on EAST	3/7/2016	MN
Update search on EAST	1/8/2017	MN
Update search on EAST	9/4/2017	MN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14025109	SHRIBMAN ET AL.
	Examiner	**Art Unit**
	MINH-CHAU NGUYEN	2459

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017	09/04/2017					
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	36	✓	✓	✓	✓					

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CLAIM		DATE								
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	64	✓	✓	✓	✓					
	65	✓	✓	✓	✓					
	66	✓	✓	✓	✓					

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	955	((peer$1 with client$1) same (web near server)) and (peer$1 with network$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:19
L4	469	3 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L5	279	4 and (client$1 near1 request$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L6	52	5 and (select$4 near1 client$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L7	1513	(peer$1 with client$1) same (web near server)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L8	700	L7 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L9	89	L8 and (select$4 with client$1 with receiv$4 with (content$1 page$1 document$1 file$1 data site$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L10	89	L9 and (select$4 with client$1 with receiv$4 with (content$1 page$1 document$1 file$1 data site$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L11	32	6 and (select$4 with client$1 with receiv$4 with (content$1 page$1 document$1 file$1 data site$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:32
L12	32	11 and port$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:33
L13	31	12 and sequen$6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:33
L14	3	("20030009518").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:37

L15	29	8 and (client$1 near3 (send$4 transmit$4) near3 (identifier$1 id$1 identification$1 address$2) with server$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:38
L16	6	15 and (server$1 near3 (store$1 storing) near3 (identifier$1 id$1 identification$1 address$2))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:39
L17	4	16 and port$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:39
L18	0	17 and (select$4 with client$1 with receiv$4 with (content$1 page$1 document$1 file$1 data site$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:39
L19	4	17 and (select$4 with client$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:39
L20	4	19 and (client$1 near3 request$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:39
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L22	11	21 and (select$4 with client$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:42
L23	11	22 and (client$1 near3 request$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:42
L24	9	23 and port$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/17 20:42

EAST Search History (Interference)

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9/ 17/ 2017 8:54:05 PM
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	3922494	A	1975-11-25	Cooper , et al.	
	2	5758195	A	1998-05-26	Balmer; Keith	
	3	6061278	A	2000-05-09	Kato , et al.	
	4	6466470	B1	2002-10-15	Houn Chang	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20030009518	A1	2003-01-09	Harrow, Ivan P. ; et al.	
	2	20030074403	A1	2003-04-17	Harrow, Ivan P. ; et al.	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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	3	20140082260	A1	2014-03-20	OH; HakJune ; et al.	
	4	20110314347	A1	2011-12-22	NAKANO; Rikizo ; et al.	
	5	20100329270	A1	2010-12-30	Asati; Rajiv ; et al.	
	6	20100085977	A1	2010-04-08	Khalid; Mohamed ; et al.	
	7	20100066808	A1	2010-03-18	Tucker; Curtis E. ; et al.	
	8	20090279559	A1	2009-11-12	Wong; Yuen Fai ; et al.	
	9	20080025506	A1	2008-01-31	Muraoka; Jochiku	
	10	20040264506	A1	2004-12-30	Furukawa, Rei	
	11	20020123895	A1	2002-09-05	Sergey Potekhin	
	12	20150033001	A1	2015-01-29	Ivanov; Vladimir	
	13	20150358648	A1	2015-12-10	Limberg; Allen LeRoy	

Oxylabs LT, UAB v. Bright Data Ltd.
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	14	20160021430	A1	2016-01-21	LaBosco; Mark ; et al.	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Attorney Docket Number	HOLA-005-US2

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2017-08-16
Name/Print	Yehuda BINDER	Registration Number	73612

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Patent Application Fee Transmittal

Application Number:	14025109
Filing Date:	12-Sep-2013
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Filer:	Yehuda Binder
Attorney Docket Number:	HOLA-005-US2

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	90	90
		Total in USD ($)		**90**

Electronic Acknowledgement Receipt

EFS ID:	30102847
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	17-AUG-2017
Filing Date:	12-SEP-2013
Time Stamp:	05:58:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$90
RAM confirmation Number	081717INTEFSW00008101506726
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS4.pdf	1035858 e941ead782da934efbfe0e6b6f027d034088930c	no	5
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30421 8d42a4dbe33f868199f47cfde7cd6f54c9150b83	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1066279		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: HOLA-005-US2

In re Application of:	)	Confirmation No. 6194
	)	
Derry Shribman *et al.*	)	Art Unit: 2459
	)	
Appln. No.: 14/025,109	)	Examiner: Nguyen, Minh Chau
	)	
Filed: September 12, 2013	)	Washington, D.C.
	)	
For: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	)	April 2, 2017
	)	

RESPONSE / AMENDMENT:

Honorable Commissioner for Patents
U.S. Patent and Trademark Office
Randolph Building, Mail Stop Amendments
401 Dulany Street
Alexandria, VA 22314

Sir:

In response to the Office Action of January 10, 2017 ("Action"):

Remarks/Arguments begin on page **2** of this paper.

Electronic Acknowledgement Receipt

EFS ID:	28808499
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	02-APR-2017
Filing Date:	12-SEP-2013
Time Stamp:	08:44:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		1-2017-after-RCE-NFOA-response.pdf	282983 5375a93289b18a09b7abe771b7a730e25768d228	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	2	8
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	282983	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS / ARGUMENTS

The examiner's action dated January 10, 2017 ("Action") has been received and its contents carefully noted.

Office Action, pages 3-18

Claims 26-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves et al. (US 2002/0007413 – "Garcia") in view of Harrow et al. (US 2003/0009518 – "Harrow").

Argument #1: The Garcia reference is silent, and affectively teaches away, from using clients as content source for other clients.

a. There is clear distinction in the art and as taught by the Garcia reference between clients and servers. Client devices, such as client 105 in the Garcia reference, are end-units that request information from servers, use client-related software such as Web browser software, communicate over the Internet using ISP connection, and are typically consumer owned and operated (see Figures 1 and 2 in Garcia, as well as paragraphs 0010 and 0085). As shown in Figure 2, a client device typically connects to the Internet via an ISP using a single connection.

b. In contrast, server devices are known in the art to be dedicated devices to store information objects, to be provided to clients upon request (See paragraph 0012 in Garcia, for example).

c. The Garcia invention is directed to introducing a new type of information-object / client mapping device referred to as "Web router". The Web router is a backbone device (see Figure

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2), and as taught in paragraph 0082, the 'Web router' communicates with 'its neighbor Web routers' via point-to-point links (paragraph 0091), and may be co-located with another server, such as '*… a Web-server, a web cache, a hosting server, a DNS server or an original content server*' (paragraph 0082). While retaining the client-server basic architecture (See paragraph 0153), the Garcia reference teaches a mapping method for affectively addressing caches, in order to allow low latency in the Internet.

d. The Garcia disclosure is silent, and affectively teaches away, from caching or retrieving information objects from clients, such as by using peer-to-peer scheme. The Garcia reference only teaches caching in servers or backbone-embedded Web routers. The Garcia disclosure is silent, and affectively teaches away, from implementing 'web router' functionality in clients. Further, caching information in clients clearly changes the way of operation of the Garcia network, and since clients are inherently sources limited, such as in bandwidth and storage capability, the latency of fetching information object is expected to be increased, rather than being reduced as intended by the Garcia invention.

e. The Garcia disclosure describes four distinct and non-interoperable selection mechanisms, detailed in paragraph 0104 as follows:

> *[0104] In a further embodiment, one of the following four mechanisms, or, a combination of some of the following four mechanisms, is or may be used to communicate the best Web cache or content server, or the set of Web caches (more generally the information object repository(ies)), which should serve a client's request:*
> *[0105] (1) direct cache selection;*

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[0106] (2) redirect cache selection;
[0107] (3) remote DNS cache selection; and
[0108] (4) client DNS cache selection.

However, the Action improperly 'pick and choose' from the different mechanisms. For example, the rejection is based on paragraph 0113 that is part of the "*(1) direct cache selection*" mechanism, and paragraphs 0119-0121 that are part of the "*(2) redirect cache selection*" mechanism.

Combining Garcia with Harrow

a. The rationale for combining the Garcia and Harrow references is "*… to support content delivery system*". Since both Garcia and Harrow describe a 'content delivery system', the rationale provides no linking to the present application, as required in MPEP 2143 that clearly states that "*Any rationale employed must provide* ***a link between the factual findings and the legal conclusion of obviousness.***" (Emphasis added). Further, this rationale amounts to nothing more than a conclusory statement, while the Office cannot rely solely on common knowledge or common sense to support its findings. Further, it is settled that the Office should provide a "satisfactory explanation" for the motivation finding that includes an express and **"rational" connection with the evidence presented.**

b. Further, since 'supporting content delivery is long desired, the rationale, in fact, confirms that the modification based on the combination amounts to a solution to a long-felt solution that serves as a secondary consideration further supporting non-obviousness.

c. The devices described by Harrow are communicating over Local Area Network (LAN) using peer-to-peer scheme. Using clients

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over the Internet as both cache-servers AND clients is clearly an unexpected result.

Regarding claims 26, 38, 49, 50 and 53.

a. Claim 26 recites the limitations: "… *each of the clients in the group sending its identifier to the first server; …*" and "… *the first server receiving and storing the identifiers of the clients in the group; …*". The rejection is based on paragraphs 0102 and 0113 in Garcia.

While the mapping scheme described in the Garcia reference is based on the IP address of the information requesting client device, the Garcia reference in general, and the cited paragraphs 0102 and 0113 in particular, is silent about receiving of identifiers, or even about being contacted by, clients other than the information-requesting client. In particular, the Garcia reference is silent about receiving or storing identifiers of client devices as recited in the claim.

b. Claim 26 recites the limitations: "… *the first server selecting one of the clients from the group based on associating the identifiers of the clients with the web server identifier …*". The rejection is based on paragraphs 0102-0103, 0121, and 0153 in Garcia.

The cited paragraphs 0102 and 0121 teach selecting the 'best cache server', and the cited paragraph 0153 teaches changing the selected cache server upon sensing loading degradation. However, the Garcia reference in general, and the cited paragraph in particular, are silent regarding selecting non-cache server in general, a non-server in particular, and

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further regarding selecting a client device as recited in the claim.

Further, the selection mechanism described by Garcia (in particular in the cited paragraphs) is based on WILD protocol, as described in paragraphs 0095-0096 and 0099-0100. This protocol is a high level protocol (above TCP) used by backbone devices such as gateways and web routers. Such protocol is not described for, and is not suited for use by, client devices.

Regarding claims 28-29 and 55.

The cited paragraph 0010 in the Garcia reference explicitly teaches HTTP with regard to Internet communication in a server/client scheme, hence further remote from combining with Harrow that discusses peer-to-peer communication in a LAN environment.

Regarding claims 30-31 and 56.

The cited paragraph 0096 in the Garcia reference explicitly teaches TCP/IP with regard to WILD scheme between Web routers, hence further remote from combining with Harrow that discusses clients peer-to-peer communication in a LAN environment.

Regarding claim 41.

The cited paragraph 0010 in the Garcia reference explicitly teaches URL with regard to Internet communication in a server/client scheme, hence further remote from combining with Harrow that discusses peer-to-peer communication in a LAN environment.

Regarding claims 43-44.

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The Garcia and Harrow references in general, and the cited paragraphs in particular, are silent about selecting two devices as recited in the claims, and only disclose selecting a single device.

Regarding claim 45.

While the Harrow reference in claim 26 discloses a communication port, the Garcia and Harrow references in general, and the cited paragraphs in particular, are silent about any port number.

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The absence of a reply to a specific rejection, issue, or comment, does not signify agreement with that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims that have not been expressed.

Nothing in this reply should be understood as conceding any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claims does not necessarily signify concession of unpatentability to the claim before its amendment.

In view of the foregoing, it is requested that all of the rejections be reconsidered and withdrawn and that the claims be considered allowable.

If the above arguments should not now place the application in the condition for allowance, the examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

131926 7590 01/10/2017

May Patents Ltd. c/o Dorit Shem-Tov
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ISRAEL

EXAMINER
NGUYEN, MINH CHAU

ART UNIT	PAPER NUMBER
2459	

MAIL DATE	DELIVERY MODE
01/10/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 14/025,109	Applicant(s) SHRIBMAN ET AL.	
	Examiner MINH-CHAU NGUYEN	Art Unit 2459	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/30/2016*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *26-66* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *26-66* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *11/30/2016*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

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The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 30, 2016 has been entered.

Remarks

Applicant's amendment dated November 30, 2016 responding to the September 8, 2016 Office Action provided in the rejection of claims 26-66. **Claims 26-66** remain pending in the application and which have been fully considered by the examiner.

Applicant's amendments and arguments filed November 30, 2016 have fully considered; however the arguments are moot in view of the new ground(s) of rejection. See rejections below for details.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 26-66 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves et al. (US 2002/0007413) hereinafter "**Garcia**", and in view of Harrow et al. (US 2003/0009518) hereinafter "**Harrow**".

Claim 26

Garcia teaches a method for use with a group of clients for data communication between a web server storing a content and a requesting client via one or more clients selected from the group, for use with a first server, and where the web server, the requesting client, the first server, and the clients in the group are communicatively coupled via the Internet and each is identified in the internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server (Garcia, 0102, 0113);

(b) the first server receiving and storing the identifiers of the devices (Garcia, 0102, 0113);

(c) the client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) the first server selecting one of the devices based on associating the identifiers of the clients with the web server identifier (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the requesting client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach a group of clients for data communication between the web server and a requesting client via one or more clients selected from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving the content from the selected client.

However, in an analogous art, **Harrow** teaches a group of clients (i.e. clients A-D) for data communication between the web server and a requesting client (i.e. client A) via one or more clients selected from the group; and (f) the selected client (i.e. client D) receiving the content from the web server; and (g) the requesting client (i.e. client A) receiving the content from the selected client (Harrow, 0031, 0034, 0082, 0088).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of a group of clients for data communication between the web server and a requesting client via one or more clients selected from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving

the content from the selected client, as disclosed by Harrow, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 27

Garcia in combination with Harrow teach the method according to claim 26 wherein the steps are sequentially executed (Harrow, 0072).

Claim 28

Garcia in combination with Harrow teach the method according to claim 26 wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected client (Garcia, 0010).

Claim 29

Garcia in combination with Harrow teach the method according to claim 26 wherein the first server is HTTP server and responds to HTTP requests from the requesting client (Garcia, 0010).

Claim 30

Garcia in combination with Harrow teach the method according to claim 26 wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 31

Garcia in combination with Harrow teach the method according to claim 26 wherein the first server is a TCI / IP server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 32

Garcia in combination with Harrow teach the method according to claim 26 wherein the content includes web-page, audio, or video content (Garcia, 0113, 0153).

Claim 33

Garcia in combination with Harrow teach the method according to claim 26 wherein the first server selecting one of the devices is based on the web server IP address or URL (Garcia, 0010); and selecting client(s) (Harrow, 0031, 0034).

Claim 34

Garcia in combination with Harrow teach the method according to claim 26 wherein the first server selecting one of the devices is based on the selected device IP address (Garcia, 0102-0103, 0121, 0153); and selecting client(s) (Harrow, 0031, 0034).

Claim 35

Garcia in combination with Harrow teach the method according to claim 26 wherein the selected device fresher storing the content received from the web server (Garcia, 0102-0103, 0121, 0153); and selecting client(s) (Harrow, 0031, 0034).

Claim 36

Garcia in combination with Harrow teach the method according to claim 26 wherein the device sending its identifier and the web server identifier to the first server

as part of browser or email application execution (Garcia, 0010, 0102-0103); and requesting client (Harrow, 0031, 0034).

Claim 37

Garcia in combination with Harrow teach the method according to claim 26 further comprising the step of the device sending its identifier to the first server, and the first server storing the device identifier (Garcia, 0102, 0113); and requesting client(s) (Harrow, 0031, 0034).

Claim 38

Garcia in combination with Harrow teach the method according to claim 37 further for data communication between a second, web server storing a second content and having an identifier in the Internet and a one of the clients via the requesting client, the method further comprising the steps of:

(h) one of the devices sending the second web server identifier to the first server (Garcia, 0102, 0113);

(i) the first server sending the identifier of the client to the one of the devices (Garcia, 0113-0114, 0119-0121, 0153);

(j) the client receiving the second content from the second web server (Garcia, 0113-0114, 0119-0121, 0153); and

(k) the one of the devices receiving the second content from the client (Garcia, 0113-0114, 0119-0121, 0153).

Harrow teaches the selected client (i.e. client D) and the requesting client (i.e. client A) receiving the content from the selected client (Harrow, 0031, 0034, 0082, 0088).

Claim 39

Garcia in combination with Harrow teach the method according to claim 26 wherein the communication with the web server or the requesting first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126).

Claim 40

Garcia in combination with Harrow teach the method according to claim 26 wherein the communication with the client or the selected device is based on, or

according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126); and requesting client(s) (Harrow, 0031, 0034).

Claim 41

Garcia in combination with Harrow teach the method according to claim 26 wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL) (Garcia, 0010).

Claim 42

Garcia in combination with Harrow teach the method according to claim 2.6 wherein the web server identifier, the first server identifier, the client identifier, or any of the device's identifier is using Internet Protocol (IP) address (Garcia, 0102, 0113); and requesting client(s) (Harrow, 0031, 0034).

Claim 43

Garcia in combination with Harrow teach the method according to claim 26 wherein in step (d) the first server selecting two or more of the device based on associating the identifiers of the devices with the web server identifier [i.e. selecting a

best cache server based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0114, 0121, 0153). Even though the best cache server is selected, but besides this, Harrow does disclose the selected device receives the content (Harrow, 0031, 0034); and in step (e) the first server sending the identifiers of the selected two or more device to the client (Garcia, 0113-0114, 0119-0121, 0153); and clients and requesting client(s) (Harrow, 0031, 0034).

Claim 44

Garcia in combination with Harrow teach the method according to claim 43 further comprising the step of the client selecting one of the devices as the selected device [i.e. selecting a best cache server based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0114, 0121, 0153). Even though the best cache server is selected, but besides this, Harrow does disclose the selected device receives the content and requesting client(s) (Harrow, 0031, 0034).

Claim 45

Garcia in combination with Harrow teach the method according to claim 26 farther comprising the steps of the client sending a communication address to the selected device, followed by communication between the client and the selected device

using the communication address [i.e. sending the IP address of the client 300 to a Web router 304] (Garcia, 0113, 0119-0120). Besides this, Harrow does disclose the feature of communication port number (Harrow, claim 28); and selecting and requesting clients (Harrow, 0031, 0034).

Claim 46

Garcia in combination with Harrow teach the method according to claim 26 further comprising the step of the requesting client sending the web server identifier to the selected device (Garcia, 0113-0114, 0119-0121); and selecting client (Harrow, 0031, 0034).

Claim 47

Garcia in combination with Harrow teach the method according to claim 46 further comprising the step of the selected device communicating with the web server (Garcia, 0113-0114, 0119-0121); and selecting client (Harrow, 0031, 0034).

Claim 48

Garcia in combination with Harrow teach the method according to claim 26 wherein step (d) the first server selecting one of the devices based on the geographical location of the clients (Garcia, 0102); and selecting client (Harrow, 0031, 0034).

Claim 49

Garcia teaches a method for use with a group of clients for data communication between a web server storing a content and a requesting client via one or more clients selected from the group, for use with a first server, and where the web server, the requesting client, the first server, and the clients in the group are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server (Garcia, 0102, 0113);

(b) the first server receiving and storing the identifiers of the devices (Garcia, 0102, 0113);

(c) the requesting client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) selecting one of the devices based on the geographical location of the devices (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the requesting client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach a group of clients for data communication between the web server and a requesting client via one or more clients selected from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving the content from the selected client.

However, in an analogous art, **Harrow** teaches a group of clients (i.e. clients A-D) for data communication between the web server and a requesting client (i.e. client A) via one or more clients selected from the group; and (f) the selected client (i.e. client D) receiving the content from the web server; and (g) the requesting client (i.e. client A) receiving the content from the selected client (Harrow, 0031, 0034, 0082, 0088).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of a group of clients for data communication between the web server and a requesting client via one or more clients selected from the group; and (f) the selected client receiving the content from the web server; and (g) the requesting client receiving the content from the selected client, as disclosed by Harrow, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 50

Garcia in combination with Harrow teach the method according to claim 49 wherein in step (d) the first server is selecting one of the devices (Garcia, 0102-0103, 0121, 0153); and selecting client (Harrow, 0031, 0034).

Claim 51

Garcia in combination with Harrow teach the method according to claim 49 wherein in step (d) the requesting client is selecting one of the devices (Garcia, 0102-0103, 0121, 0153); and selecting client (Harrow, 0031, 0034).

Claim 53

Garcia teaches a method for data communication between a requesting client and a web server storing a contempt via a second client, for use with a first server and a second client, and where the web server, the requesting client, the first server, and the second client are communicatively coupled via the Internet mid each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) sending its identifier and the web server identifier to the first server (Garcia, 0102, 0113, 0119-0121, 0153);

(b) receiving from the first server the identifier of the device (Garcia, 0113-0114, 0119-0121, 0153);

(c) sending the web server identifier to the device (Garcia, 0113, 0119-0120).

Garcia fails to teach second device and (d) receiving the content associated with the web server from the second client.

However, in an analogous art, **Harrow** teaches second device and (d) receiving the content associated with the web server from the second client (Harrow, 0031, 0034, 0082, 0088).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of second device and (d) receiving the content associated with the web server from the second client, as disclosed by Harrow, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 59

Garcia in combination with Harrow teach the method according to claim 53 further for data communication with a second web server storing a second content and having an identifier in the Internet and the devices via the client, the method further comprising the steps of: (e) receiving the second content from the second web server

(Garcia, 0113-0114, 0119-0121, 0153); and (f) sending the second content to the second client and requesting client (Harrow, 0031, 0034).

Claim 52 does not teach or define any new limitation other than above claim 38. Therefore, claim 52 is rejected for similar reasons.

Claims 54-58, 60-66 do not teach or define any new limitation other than above claims 27, 29, 31-32, 36, 39-43, 45-46. Therefore, claims 54-58, 60-66 are rejected for similar reasons.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MINH-CHAU NGUYEN whose telephone number is (571)272-4242. The examiner can normally be reached on 9AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JEFFREY L. NICKERSON can be reached on (571) 270-3631. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MINH-CHAU NGUYEN/
Primary Examiner, Art Unit 2459

Notice of References Cited	Application/Control No. 14/025,109	Applicant(s)/Patent Under Reexamination SHRIBMAN ET AL.	
	Examiner MINH-CHAU NGUYEN	Art Unit 2459	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
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*	B	US-2003/0074403 A1	04-2003	Harrow, Ivan P.	G06F17/30206	709/203
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14025109	SHRIBMAN ET AL.
	Examiner	**Art Unit**
	MINH-CHAU NGUYEN	2459

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017						
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	34	✓	✓	✓						
	35	✓	✓	✓						
	36	✓	✓	✓						

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14025109	SHRIBMAN ET AL.
	Examiner	**Art Unit**
	MINH-CHAU NGUYEN	2459

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016	01/07/2017						
	37	✓	✓	✓						
	38	✓	✓	✓						
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	65	✓	✓	✓						
	66	✓	✓	✓						

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14025109	SHRIBMAN ET AL.
	Examiner	Art Unit
	MINH-CHAU NGUYEN	2459

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	201-203, 207	3/7/2016	MN

SEARCH NOTES		
Search Notes	Date	Examiner
Search on EAST	3/7/2016	MN
Update search on EAST	1/8/2017	MN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	("20020007413").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/01/08 22:34
L2	2	("7865585").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/01/08 22:34
L3	1379	(peer$1 with client$1) same (web near server)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/01/08 22:47
L4	698	3 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/01/08 22:48
L5	283	4 and (select$4 with client$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/01/08 22:49
L6	89	4 and (select$4 with client$1 with receiv$4 with (content$1 page$1 document$1 file$1 data site$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/01/08 22:49
L7	87	6 and (client$1 near3 request$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/01/08 22:50

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.N/	1	8479251	B2	2013-07-02	Feinleib et al	
	2	8499059	B2	2013-07-30	Stoyanov	
	3	7970835	B2	2011-28-01	Xerox Corporation	
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	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

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/M.N/	1	20150067819	A1	2015-03-05	Hola Networks Ltd.	
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	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

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/M.N/	1	2015034752	WO	A1	2015-03-12	Akamai Technologies INC		
	2	2000/018078	WO	A1	2000-03-30	Sopuch David. J		
	3	0948176	EP	A2	1999-10-06	Siemens Inf &Comm Networks		
	4	2597869	EP	A1	2015-05-29	Sharp Kabushiki Kaisha Osaka-shi		
	5	2010090562	WO	A1	2010-08-12	Telefonaktiebolaget L M Ericsson		

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(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

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/M.N/	1	R. Fielding et al, RFC 2616: Hypertext Transfer Protocol -- HTTP/1.1, June 1999, retrieved from the Internet http://rcf-editor.org [retrieved Apr. 15, 2002] (114 pages)	
/M.N/	2	"On the Leakage of Personally Identifiable Information via Online Social Networks"-Wills et al, AT&T, Apr. 2009 http://www2.research.att.com/~bala/papers/wosn09.pdf.	

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EXAMINER SIGNATURE

Examiner Signature	/MINH CHAU NGUYEN/	Date Considered	01/08/2017

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2016-11-29
Name/Print	Yehuda BINDER	Registration Number	73612

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	14/025,109	Filing Date	2013-09-12	Docket Number (if applicable)	HOLA-005-US2	Art Unit	2459
First Named Inventor	Derry Shribman			Examiner Name	NGUYEN, MINH CHAU		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, to any international application that does not comply with the requirements of 35 U.S.C. 371, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV.

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☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☒ Amendment/Reply

☒ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 506726

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

Oxylabs LT, UAB v. Bright Data Ltd.
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PTO/SB/30EFS (07-14)
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Signature of Registered U.S. Patent Practitioner			
Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2016-11-30
Name	BINDER Yehuda	Registration Number	73612

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: HOLA-005-US2

In re Application of:	)	Confirmation No. 6194
	)	
Derry Shribman *et al.*	)	Art Unit: 2459
	)	
Appln. No.: 14/025,109	)	Examiner: Nguyen, Minh Chau
	)	
Filed: September 12, 2013	)	Washington, D.C.
	)	
For: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	)	November 30, 2016
	)	

RESPONSE / AMENDMENT:

Honorable Commissioner for Patents
U.S. Patent and Trademark Office
Randolph Building, Mail Stop Amendments
401 Dulany Street
Alexandria, VA 22314

Sir:

In response to the Office Action of September 8, 2016 ("Action"), as part of a filed RCE kindly amend the above-identified application as follows:

Amendments to the Claims appear in the Listing of Claims that begins on page 2 of this paper.

Remarks/Arguments begin on page 12 of this paper.

Amendments to the claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1-25. (Cancelled)

26. (Currently amended) A method for use with a group of clients for data communication between a web server storing a content and a requesting client via one or more ~~devices~~ clients selected from the group, for use with a first server, and where the web server, the requesting client, the first server, and the ~~devices~~ clients in the group are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) each of the ~~devices~~ clients in the group sending its identifier to the first server;

(b) the first server receiving and storing the identifiers of the clients in the group ~~devices~~;

(c) the requesting client sending its identifier and the web server identifier to the first server;

(d) the first server selecting one of the ~~devices~~ clients from the group based on associating the identifiers of the ~~devices~~ clients with the web server identifier;

(e) the first server sending the identifier of the selected ~~device~~ client to the requesting client;

(f) the selected ~~device~~ client receiving the content from the web server; and

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(g) the requesting client receiving the content from the selected client ~~device~~.

27. (Previously presented) The method according to claim 26, wherein the steps are sequentially executed.

28. (Currently amended) The method according to claim 26, wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected client ~~device~~.

29. (Currently amended) The method according to claim 26, wherein the first server is HTTP server and responds to HTTP requests from the requesting client or the ~~clients in the group devices~~.

30. (Previously presented) The method according to claim 26, wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and communicates based on, or according to, using TCP/IP protocol or connection.

31. (Previously presented) The method according to claim 26, wherein the first server is a TCP / IP server and communicates based on, or according to, using TCP/IP protocol or connection.

32. (Previously presented) The method according to claim 26, wherein the content includes web-page, audio, or video content.

33. (Currently amended) The method according to claim 26, wherein the first server selecting one of the ~~devices~~ clients is based on the web server IP address or URL.

34. (Currently amended) The method according to claim 26, wherein the first server selecting one of the ~~devices~~ clients is based on the selected client ~~device~~ IP address.

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35. (Currently amended) The method according to claim 26, wherein the selected ~~device~~ client further storing the content received from the web server.

36. (Currently amended) The method according to claim 26, wherein the requesting client sending its identifier and the web server identifier to the first server as part of browser or email application execution.

37. (Currently amended) The method according to claim 26, further comprising the step of the requesting client sending its identifier to the first server, and the first server storing the requesting client identifier.

38. (Currently amended) The method according to claim 37, further for data communication between a second web server storing a second content and having an identifier in the Internet and a one of the ~~devices~~ clients via the requesting client, the method further comprising the steps of:

(h) one of the clients ~~devices~~ sending the second web server identifier to the first server;

(i) the first server sending the identifier of the requesting client to the one of the ~~devices~~ clients;

(j) the requesting client receiving the second content from the second web server; and

(k) the one of the ~~devices~~ clients receiving the second content from the requesting client.

39. (Currently amended) The method according to claim 26, wherein the communication with the web server or the requesting

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first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

40. (Currently amended) The method according to claim 26, wherein the communication with the requesting client or the selected client ~~device~~ is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

41. (Previously presented) The method according to claim 26, wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL).

42. (Currently amended) The method according to claim 26, wherein the web server identifier, the first server identifier, the requesting client identifier, or any of the ~~device's~~ client's identifier is using Internet Protocol (IP) address.

43. (Currently amended) The method according to claim 26, wherein in step (d) the first server selecting two or more of the clients ~~devices~~ based on associating the identifiers of the clients ~~devices~~ with the web server identifier; and in step (e) the first server sending the identifiers of the selected two or more clients ~~devices~~ to the requesting client.

44. (Currently amended) The method according to claim 43, further comprising the step of the requesting client selecting one of the clients ~~devices~~ as the selected client ~~device~~.

45. (Currently amended) The method according to claim 26, further comprising the steps of the requesting client sending a communication port number to the selected client ~~device~~, followed by communication between the requesting client and the selected client ~~device~~ using the communication port number.

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46. (Currently amended) The method according to claim 26, further comprising the step of the requesting client sending the web server identifier to the selected client ~~device~~.

47. (Currently amended) The method according to claim 46, further comprising the step of the selected client ~~device~~ communicating with the web server.

48. (Currently amended) The method according to claim 26, wherein step (d) the first server selecting one of the clients ~~devices~~ based on the geographical location of the clients ~~devices~~.

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49. (Currently amended) A method for use with a group of clients for data communication between a web server storing a content and a requesting client via one or more clients selected from the group ~~devices~~, for use with a first server, and where the web server, the requesting client, the first server, and the clients in the group ~~devices~~ are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) each of the clients in the group ~~devices~~ sending its identifier to the first server;

(b) the first server receiving and storing the identifiers of the clients in the group ~~devices~~;

(c) the requesting client sending its identifier and the web server identifier to the first server;

(d) selecting one of the clients from the group ~~devices~~ based on the geographical location of the clients ~~devices~~;

(e) the first server sending the identifier of the selected client ~~device~~ to the requesting client;

(f) the selected client ~~device~~ receiving the content from the web server; and

(g) the requesting client receiving the content from the selected client ~~device~~.

50. (Currently amended) The method according to claim 49, wherein in step (d) the first server is selecting one of the clients ~~devices~~.

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51. (Currently amended) The method according to claim 49, wherein in step (d) the requesting client is selecting one of the clients ~~devices~~.

52. (Currently amended) The method according to claim 49, further for data communication between a second web server storing a second content and having an identifier in the Internet and a one of the clients ~~devices~~ via the requesting client, the method further comprising the steps of:

(h) one of the clients ~~devices~~ sending the second web server identifier to the first server;

(i) the first server sending the identifier of the requesting client to the one of the clients ~~devices~~;

(j) the requesting client receiving the second content from the second web server; and

(k) the one of the clients ~~devices~~ receiving the second content from the requesting client.

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53. (Currently amended) A method for data communication between a requesting client and a web server storing a content via a second client ~~device~~, for use with a first server and a second client ~~device~~, and where the web server, the requesting client, the first server, and the second client ~~device~~ are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) sending its identifier and the web server identifier to the first server;

(b) receiving from the first server the identifier of the second client ~~device~~;

(c) sending the web server identifier to the second client ~~device~~; and

(d) receiving the content associated with the web server from the second client ~~device~~.

54. (Previously presented) The method according to claim 53, wherein the steps are sequentially executed.

55. (Previously presented) The method according to claim 53, wherein the first server is HTTP server and responds to HTTP requests.

56. (Previously presented) The method according to claim 53, wherein the first server is a TCP / IP server and communicates based on, or according to, using TCP/IP protocol or connection.

57. (Previously presented) The method according to claim 53, wherein the content includes web-page, audio, or video content.

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58. (Previously presented) The method according to claim 53, wherein the steps are part of browser or email application execution.

59. (Currently amended) The method according to claim 53, further for data communication with a second web server storing a second content and having an identifier in the Internet and the second clients ~~devices~~ via the requesting client, the method further comprising the steps of:

(e) receiving the second content from the second web server; and

(f) sending the second content to the second client ~~device~~.

60. (Previously presented) The method according to claim 53, wherein the communication with the web server or the first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

61. (Currently amended) The method according to claim 53, wherein the communication with the second client ~~device~~ is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

62. (Previously presented) The method according to claim 53, wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL).

63. (Currently amended) The method according to claim 53, wherein the web server identifier, the first server identifier, the requesting client identifier, or the second client ~~device~~ identifier is using Internet Protocol (IP) address.

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64. (Currently amended) The method according to claim 53, wherein step (b) comprising the receiving from the first server the identifiers of two or more second clients ~~devices~~, and further comprising the step of selecting one out of second clients ~~devices~~ based on associating the identifiers of the second clients ~~devices~~ with the web server identifier.

65. (Currently amended) The method according to claim 53, further comprising the steps of sending a communication port number to the second client ~~device~~, followed by communication with the second client ~~device~~ using the communication port number.

66. (Currently amended) The method according to claim 53, further comprising the step of sending the web server identifier to the second client ~~device~~.

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REMARKS / ARGUMENTS

The examiner's action dated September 8, 2016 ("Action") has been received and its contents carefully noted.

Without agreeing with the rejections, and in order to further distinguish over the Garcia reference, the claims were amended to specify that the 'devices' are 'clients'. This is supported throughout the specification, where the devices / clients are referred to as 'peers', such as in clients 70-78 in Figure 2.

According to the Action, the 'device' was equated in the Garcia reference to the cache server 306, which is clearly **a dedicated device and performs a server functionality.** The Garcia reference is silent, and actually teaches away from identifying and using another client device for supporting a content request by a specific client.

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The absence of a reply to a specific rejection, issue, or comment, does not signify agreement with that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims that have not been expressed.

Nothing in this reply should be understood as conceding any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claims does not necessarily signify concession of unpatentability to the claim before its amendment.

In view of the foregoing, it is requested that all of the rejections be reconsidered and withdrawn and that the claims be considered allowable.

If the above arguments should not now place the application in the condition for allowance, the examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

By /Yehuda Binder/
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Registration No. 73,612

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Fax: +972-9-7442619

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	8479251	B2	2013-07-02	Feinleib et al	
	2	8499059	B2	2013-07-30	Stoyanov	
	3	7970835	B2	2011-28-01	Xerox Corporation	
	4	8832179	B2	2014-09-09	Owen , et al.	
	5	6173330	B1	2001-09-01	Guo , et al.	
	6	8769035	B2	2014-01-07	Resch , et al.	
	7	8171101	B2	2012-05-01	Gladwin , et al.	
	8	7558942	B2	2009-07-07	Chen , et al.	

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	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

	9	4937781	A	1990-06-26	Lee , et al.	

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	1	20150067819	A1	2015-03-05	Hola Networks Ltd.	
	2	20120254456	A1	2012-10-04	Visharam Zubair et al.	
	3	20080222291	A1	2008-09-11	Weller et al.	
	4	20100235438	A1	2010-09-16	Narayanan et al.	
	5	20120124239	A1	2012-05-17	Shribman et al.	
	6	20130166768	A1	2013-06-27	Thomson Licensing	
	7	20020065930	A1	2002-30-05	Rhodes, David L.	
	8	20030204602	A1	2003-10-30	Hudson Michael D.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

	9	20120099566	A1	2012-04-26	Laine; Tuomas ; et al.	
	10	20130201316	A1	2013-08-08	BINDER; Yehuda ; et al.	
	11	20080125123	A1	2008-05-29	Dorenbosch; Jheroen P. ; et al.	
	12	20140301334	A1	2014-10-09	Labranche; Miguel ; et al.	
	13	20070239655	A1	2007-10-11	Agetsuma; Masakuni ; et al.	
	14	20070226810	A1	2007-09-27	Hotti; Timo	
	15	20100094970	A1	2010-04-15	Zuckerman; Gal ; et al.	
	16	20020120874	A1	2002-29-08	Shu, Li ; et al.	
	17	20100115063	A1	2010-06-05	GLADWIN; S. CHRISTOPHER ; et al.	
	18	20100154044	A1	2010-17-06	Manku; Tajinder	
	19	20100293555	A1	2010-15-11	VEPSALAINEN; Ari M.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US2

	20	20130272519	A1	2013-17-10	Huang; Lawrence P.	
	21	20030115364	A1	2003-06-19	Shu Li et al.	
	22	20090217122	A1	2009-27-08	Yokokawa; Takashi ; et al.	
	23	20010033583	A1	2001-25-10	Rabenko, Theodore F. ; et al.	

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	1	2015034752	WO	A1	2015-03-12	Akamai Technologies INC		
	2	2000/018078	WO	A1	2000-03-30	Sopuch David. J		
	3	0948176	EP	A2	1999-10-06	Siemens Inf &Comm Networks		
	4	2597869	EP	A1	2015-05-29	Sharp Kabushiki Kaisha Osaka-shi		
	5	2010090562	WO	A1	2010-08-12	Telefonaktiebolaget L M Ericsson		

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

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First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	R. Fielding et al, RFC 2616: Hypertext Transfer Protocol -- HTTP/1.1, June 1999, retrieved from the Internet http://rcf-editor.org [retrieved Apr. 15, 2002] (114 pages)	
	2	"On the Leakage of Personally Identifiable Information via Online Social Networks"-Wills et al, AT&T, Apr. 2009 http://www2.research.att.com/~bala/papers/wosn09.pdf.	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2016-11-29
Name/Print	Yehuda BINDER	Registration Number	73612

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(54) **System for providing enhanced security for transactions transmitted through a distributed network**

System zur Bereitstellung verbesserten Sicherheit für Transaktionen die über ein verteiltes Netzwerk übertragen werden

Système permettant d'améliorer la sécurité de transactions transmis par un réseau réparti

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Description

Field of the Invention

[0001] The present invention is directed to the field of network security, and more specifically to preventing third parties from intercepting data transmissions over a network.

Background of the Invention

[0002] As the world becomes ever more tightly connected with the proliferation and increasing popularity of the Internet, electronic commerce will become increasingly important in our lives. Banks and other financial institutions allow customers to access their accounts over the Internet; brokerage houses allow clients to trade stocks, mutual funds and other securities over the Internet; and manufacturers, wholesalers, and retailers allow customers to order and pay for products over the Internet. While the most significant financial transactions are still carried out over private electronic data interchange (EDI), bank, and interbank networks, consumer credit card transactions are carried out over the Internet with increasing frequency. While most of these credit card transactions are carried out with some form of encryption, user anxiety remains high because messages can be intercepted by third parties and translated at leisure, using common decryption techniques. Even though a relatively small percentage of Internet transactions contain credit card numbers, one could simply locate a merchant that accepts credit card transactions and search for those transactions having the merchant's IP address. This is guaranteed to lead to the discovery of numerous credit card containing packets which can then be decrypted offline.

[0003] "Security Problems in the TCP/IP Protocol Suite" S.M. Bellovin in Computer Communication Review, Volume 19, No. 2, 30th April 1989 (1989-04-30) pages 32-48 discloses a method of transmitting data by distributing a sequence of characters among a plurality of packets, assigning each packet a number and transmitting the plurality of packets from a source node to a destination node.

[0004] US 5151899 Harvey et al discloses a method of transmitting data by packets wherein a sequence of characters is distributed across a number of packets and each packet is assigned a packet number.

[0005] "Internetworking with TCP/IP2, D. E. Corner, Prentice-Hall International Editions, 1991, pages 103-104, ISBN 0-13-474321-0 discloses a method for forcing a packet to follow a particular route for the purpose of testing the route.

Summary of the Invention

[0006] According to the invention there is provided a method of transmitting transaction data as recited in claim 1.

Brief Description of the Drawings

[0007] The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same becomes better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1A is a block diagram of a general purpose computer system for implementing the present invention;
FIGURE 1B is a diagram of a network for implementing the present invention;
FIGURE 2 is a flow chart depicting an overall operation of the present invention;
FIGURE 3A-3D depict exemplary Internet packet numbering schemes according to the prior art and the present invention;
FIGURE 4 depicts Internet packet routing according to the prior art; and
FIGURE 5 depicts the routing of renumbered Internet packets according to the present invention.

Detailed Description of the Preferred Embodiment

[0008] The present invention is directed to a system for providing enhanced security to transactions sent from a client computer to a server computer through a distributed network. In accordance with the present invention, the system of the present invention executes on a computer, such as a general purpose personal computer. FIGURES 1A-1B and the following discussion are intended to provide a brief, general description of a suitable computing environment in which the invention may be implemented. Although not required, the invention will generally be implemented as computer-executable instructions, such as program modules, being executed by a personal computer. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system configurations, multiprocessor systems, minicomputers, and mainframe computers. The invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

[0009] With reference to FIGURE 1A, an exemplary system for implementing the invention includes a general purpose computing device such as a conventional personal computer 20, including a processing unit 21, a system memory 22, and a system bus 23 that couples var-

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ious system components including the system memory to the processing unit 21. The system bus 23 may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. System timing is provided by a clock signal (not shown) applied to the system bus 23. The system memory includes read only memory (ROM) 24 and random access memory (RAM) 25. A basic input/output system 26 (BIOS) is stored in ROM 24, and contains the basic routines that helps to transfer information between elements within the personal computer 20, such as during start-up. The personal computer 20 further includes storage devices such as a hard disk drive 27 connected to the system bus through a hard drive interface 32 for reading data from and writing data to a hard disk 31. In addition, one or more removable disk drives 30 are connected to the system bus through one or more removable storage interfaces 34 for reading data from or writing data to removable storage 29, such as floppy disks, removable magnetic disks, CD-ROMs or other optical media. The drives and their associated computer-readable media provide nonvolatile storage of computer readable instructions, data structures, program modules and other data for the personal computer 20. Although the exemplary environment described herein employs a hard disk and removable media, it should be appreciated by those skilled in the art that other types of computer-readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital versatile disks (also known as Digital Video Disks or DVDs), Bernoulli cartridges, random access memories (RAMs), read only memories (ROMs), and the like, may also be used in the exemplary operating environment.

[0010] A number of program modules may be stored on the storage devices, including an operating system 35, one or more application programs 36, and program data 38. A user may enter commands and information into the personal computer 20 through input devices such as a keyboard 40 and pointing device 42. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are often connected to the processing unit 21 through a serial interface 46 that is coupled to the system bus, but may be connected by other interfaces, such as a parallel port, game port or a universal serial bus (USB). A display device 47, such as a monitor, is also connected to the system bus 23 via a video interface 48. In addition to the monitor, personal computers typically include other peripheral output devices (not shown), such as printers and plotters.

[0011] The personal computer 20 may operate in a networked environment using logical connections to one or more remote computers, such as remote computers 49 and 60. Each remote computer 49 or 60 may be another personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to the personal computer 20. The logical connections depicted in FIGURE 1A include a local area network (LAN) 51 and a wide area network (WAN) 52, Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets and global networks such as the Internet. As depicted in FIGURE 1A, the remote computer 60 communicates with the personal computer 20 via the local area network 51. The remote computer 49 communicates with the personal computer 20 via the wide area network 52.

[0012] When used in a LAN networking environment, the personal computer 20 is connected to the local network 51 through a network interface 53. When used in a WAN networking environment, the personal computer 20 typically includes a modem 54 or other means for establishing communications over the wide area network 52, such as the Internet. The modem 54, which may be internal or external, is connected to the system bus 23 via the serial interface 46. In a networked environment, program modules depicted relative to the personal computer 20, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

[0013] FIGURE 1B depicts an exemplary distributed communications network including a variety of interconnected networks. Geographically distributed networks such as network A 201, network B 202, and network C 203 are interconnected via gateways 210, which provide the necessary interfacing between disparate networks of possibly different bandwidths and packet handling capabilities as well as possibly different architectures. Each of networks A, B, and C may be made up of a number of network nodes 215. The network nodes 215 communicate with each other through physical links as well as through radio or microwave transmissions through relay stations such as a satellite 223.

[0014] A user at a terminal or personal computer 205 may access a network through a common access point at a network node 215, a local area network (LAN) 220, 221, a digital PBX 225, or any other common network access points. Two or the more popular local area network architectures are depicted, the ring 220, and the bus 221, but other network topologies may also be employed. While the following discussion is directed to an Internet environment, the teachings of the present invention are applicable to any distributed network environment. In the present invention, personal computer 20 is connected to a distributed network such as the Internet, either directly through to modem 54 to a remote computer 49 which serves as an Internet Service Provider (ISP), an Internet router, or through a LAN 51 to a remote computer 60 which serves as the local area network's Internet gateway 210. Each node in the path between the user's personal computer 20 and the server computer acts as an Internet router. An Internet router typically either maintains a routing table having entries representing every

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other router on the network, or has a mechanism for determining a route or for asking an adjacent router for routing information. The routing table will also typically include statistics concerning the link between the node and each other connected node so that information is available as to the "best" path from the node to another node. Typically, routing tables contain entries for a primary route, as well as one or more alternate routes. Alternatively, a routing algorithm may be used to establish an appropriate routing path from the client to the server. Both routing tables and routing algorithms are well known in the art and will not be discussed further. Internet routers and ISPs will be referred to collectively as "routers" in the remainder of the discussion.

[0015] A user typically interacts with the Internet through web browser software (not shown) running on a personal computer 20. The web browser software allows the user to access remote server computers on the Internet through a Uniform Resource Locator (URL), which serves as a server's network address. Examples of suitable web browsers include Explorer™, available from Microsoft Corporation, of Redmond, Washington, or Navigator™, available from Netscape Communications of Mountain View, California. When the user enters or selects a URL through the web browser, the URL is forwarded to the router, where a table is checked to determine a "best" path to a next node from the router to the server designated by the URL. Interaction between a web browser (the client) and a server will typically be through use of the Hypertext Transfer Protocol (HTTP), which includes specific communication methods that allow clients to request data from a server and send information to the server. According to the Hypertext Transport Protocol, the client contacts the server at the Internet address as specified in the URL to open the connection. The client then sends a message to the server requesting service as specified by a request header that defines a method requested for the transaction. Typical HTTP methods are the GET, for getting an object from a server, and the POST, for posting data to an object on the server. The server then sends a response to the client consisting of response headers describing the state of the transmission, followed by the actual data. The connection is then closed. In a typical user interaction with the Internet, the user is requesting a web page written in the Hypertext Markup Language (HTML) from a server in the World Wide Web (WWW). Depending on the content of the web page, the user may further interact with the server by sending additional information to the server. All such transmissions to the server will hereinafter be referred to as "transactions."

[0016] FIGURE 2 depicts a flow chart describing an overall method of providing enhanced security to a transaction on a computer network according to the present invention. Greater detail is provided in the discussions accompanying FIGURES 3A-3D, 4 and 5. Referring to FIGURE 2, beginning with step 110, transaction data is parceled into a number of different packets. The packets are then assigned packet numbers at a step 120. Each packet is then assigned a route to its intended destination at a step 130, and the packets are then transmitted from the source to the destination via the assigned route at a step 140.

[0017] Referring to FIGURE 3A-3D, the data to be passed between the client computer and a server is typically transmitted as one or more packets. In FIGURE 3A, transaction data 300 may include such information as a 16-digit credit card number, as shown. According to prior art Internet packet routing techniques, the transaction data 300 may be divided into a number of packets. For example, as shown in FIGURE 3B, the transaction data 300 has been divided into eight packets 301-308, each containing two characters of transaction data. Packets 301-308 are assigned packet numbers 1-8, respectively. According to a present embodiment of the invention, the transaction data is also divided into eight packets 331-338, but the packets in the sequence are assigned packets numbers according to a pseudo-random ordering. The sequence is referred to as pseudo-random in that the resulting sequence is preferably an increasing or decreasing series of random numbers. In other words, beginning with a first random number for the first packet, each subsequent packet number is calculated by taking a new random number and either adding or subtracting it from the first random number, depending on whether an increasing or decreasing sequence is desired. For a decreasing sequence, the random number for the first packet should be added to a base value large enough to ensure that subtracting subsequent random numbers will not result in a negative value. Each random number may have the same seed value or may have any number of different seed values. The packet renumbering scheme should be such that no two packets have adjacent numbers in order to increase the effectiveness of the security. In the example shown in FIGURE 3C, the transaction data has been divided into eight packets 331-338 that have been assigned packet numbers in increasing pseudo-random sequence, 17-32-46-53-61-80-89-97. Alternatively, the transaction data may be divided into a larger number of packets. For example, as shown in FIGURE 3D, the transaction data has been divided into 16 packets 311-326, and the packets have been assigned packet numbers
20-34-57-62-81-88-95-101-111-119-132-147-160-173-189-210, as an increasing pseudo-random sequence.

[0018] FIGURE 4 illustrates a conventional method of routing of Internet packets. For purposes of illustration, the Internet packets 301-308 are depicted with packet numbers 1-8, respectively, within the packet rather than the corresponding transaction data. As shown in FIGURE 4, a source node A 401 is connected to a destination node E 405 through a number of interconnected network nodes.

[0019] From the source node A 401, each packet of the transaction is transferred, in turn, through a number of intermediate nodes B 402, C 403, D 404 before reach-

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ing the destination E 405. Generally, unless a failure occurs in a link between nodes in a route after transmission has begun, all packets of a transaction are sent along the same route, which is typically a "best" available route. Upon receipt at the destination node E 405, the server merely has to reassemble the packets in sequence to reconstruct the transaction data.

[0020] The problem with the prior art approach to Internet packet routing is that a third party interested in capturing credit card numbers or other sensitive data could simply monitor a selected network node for network traffic containing URLs or other network addresses for destination nodes known to accept the credit card numbers or other sensitive information. For instance, many mail-order companies now offer on-line purchasing of products through the Internet. A third party could monitor a network node for all traffic addressed to the mail-order company. The captured network traffic could then be analyzed at the third party's leisure to locate the credit card numbers. Even where prior art encryption techniques are employed, the third party would still have a considerable amount of time to decrypt the information using common techniques. Even if the third party were to miss a small number of packets in the sequence, because the Internet packets are sequentially numbered, the third party would know which packets are missing and could apply a common number substitution to successively substitute each possible character or permutation of characters that would appear in the missing packet in an attempt to find a valid credit card number.

[0021] FIGURE 5 depicts an exemplary routing of transaction data 300 according to an embodiment of the present invention. The transaction data 300 is divided into 8 packets as shown in FIGURE 3C. For purposes of illustration, the Internet packets 331-338 are depicted with packet numbers 17-32-46-53-61-80-89-97, respectively, within the packet rather than the corresponding transaction data. These packets of the transaction data enter a source node A 501, whereupon the packets are sent along different routes to destination node, E 505. In a present embodiment of the invention, the different routes are forced by sending an indication along with each packet to choose randomly from among several possible routes.

[0022] For instance, in the example of FIGURE 5, the network includes a number of intermediate nodes B 502, C 503, D 504, F 506, G 507, H 508, I 509, J 510, and K 511, all of which are interconnected such that Internet packets may travel over a number of routes when being sent from the source node to the destination node. For example, one exemplary routing assigned to each of the packets of the transaction data is shown in Table 1 below.

TABLE 1

Packet Number	Route
17	A-B-C-J-K-F-E
32	A-I-H-G-K-E
46	A-H-K-J-C-D-E
53	A-H-F-K-E
61	A-B-I-C-D-E
80	A-I-C-J-E
89	A-H-F-E
97	A-G-H-F-E

[0023] Since each of the packets are transmitted along different routes, it is likely that they will arrive at their destination in an order other than their initial transmission order. However, since the packets have been numbered as either an increasing or decreasing series, the packets merely have to be placed in a corresponding increasing or decreasing order to reconstruct the transaction data.

[0024] With the present invention, a third party monitoring transmissions at any given node will only capture a small portion of the total number of packets making up a transaction. For instance, if the third party is monitoring the Internet at node D 504, only 2 of the 8 packets of the transaction data 300 would be captured. Even if the third party knows of the sequencing scheme of the present invention, for example, the packets are numbered in an increasing sequence, only the relative order of the intercepted packets would be known. While the third party could try a highspeed substitution in an attempt to guess the missing digits, the third party would have no way of knowing how many packets were missing, or where to try the substitutions.

[0025] As will be appreciated, the present invention increases the security of the transaction data transmitted on a public network by encoding the relative position of a packet within a data stream and by assigning different routes to the packets to lessen the likelihood that packets will be intercepted. Further, as will be appreciated by those skilled in the art, further security can be provided by applying encryption techniques to the data contained within as is well known in the prior art.

Claims

1. A method of transmitting transaction data (300) comprising a sequence of characters from a source node to a destination node through a distributed network interconnecting a plurality of network nodes including the source node and the destination node, the method comprising:

   a. distributing the sequence of characters among a plurality of packets (301-308);
   b. assigning each packet of the plurality of pack-

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ets (301-308) a packet number (1-8) **characterised in that** the packet number is assigned according to a pseudo-random function such that the packet numbers form a pseudo-random sequence (17-32-46-57-61-80-89-97); and by the steps of:
c. assigning to each of the plurality of packets (301-308) a route from the source node (A401) to the destination node (E405);
d. transmitting the plurality of packets from the source node (A401) to the destination node (E405) on their assigned routes.
e. receiving the plurality of packets at the destination node (E405); and
f. arranging, at the destination node (E405), the plurality of packets (301-308) according to the pseudo-random sequence of packet numbers such that the transaction data is reconstructed, **characterised in that** in step c. the packets are each assigned different routes from others of the plurality of packets.

2. The method of claim 1, wherein the packet numbers form a sequence such that the relative position of each packet is known.

3. The method of claim 2, wherein distributing the sequence of characters among a plurality of packets (301-308) comprises distributing into each packet of the plurality of packets, a single character of the sequence of characters.

4. The method of claim 2, wherein the pseudo-random sequence is an increasing sequence of random numbers.

5. The method of claim 4, wherein each packet of the plurality of packets (301-308) is assigned a number according to a pseudo-random function such that the packet numbers form a pseudo-random sequence by:

a. assigning a first packet of the pseudo-random sequence a random number as its packet number; and
b. for each subsequent packet number in the pseudo-random sequence, adding a random number to the packet number of preceding packet.

6. The method of claim 2, wherein the pseudo-random sequence is a decreasing sequence of random numbers.

7. The method of claim 6, wherein each packet of the plurality of packets (301-308) is assigned a packet number according to a pseudo-random function such that the packet numbers form a pseudo-random sequence by:

a. assigning a first packet of the pseudo-random sequence a random number as its packet number; and
b. for each subsequent packet number in the pseudo-random sequence, subtracting a random number from the packet number of an immediately preceding packet.

Patentansprüche

1. Verfahren zum Übertragen von Transaktionsdaten (300), die eine Folge von Zeichen umfassen, von einem Ursprungsknoten zu einem Zielknoten über ein verteiltes Netz, das eine Vielzahl von Netzknoten einschließlich des Ursprungsknotens und des Zielknotens verbindet, wobei das Verfahren umfasst:

a. Verteilen der Folge von Zeichen auf eine Vielzahl von Paketen (301-308);
b. Zuweisen einer Paketnummer (1-8) zu jedem Paket aus der Vielzahl von Paketen (301-308), **dadurch gekennzeichnet, dass** die Paketnummer entsprechend einer pseudozufälligen Funktion zugewiesen wird, derart, dass die Paketnummern eine pseudozufällige Folge (17-32-46-57-61-80-89-97) bilden; und durch die folgenden Schritte:
c. Zuweisen einer Route vom Ursprungsknoten (A401) zum Zielknoten (E405) zu jedem Paket aus der Vielzahl von Paketen (301-308);
d. Übertragen der Vielzahl von Paketen vom Ursprungsknoten (A401) zum Zielknoten (E405) über die ihnen zugewiesenen Routen;
e. Empfangen der Vielzahl von Paketen am Zielknoten (E405); und
f. Anordnen der Vielzahl von Paketen (301-308) am Zielknoten (E405) entsprechend der pseudozufälligen Folge von Paketnummern, derart, dass die Transaktionsdaten wiederhergestellt werden, **dadurch gekennzeichnet, dass** in Schritt c. den Paketen jeweils Routen zugewiesen werden, die von denen anderer Pakete aus der Vielzahl von Paketen verschieden sind.

2. Verfahren nach Anspruch 1, wobei die Paketnummern eine Folge bilden, derart, dass die relative Position jedes Paketes bekannt ist.

3. Verfahren nach Anspruch 2, wobei das Verteilen der Folge von Zeichen auf eine Vielzahl von Paketen (301-308) derart erfolgt, dass jedem Paket aus der Vielzahl von Paketen ein einziges Zeichen aus der Folge von Zeichen zugeteilt wird.

4. Verfahren nach Anspruch 2, wobei die pseudozufäl-

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lige Folge eine wachsende Folge von Zufallszahlen ist.

5. Verfahren nach Anspruch 4, wobei jedem Paket aus der Vielzahl von Paketen (301-308) eine Nummer entsprechend einer pseudozufälligen Funktion zugewiesen wird, derart, dass die Paketnummern eine pseudozufällige Folge bilden, durch:

a. Zuweisen einer Zufallszahl als Paketnummer zu einem ersten Paket der pseudozufälligen Folge; und
b. für jede nachfolgende Paketnummer in der pseudozufälligen Folge, Addieren einer Zufallszahl zu der Paketnummer des vorhergehenden Paketes.

6. Verfahren nach Anspruch 2, wobei die pseudozufällige Folge eine fallende Folge von Zufallszahlen ist.

7. Verfahren nach Anspruch 6, wobei jedem Paket aus der Vielzahl von Paketen (301-308) eine Paketnummer entsprechend einer pseudozufälligen Funktion zugewiesen wird, derart, dass die Paketnummern eine pseudozufällige Folge bilden, durch:

a. Zuweisen einer Zufallszahl als Paketnummer zu einem ersten Paket der pseudozufälligen Folge; und
b. für jede nachfolgende Paketnummer in der pseudozufälligen Folge, Subtrahieren einer Zufallszahl von der Paketnummer eines unmittelbar vorangehenden Paketes.

Revendications

1. Procédé de transmission de données de transaction (300) comprenant une séquence de caractères d'un noeud source à un noeud destinataire par le biais d'un réseau réparti interconnectant une pluralité de noeuds de réseau comprenant le noeud source et le noeud destinataire, le procédé consistant à :

a. répartir la séquence de caractères entre une pluralité de paquets (301-308) ;
b. attribuer à chaque paquet de la pluralité de paquets (301-308) un numéro de paquet (1-8) **caractérisé en ce que** le numéro de paquet est attribué selon une fonction pseudo-aléatoire telle que les numéros de paquet forment une séquence pseudo- aléatoire (17-32-46-57-61-80-89-97), et par les étapes consistant à :
c. attribuer à chaque paquet de la pluralité de paquets (301-308) un trajet du noeud source (A401) au noeud destinataire (E405) ;
d. transmettre la pluralité de paquets du noeud source (A401) au noeud destinataire (E405) suivant les trajets qui leur ont été attribués ;
e. recevoir la pluralité de paquets au noeud destinataire (E405), et
f. agencer, au noeud destinataire (E405), la pluralité de paquets (301-308) selon la séquence pseudo-aléatoire de numéros de paquet de telle sorte que les données de transaction soient reconstituées, **caractérisé en ce que**, à l'étape c., il est attribué à chacun des paquets un trajet différent de celui des autres paquets de la pluralité de paquets.

2. Procédé selon la revendication 1, dans lequel les numéros de paquet forment une séquence telle que la position relative de chaque paquet est connue.

3. Procédé selon la revendication 2, dans lequel le fait de répartir la séquence de caractères entre une pluralité de paquets (301-308) consiste à répartir dans chaque paquet de la pluralité de paquets un seul caractère de la séquence de caractères.

4. Procédé selon la revendication 2, dans lequel la séquence pseudo-aléatoire est une séquence croissante de nombres aléatoires.

5. Procédé selon la revendication 4, dans lequel à chaque paquet de la pluralité de paquets (301-308) est attribué un numéro selon une fonction pseudo-aléatoire telle que les numéros de paquet forment une séquence pseudo-aléatoire :

a. en attribuant à un premier paquet de la séquence pseudo-aléatoire un nombre aléatoire comme numéro de paquet, et
b. pour chaque numéro de paquet suivant de la séquence pseudo-aléatoire, en ajoutant un nombre aléatoire au numéro de paquet du paquet précédent.

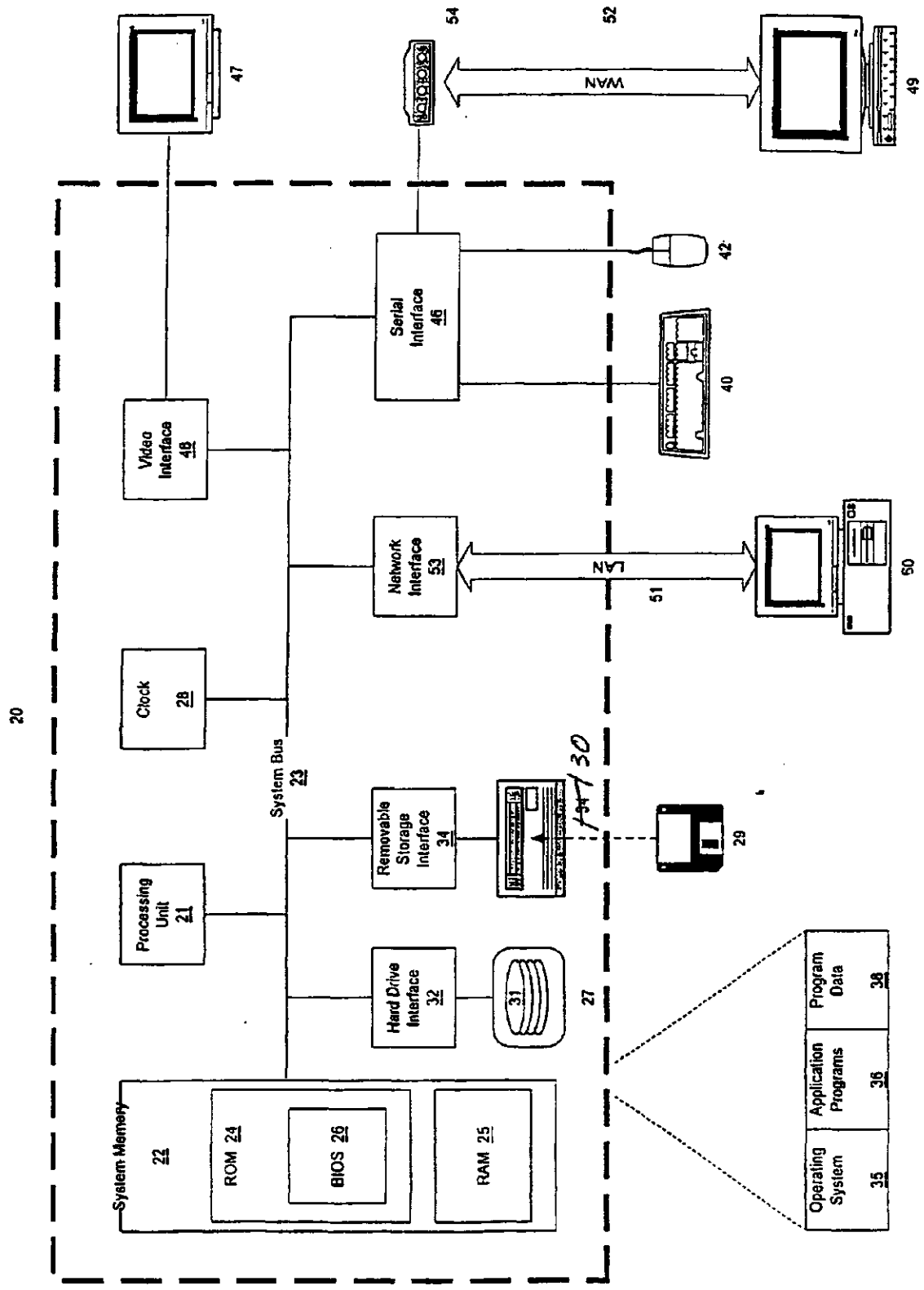
6. Procédé selon la revendication 2, dans lequel la séquence pseudo-aléatoire est une séquence décroissante de nombres aléatoires.

7. Procédé selon la revendication 6, dans lequel à chaque paquet de la pluralité de paquets (301-308) est attribué un numéro de paquet selon une fonction pseudo-aléatoire telle que les numéros de paquet forment une séquence pseudo-aléatoire :

a. en attribuant à un premier paquet de la séquence pseudo-aléatoire un nombre aléatoire comme numéro de paquet, et
b. pour chaque numéro de paquet suivant de la séquence pseudo-aléatoire, en soustrayant un nombre aléatoire du numéro de paquet d'un paquet venant immédiatement avant.

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FIGURE 1A



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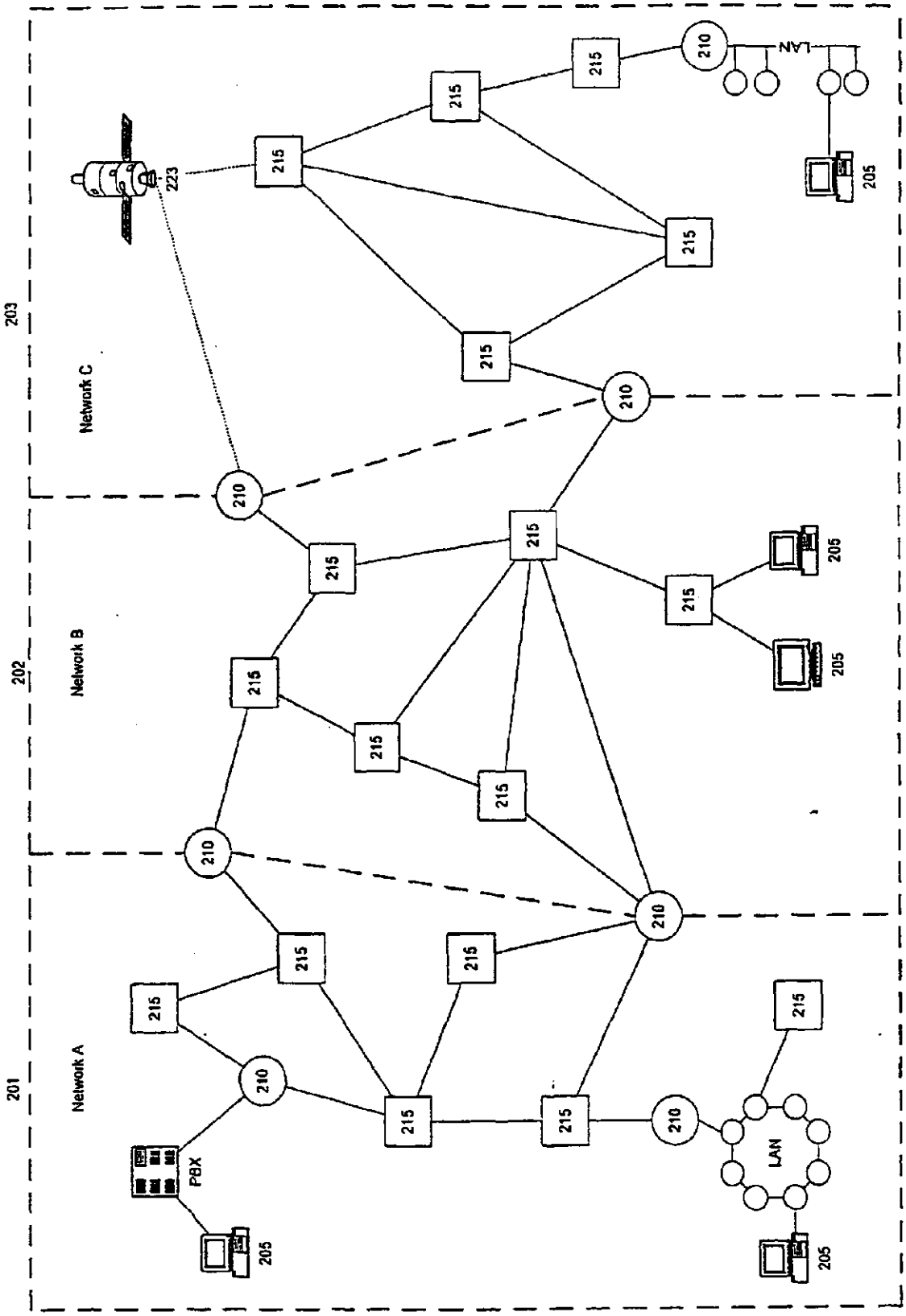
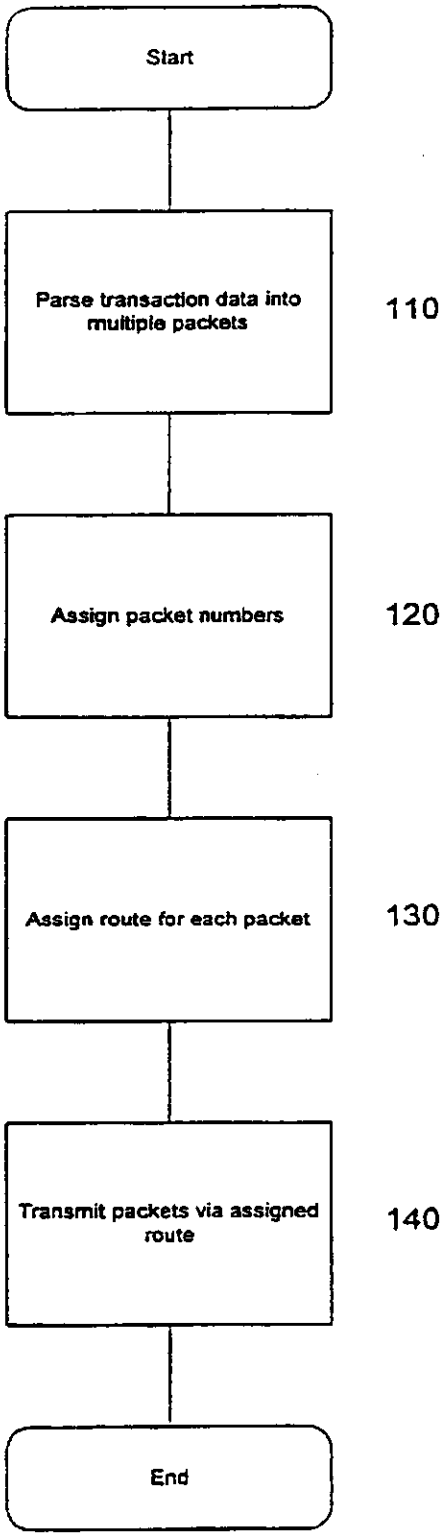


FIGURE 1B

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FIGURE 2



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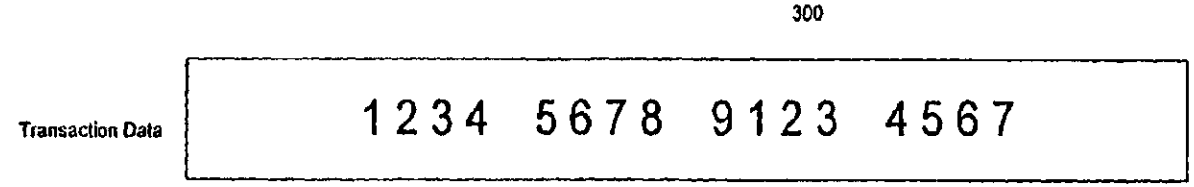


FIGURE 3A

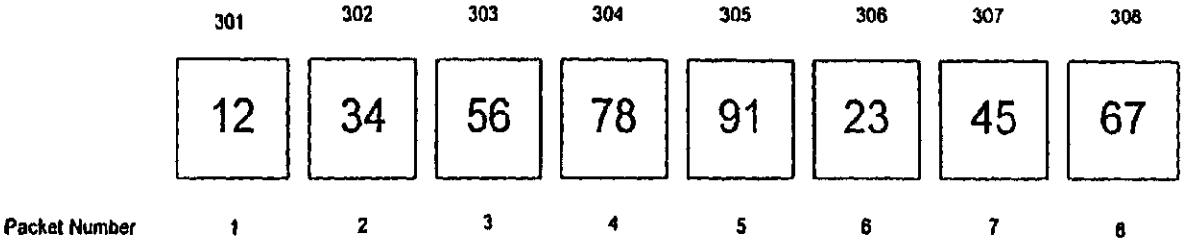


FIGURE 3B

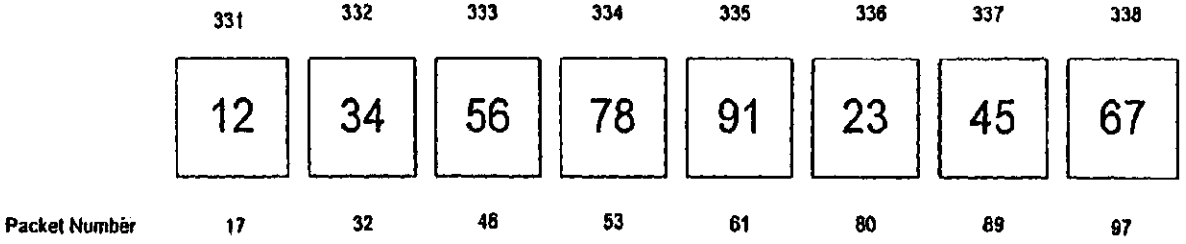


FIGURE 3C

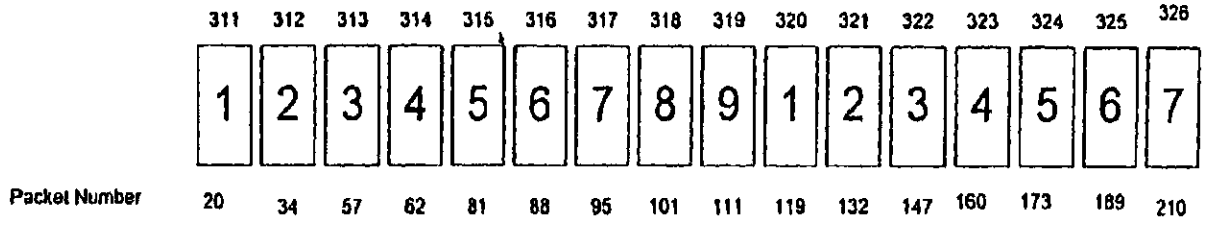
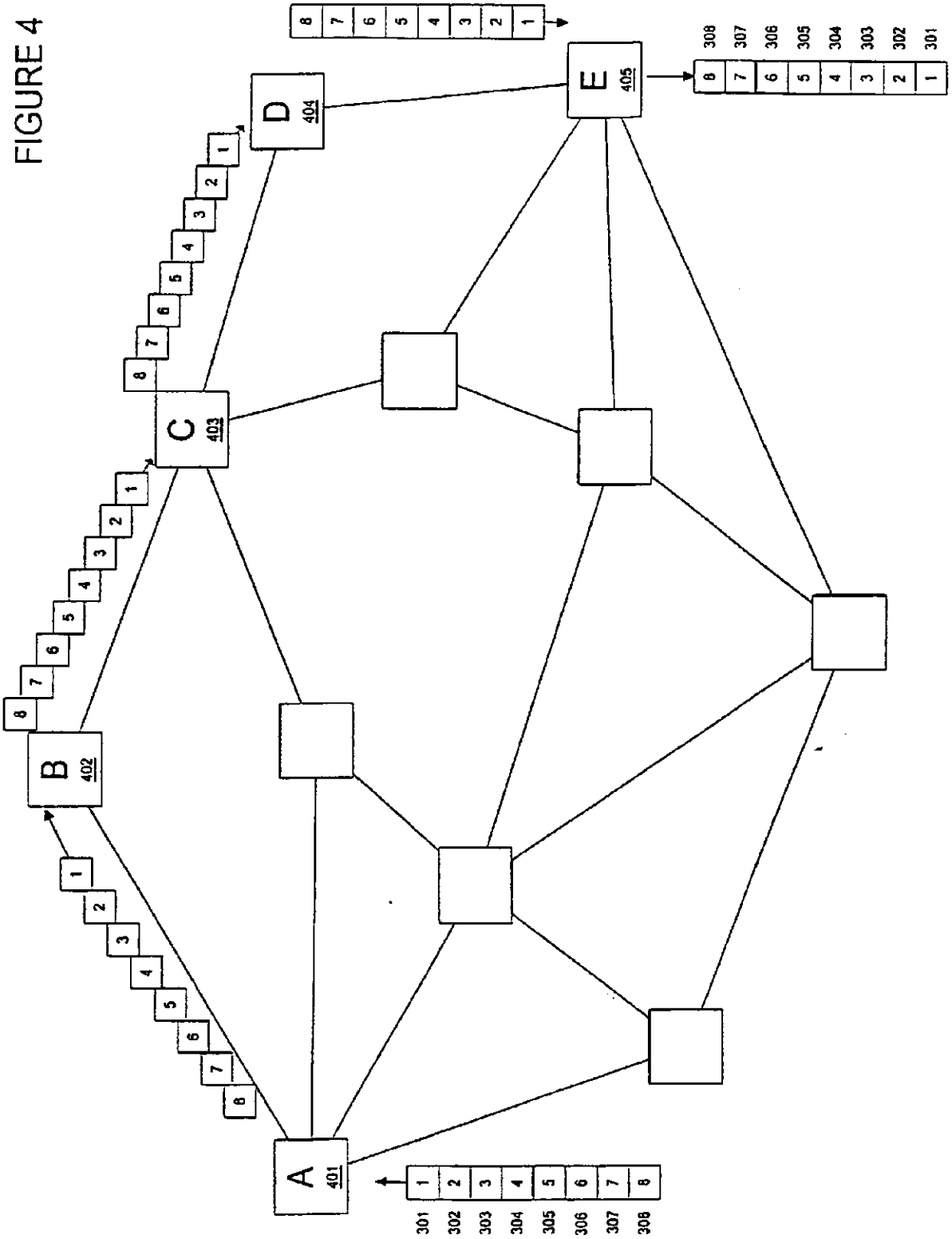


FIGURE 3D

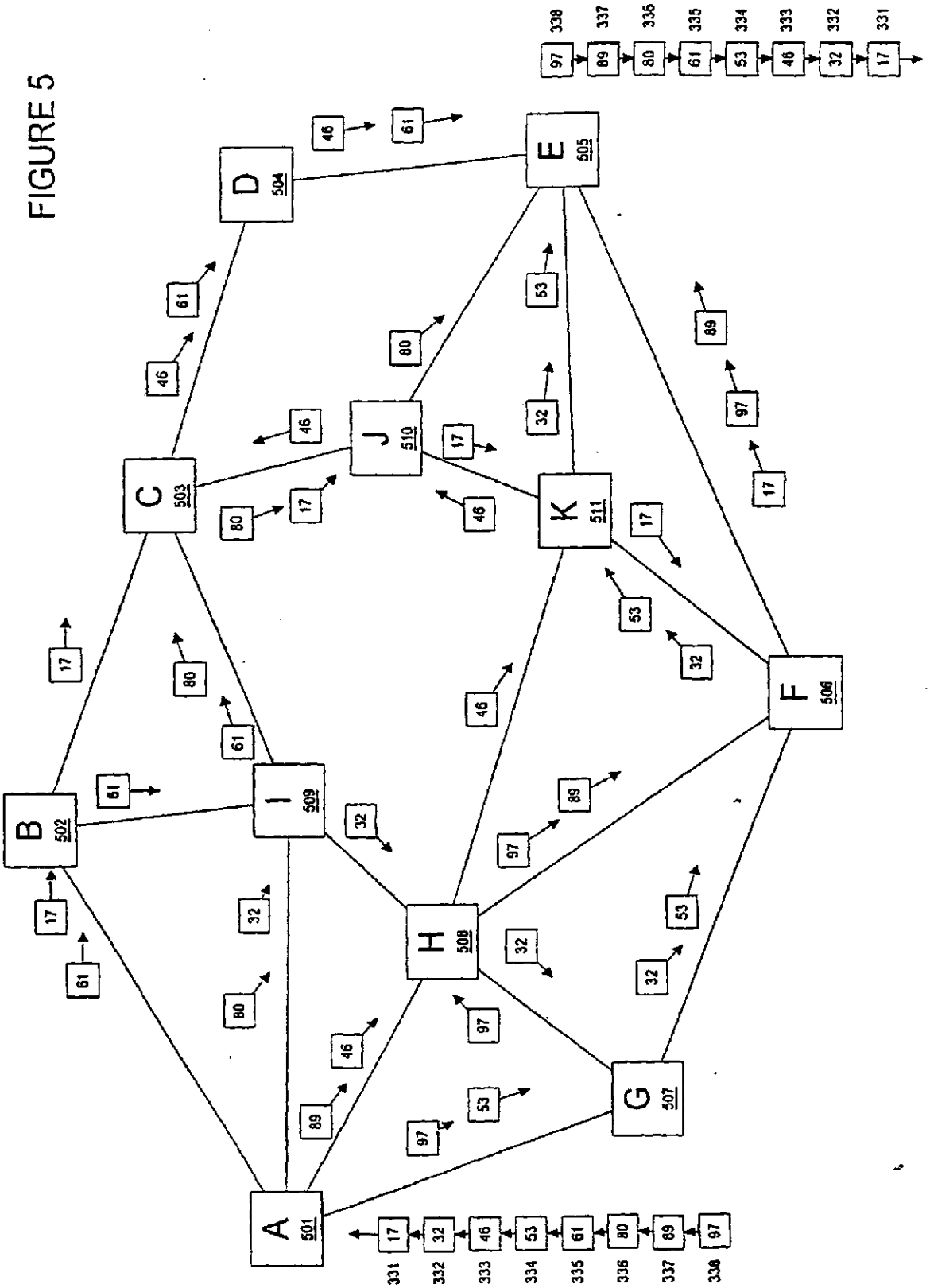
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FIGURE 4



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FIGURE 5



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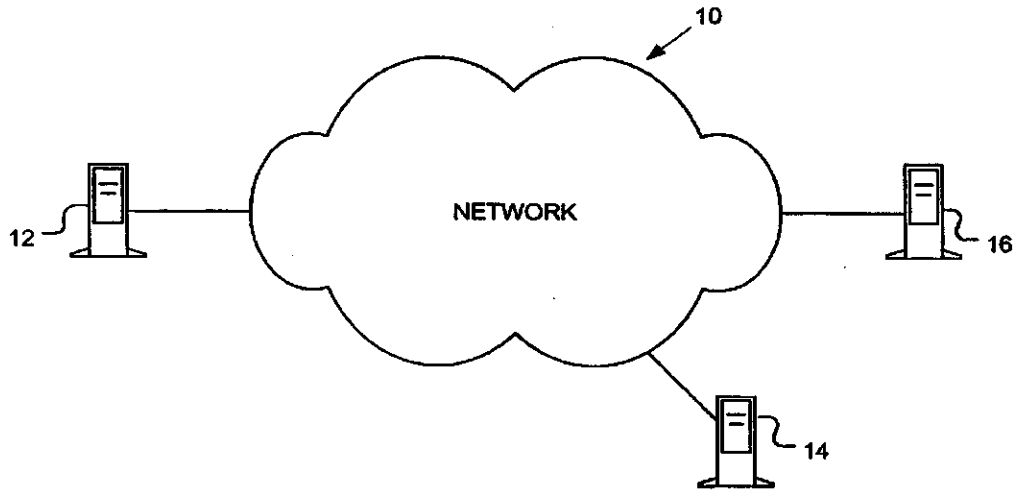
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(57) Abstract

A method of providing a message from a first computing device to a second computing device, using an intermediary is disclosed. The first computing device splits the message to be provided into at least two unrelated message portions; enrypts one of the message portions and provides this encrypted to an intermediate computer. The remaining message portion is provided to the second computing device. The second computing device then obtains the first message portion, preferably from the intermediate computer, and combines the message portions to decrypt the message. Preferably, the message is split into the message portion using computationally simple exclusive–OR techniques. As well, preferably the first message portion is encrypted using the widely supported secure socket layer encryption. Using this method, an operator at the intermediate device cannot obtain the message. A third party can only obtain the message by decrypting the encrypted first message portion and obtaining the second message portion. The method may easily be used to split a message into three or more message portions and provided to the second, recipient computer by way of multiple intermediate computers. Devices using the method are also disclosed.

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SECURE MESSAGE EXCHANGE METHOD USING INTERMEDIARIES

FIELD OF THE INVENTION:

The present invention relates to methods and devices for exchanging messages, and more particularly to methods and devices for securely exchanging data between computing devices using at least one intermediary.

BACKGROUND OF THE INVENTION:

In recent years the use of public computer networks to carry sensitive data has become widespread. The best example of such a public computer network is the public Internet. Because of widespread access availability, the Internet is evolving into a preferred communications network. As such, the Internet is being used for the exchange of sensitive data, that may be of a private nature. Recently, the Internet has been heralded as a vehicle facilitating commercial transactions. Because of the sensitivity of financial information, secure communications using the insecure network is a requirement.

As a result, many encryption and decryption methods are being developed. One encryption and decryption mechanisms that has gained popularity is the secure sockets layer ("SSL") method pioneered by Netscape Communications of CA as detailed in Freier, A.O., Karlton, P. and Kocher P. "The SSL Protocol Version 3.0", Netscape Communications, November 18, 1996, and U.S. Patent No. 5,657,390 the contents of both of which are

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hereby incorporated by reference. SSL encryption allows an end-user to safely exchange encrypted data using a modified hyper text transfer protocol ("HTTP") session using a temporary session key, which need not be stored or entered by the end-user. Moreover, most currently available Internet-browser applications support SSL encryption. Accordingly, SSL encryption is convenient for end-users.

However, current implementations of SSL encryption require an end-user to communicate with an SSL capable server, such as the Netscape Commerce Server. Many vendors are not able to, or do not wish to administer an SSL capable server. As such, third party intermediaries such as internet service providers have begun operating SSL capable servers for their commercial clients that act as vendors.

End-users may provide sensitive information to the SSL capable servers that vendors may then retrieve, by for example, establishing another SSL session with the SSL capable server. Typically, data received and stored by an SSL server is decrypted and stored at the SSL capable server in plaintext format, until retrieved remotely by the intended message recipient. As such, operators of the SSL capable servers have access to the plaintext message. This may lead to misuse of the sensitive information by these operators.

One known solution addressing this concern requires double encryption of the message by way of another encryption method. For example, the data provided to the SSL server may be encrypted so that decryption is only possible using a key

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known to the vendor. This, however, requires the vendor to provide a key to the end-user that must be applied by the end-user using, for example, another software application. This application and the key must be supplied to the end-user prior to SSL session. If the encryption algorithm is complex, the key and software may be quite large and would typically need to be stored at the end-user computing device. All this is quite complex and cumbersome for end-users.

Accordingly, a stream-lined secure method of providing data from a first computing device to a second computing device using an intermediary is desirable.

SUMMARY OF THE INVENTION:

In accordance with an aspect of the present invention, there is provided a method of conveying a message from a first computing device to a second computing device. The method comprises the steps of: a. splitting the message at the first computing device into at least two independent message portions, wherein each message portion is insufficient to form the message and all the message portions are required to form the message; b. encrypting one of the message portions at the first computing device; c. providing the encrypted message portion from the first computing to an intermediate computing device; d. providing the remaining message portions to a second computing device; e. providing the first message portion to the second computing device; and f. re-combining the first message portion and the remaining message portions at the second computing device to form the message.

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In accordance with yet another aspect of the present invention, there is provided a computing device comprising: a processor; a computer network interface in communication with the processor; persistent storage memory in communication with the processor, the persistent storage memory comprising processor readable instruction adapting the device to: a. split the message at the first computing device into at least two independent message portions, wherein each message portion is insufficient to form the message and all the message portions are required to form the message; b. encrypt one of the message portions at the computing device; c. provide the encrypted message portion from the computing device to an intermediate computing device using the network interface; and d. provide at least one of the remaining message portions to a second computing device interconnected with the network.

In accordance with yet a further aspect of the invention, there is provided a computer readable medium comprising a software application that, when loaded by a network interconnected computing device adapts the computing device to: a. split a data message at the computing device into at least two message portions, wherein each of the message portions is insufficient to form the message and wherein all the message portions are required to form the message; b. encrypt one of the message portions at the first computing device; c. provide the encrypted message portion from the computing device to an intermediate computing device using the network interface; and d. provide at least one of the remaining message portions to a second computing device

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interconnected with the network.

BRIEF DESCRIPTION OF THE DRAWING:

In figures which illustrate, by way of example only, embodiments of the present invention,

FIG. 1 illustrates a plurality of network interconnected computing devices, exemplary of embodiments of the present invention;

FIG. 2 illustrates a preferred architecture of one of the devices of FIG. 1;

FIG. 3 illustrates an exemplary organization of memory at one of the devices of FIG. 1;

FIGS. 4 and 5 are flowcharts of methods exemplary of embodiments of the present invention; and

FIG. 6 illustrates a further arrangement of computing devices, exemplary of an embodiment of the present invention.

DETAILED DESCRIPTION:

FIG. 1 illustrates a plurality of computing devices 12, 14 and 16 exemplary of embodiments of the present invention. Devices 12, 14 and 16 are interconnected by data network 10.

Network 10 is preferably a packet switched data network, such as a network adhering to te internet protocol ("IP"), allowing devices 12, 14 and 16 to exchange data. Data may be exchanged between network interconnected computing devices

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using the IP protocol as detailed in RFC 791, by way of intermediate routers (not illustrated). Network 10 may for example, be the public Internet, comprised of numerous smaller physical networks all adhering to the internet protocol. Network 10 could, of course, be any other suitable local area, wide area or other computer network, such as a token ring network, or the like.

Each of devices 12, 14 and 16 is preferably a conventional network client or server computing device such as an intel x86 based computer, or any other suitable computing device. In the illustrated embodiments, computing devices 12, 14, and 16 are architecturally substantially similar.

Device 12 acts as a network based client, that may be permanently or intermittently connected to network 10. The architecture of device 12 is illustrated in FIG. 2. As illustrated, device 12 comprises a processor 18, in communication with persistent storage memory 20, and a network interface 22. Processor 18 may for example, be a conventional intel x86 class processor, a Motorola 68000 series processor, a RISC processor or any other suitable processor known to those skilled in the art. Persistent storage memory 20 preferably comprises a combination of read only memory, random access memory, disk storage, and the like. Additionally, persistent storage memory 20 further preferably comprises a device capable of reading data from a removable storage medium 28, such as a diskette, CD-ROM or the like for storage in other portions of memory 20. Network interface 22 may be an ethernet interface, a modem, an asynchronous transfer mode or

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ISDN interface, or any other suitable interface for connecting device 12 to network 10. A monitor 24 and input device 26, such as a keyboard further preferably form part of device 12 allowing input and display of end-user data.

An exemplary organization of persistent storage memory 20 of device 12 is illustrated in FIG. 3. Stored within memory 20 are computer software programs and data that are loaded into working memory of device 12 to permit device 12 to be operable as a network based client computing device. As illustrated, memory 20 stores operating system software 34; application software 36; and data 38. Operating system software 34 may, for example, be Microsoft Windows 95 or 98 software; Microsoft NT Workstation operating system software, UNIX operating system software, or the like. Application software 36 includes network interface software 40, which typically includes an internet protocol suite allowing inter-connection with network 10 and thus communication of operating system 34 with network 10 through the physical network interface 22 (FIG. 1). Application software 36 further preferably includes an internet browser application 42 such as the Microsoft Internet Explorer or Netscape Communicator browser or the like. As such, browser application 42 will be capable of displaying documents written in the hyper-text-markup-language ("HTML"), as for example detailed in C. Musciano, B. Kennedy, HTML: The Definitive Guide, 3ed, (Cambridge, MA: O'Reilly & Associates, 1997), the contents of which are hereby incorporated by reference. Preferably browser application 42 is further capable of executing software applications downloaded through network 10. Most

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preferably, browser application 42 is capable of downloading and executing software written in the Javascript or Java programming languages as, for example, more particularly detailed in D. Flannagan, Javascript: The Definitive Guide (Nutshell Handbook) (Cambridge, MA: O'Reilly & Associates, 1997) and P. Niemeyer and J, Peck, Exploring Java, 2ed, (Cambridge, MA: O'Reilly & Associates, 1997), the contents of both of which are hereby incorporated by reference. Such Javascript or Java applications may preferably be downloaded through network 10 into data portion 38 of memory 20 and executed by browser application 42, as required. Additionally, application software 36 may comprise other applications 44 used by an end-user for purposes unrelated to the disclosed methods.

Devices 14 and 16 preferably act as network servers. The organization of memories at devices 14 and 16 and specific architecture of these devices are not illustrated. These are, however, similar to the described architecture of device 12 and organization of memory 20. However, each of devices 14 and 16 need not store nor execute an internet browser application, as device 12 preferably does. Instead, devices 14 and 16 preferably execute and store within their persistent storage memory, network server applications, such as for example an HTTP server application such as the Apache internet server application; the Netscape Commerce Server application, or the Microsoft Back Office software application, or the like. Additionally, the network server application at device 14 further preferably allows the exchange of encrypted messages using one or more known encryption methods. For

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example, the server application at device 14 preferably supports encrypted communication between network interconnected devices using the secure sockets layer ("SSL") described above. As will become apparent, device 16 typically need not allow for exchange of encrypted messages. Also stored within persistent memory at devices 14 and 16 are common gateway interface ("CGI") applications or Java applications or other software that may be executed at devices 14 or 16 in response to network contact of these devices. CGI programming techniques are detailed in S. Gundarvan, CGI Programming on the World Wide Web, (Cambridge, MA: O'Reilly & Associates, 1996), the contents of which are hereby incorporated by reference. As will become apparent, also stored within persistent storage memory of device 16 are HTML documents and software in the form of Java applets, applications or Javascript code that may be downloaded and executed by device 12 to facilitate encryption in accordance with methods exemplary of the present invention.

In operation, after causing device 12 to become network interconnected, an end-user at device 12 wishes to securely provide device 16 with a message. For illustration purposes, devices 14 and 16 are assumed to be permanently interconnected with network 10, and identified by at least one uniform resource locator ("URL"). Of course, device 14 and 16 could be connected to network 10, intermittently as required. Device 16 may, for example, be offering acting as an electronic commerce server, accepting and verifying orders for particular products or services. As noted, orders may include sensitive personal and financial information.

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The secure provision of the message may better be understood with reference to FIGS. 1, 4 and 5. Steps 400 performed by device 12 are illustrated in FIG.4. Steps 500 performed by device 16 are illustrated in FIG. 5. Specifically, in steps S402 and S502 device 12 contacts server 16 over network 10 using the HTTP protocol and a known URL identifying an HTML page used as a starting point, to establish an HTTP session between devices 12 and 16. Eventually after following one or more HTML links from the initially presented HTML page, the end-user at device 12 will wish to securely provide a message to device 16. Specifically, in step S402 device 12 receives a series of HTML instructions provided by device 16 in step S504 causing device 12 to request information from an end-user to be securely exchanged. For example, device 16 may preferably provide an HTML document including JavaScript code and a Java Applet in step S504 causing device 12 to first present an HTML form for completion by the end-user. The end-user, in turn, completes the form by presenting data such as the end-user's name; address; credit card number; and presses a submit icon or key thus providing the provided Javascript code with the plaintext data acquired, in step S404. For the purposes of this description, the plaintext data acquired through the presentation and completion of the described form will be referred to as M1.

Most preferably, the provided Javascript code or Java Applet now at device 12 further causes device 12 to split the data M1, is a manner exemplary of the present invention once the form has been completed. A portion of the provided Java

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Applet and Javascript code is executed once all the data on the input form has been provided and the end-user is ready to submit the data to devices 14 and 16 in steps S406-S410.

The Java Applet executing at device 12 forms two independent data portions C1 and C2 from the submitted, plaintext data, M1, in step S406. C1 and C2 may be considered blocks or streams of ciphertext data. C1 and C2 may be combined to form the plaintext data M1, but individually C1 or C2 do not contain sufficient information to re-create M1. Two such data streams C1 and C2 may for example, be formed by generating a random or pseudo-random bit stream B1 that is bit wise exclusive-OR-ed with the data M1. The pseudo-bit stream may be generated using techniques known to those skilled in the art. One stream is the pseudo-random stream, B1 while the other is the resultant exclusive-OR-ed stream (ie. B1 XOR M1). Advantageously and unlike many conventional known and relatively secure public or private key encryption algorithms, splitting data into two streams is computationally simple. This simplicity allows the required Java Applet or Javascript code to be very small and easily and quickly provided to device 12 from device 16. Other techniques for splitting M1 into two or more separate message streams will be understood by those skilled in the art, and are for example detailed in B. Schneier, Applied Cryptography, Protocols, Algorithms, and Source Code in C, 2ed, (John Wiley & Sons: New York, 1996), or A. Shamir, "How to Share a Secret", Communications of the ACM, Nov. 1979, Vol 22, No. 11, the contents of which are hereby incorporated by reference.

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Now, one of the two data streams (C2, for example) is provided in steps S408 and S506 to device 16 over network 10 using, for example, an HTTP connection, typically without encrypting this data stream. This received data stream is stored at device 16, also in step S506.

In step S410 the other of the two streams (C1) is provided to the Javascript code at device 12, which replaces M1 with C1 in the HTML form. Thereafter in step S410, browser application 42, under control of the HTML document provided in step S402, establishes an SSL session with intermediate computing device 14 acting as an SSL capable server, and provides C1 to device 14 using the SSL session. Data provided by way of network 10 during the SSL session is encrypted using an SSL session key, and provided to device 14; and decrypted and stored at device 14, preferably as a file, all using conventional techniques understood by those skilled in the art.

Next, in order to retrieve the plaintext message M1, both ciphertext message streams C1 and C2 are required. Thus, upon receipt of the stream containing C2, device 16 under control of software such as a Java application or Java Applet (not illustrated) may accordingly contact device 14 by, for example, establishing an HTTP or FTP session with device 14 over network 10, and preferably providing a password and identifier; and retrieving the stored file containing C1. While typically, device 16 unlike device 14 is not an SSL capable server, it may include client software capable of retrieving data from device 14 using an SSL session. Thus,

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device 16 could establish an SSL session with device 14 to retrieve the file containing C1. Alternatively, device 14 could provide a message containing C1 to device 16 once received. This could be done by device 14 initiating a session and providing the file or by way of electronic mail message, sent to or retrieved by device 16, or in any other suitable manner. Once C1 has been received at device 16, the software application at device 16 may re-assemble M1 from C1 and C2 using the inverse operators used to split M1 into C1 and C2 in step S510. Using the example technique, device 16 may bitwise exclusive-OR C1 with C2 to form M1.

Alternatively, streams C1 and C2 may be retrieved remotely from devices 14 and 16, respectively. For example, an authorized remote user (not illustrated) could establish a connection to network 10, using another computing device and contact device 14, preferably using an SSL session, and device 16 to retrieve C1 and C2.

Additionally, and optionally, in order to discover an error in M1, C1 and C2, M1, C1 and C2 may each be appended with a checksum in the form of a CRC, secure hash algorithm, as detailed in B. Schneier, Applied Cryptography, Protocols, Algorithms, and Source Code in C, 2ed, or the like. Corruption in C1 could thus be detected at device 14 or 16, while corruption of C2 or M1 could be detected at device 16. In response to detecting corruption, device 14 or 16 could request re-transmission of C1, C2 or C1 and C2, from device 12, as required.

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As should be appreciated from the above description, in order for a third party to intercept the message M1, the third party will require both C1 and C2. As C1 and C2 are routed to different network interconnected computing devices 14 and 16, typically over different network paths, and often over different physical networks all forming part of network 10, interception of both C1 and C2 on network 10 by a third party is highly unlikely. Further, as C1 is encrypted during transmission, a third party obtaining C1 is further unlikely. Moreover, an operator at server 14 cannot obtain M1, as only C1 has been provided. As there is preferably no statistical correlation between C1 and C2, even a brute force attack on C1 or C2 will not be sufficient to obtain M1. Once M1 has been re-assembled it may be processed as required in step S512 at server 16, or remotely.

As will appreciated, the above example embodiments have been described using a single intermediate computing device. The invention may easily be applied to split the transmitted message into three or more portions, and provide portions to additional intermediaries as illustrated by way of example, with reference to FIG. 6. In the arrangement of FIG. 6, computing device 50 wishes to securely convey a message to computing device 56. Device 50 comprises software similar to that described above, and preferably splits a message M1' into three independent message portions C1', C2' and C3'. This may be done, for example, by splitting message M1' into portions C1' and C2'' using the above described XOR technique. Message C2'' may further be split into message C2' and C3' by again splitting C2'' using the described XOR technique. Message

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portion C1' is encrypted and provided by way of a network to device 52. At device 52 it is decrypted and stored. Message portion C2' is optionally also encrypted and provided to device 54, where it is decrypted and stored. Again, SSL sessions between devices 50 and 52 and devices 50 and 54 may facilitate the encrypted exchange of C1' and C2'. Portion C3' is provided by device 50 to device 56, and optionally encrypted. Now, device 56 may obtain portions C1' and C2' from device 52 and 54, respectively. Alternatively, device 54 may obtain message portion C2' from device 52. C1' and C2' could be combined at device 54 and provided to device 56. Alternatively, device 56 could obtain C1' and C2' from device 54 and combine these. In any event, once C1', C2' and C3' are combined at device 56 message M1' may be extracted. Using the example XOR technique, M1'= C1' XOR (C2' XOR C3'). Once again, operators at intermediate devices 52, 54 cannot obtain M1' from message portions C1' and C2'.

As will be appreciated the described method can easily be extended to splitting an initial message M into an arbitrary number of intermediate message portions and using an arbitrary number of intermediate devices.

It will be appreciated that the above described embodiments use the Java or Javascript language and SSL encryption, a person skilled in the art will readily appreciate that the described methods may easily be implemented using other known encryption methods and other computer languages. For example, the described Javascript could be replaced with a compiled C application, executing as

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a "plug-in" to the network browser 42 or as part of the browser or other application. Moreover, message portions encrypted using the described SSL sessions could be encrypted using any other symmetric or public key encryption methods. For example, the known Pretty-Good-Privacy application available from Network Associates could be used. As well, while communications with server 16 has been described as not requiring encryption, a person skilled in the art will appreciate that communications with device 16 could also be encrypted.

Similarly, while the organization of software blocks, and data portions have been illustrated as clearly delineated, a person skilled in the art will appreciate that the delineation between blocks and data portions is somewhat arbitrary. Numerous other arrangements of software and data are possible. Similarly, while computing device 12, 14 and 16 have been illustrated as substantially similar, a person skilled in the art will appreciate that, in practice, these are typically quite dissimilar.

It will be further understood that the invention is not limited to the embodiments described herein which are merely illustrative of a preferred embodiments of carrying out the invention, and which are susceptible to modification of form, arrangement of parts, steps, details and order of operation. The invention, rather, is intended to encompass all modifications within its spirit and scope, as defined by the claims.

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WHAT IS CLAIMED IS:

1. A method of conveying a message from a first computing device to a second computing device, said method comprising the steps of:

a. splitting said message at said first computing device into at least two independent message portions, wherein each message portion is insufficient to form said message and all said message portions are required to form said message;

b. encrypting one of said message portions at said first computing device;

c. providing said encrypted message portion from said first computing to an intermediate computing device;

d. providing the remaining message portions to a second computing device;

e. providing said first message portion to said second computing device; and

f. re-combining said first message portion and said remaining message portions at said second computing device to form said message.

2. The method of claim 1, wherein said remaining message portions are provided to further intermediate computing

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devices prior to step d.

3. The method of claim 2, wherein said first message portion is provided to said second computing device by said intermediate computing device.

4. The method of claim 1, wherein said first, second and intermediate computing devices are interconnected with at least one data network, and wherein said first and remaining message portions are provided to said intermediate and second computing device over different data paths on said network.

5. The method of claim 4, wherein said second computing device and said intermediate computing device are interconnected to different physical networks.

6. The method of claim 1, wherein step e. comprises decrypting said encrypted message portion at said intermediate computing device.

7. The method of claim 1, wherein step a. comprises forming a pseudo-random bit stream at said first computing device, and applying said pseudo-random bit stream to said message to form said second message portion, and wherein said first message portion comprises said pseudo-random bit stream.

8. The method of claim 6, wherein step e. further comprises encrypting said decrypted message portion at said intermediate computing device.

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9. The method of claim 1, further comprising the step of

g. obtaining a software application to perform step a. at said first device from said second device.

10. The method of claim 1, wherein said first, second and intermediary computing devices are interconnected with a computer network adhering to an internet protocol, and wherein step c. comprises establishing a connection over said network between said first computing device and said intermediate computing device and said encrypted is provided to said intermediate computing device using said connection.

11. The method of claim 10, wherein data exchanged using said connection is encrypted using a temporary key generated for said connection.

12. The method of claim 11, wherein step e. further comprises establishing a network connection between said first computing device and said second computing device, and wherein said first message portion is provided to said second computing device using said session.

13. The method of claim 1, wherein step e. comprises providing said first message portion to said second computing device as an electronic mail message from said intermediary computing to said second computing device.

14. A computing device comprising:

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a processor;

a computer network interface in communication with said processor;

persistent storage memory in communication with said processor, said persistent storage memory comprising processor readable instruction adapting said device to:

a. split said message at said first computing device into at least two independent message portions, wherein each message portion is insufficient to form said message and all said message portions are required to form said message;

b. encrypt one of said message portions at said computing device;

c. provide said encrypted message portion from said computing device to an intermediate computing device using said network interface; and

d. provide at least one of the remaining message portions to a second computing device interconnected with said network.

15. The computing device of claim 14, wherein some of said processor readable instructions are provided to said computing device from said second computing device using said network interface.

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16. The computing device of claim 15, wherein said processor readable instructions further comprise a pseudo-random bit stream generator and adapt said processor to apply a pseudo-random bit stream formed by said generator to said data message to form said second message portion, and wherein said first message portion comprises said pseudo-random bit stream.

17. The computing device of claim 16, wherein said network comprises and internet protocol compliant network, and said processor readable instructions further adapt said computing device to communicate over said network using an internet protocol.

18. The device of claim 16, wherein said processor readable instructions further adapt said device to provide said first message portion to said intermediate computer using the http protocol.

19. A computer readable medium comprising a software application that, when loaded by a network interconnected computing device adapts said computing device to:

a. split a data message at said computing device into at least two message portions, wherein each of said message portions is insufficient to form said message and wherein all said message portions are required to form said message;

b. encrypt one of said message portions at said first computing device;

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c. provide said encrypted message portion from said computing device to an intermediate computing device using said network interface; and

d. provide at least one of the remaining message portions to a second computing device interconnected with said network.

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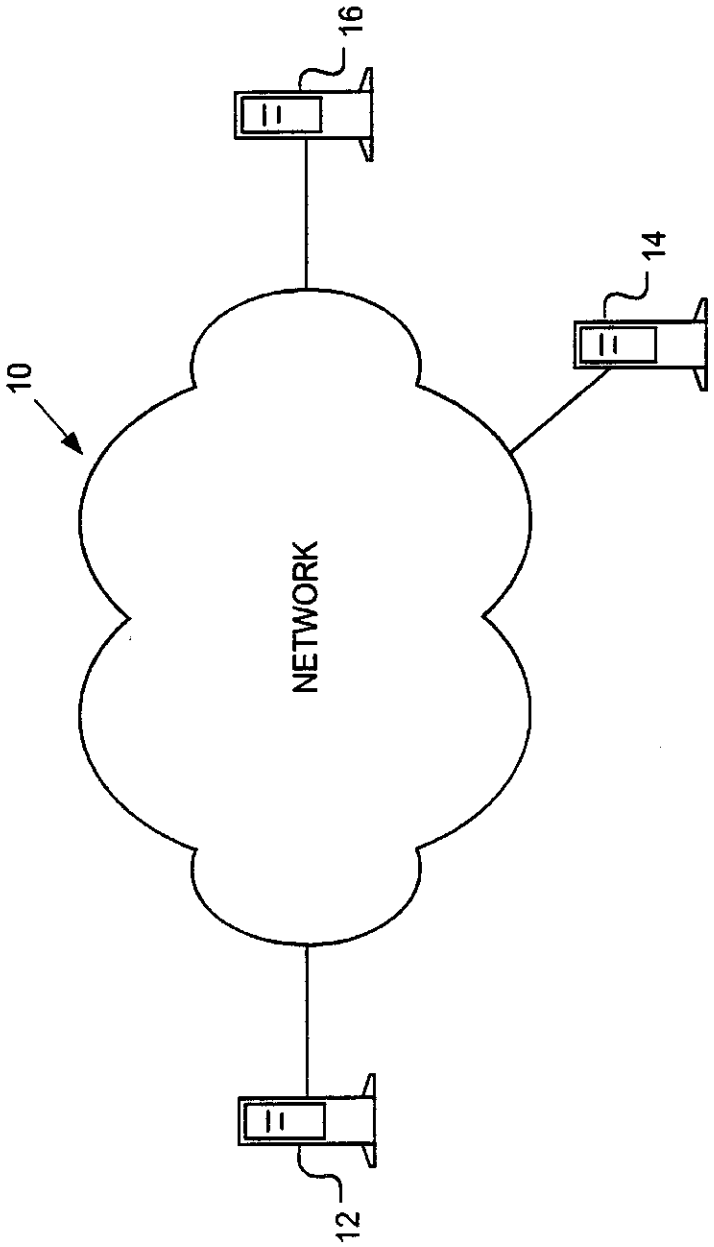


FIG. 1

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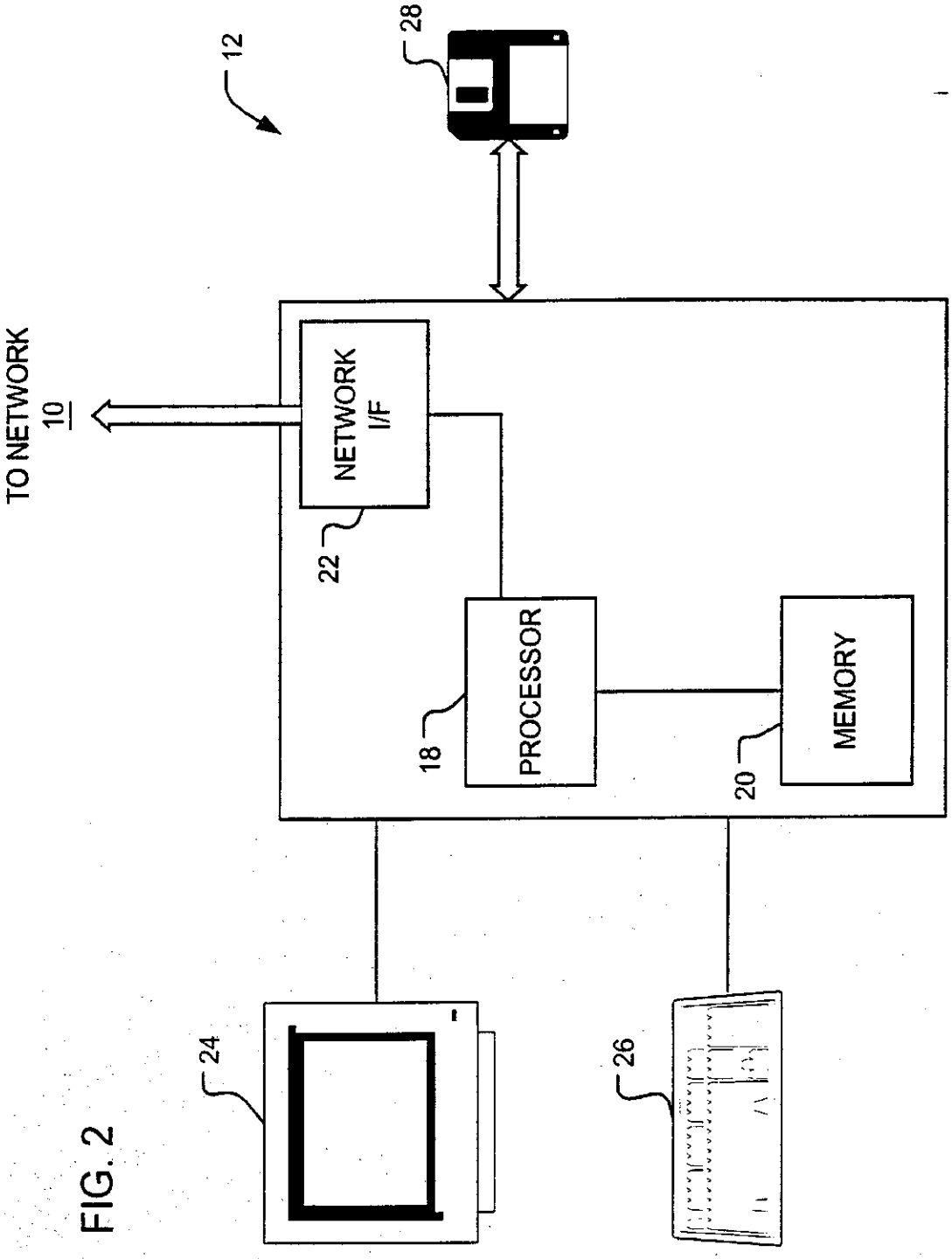


FIG. 2

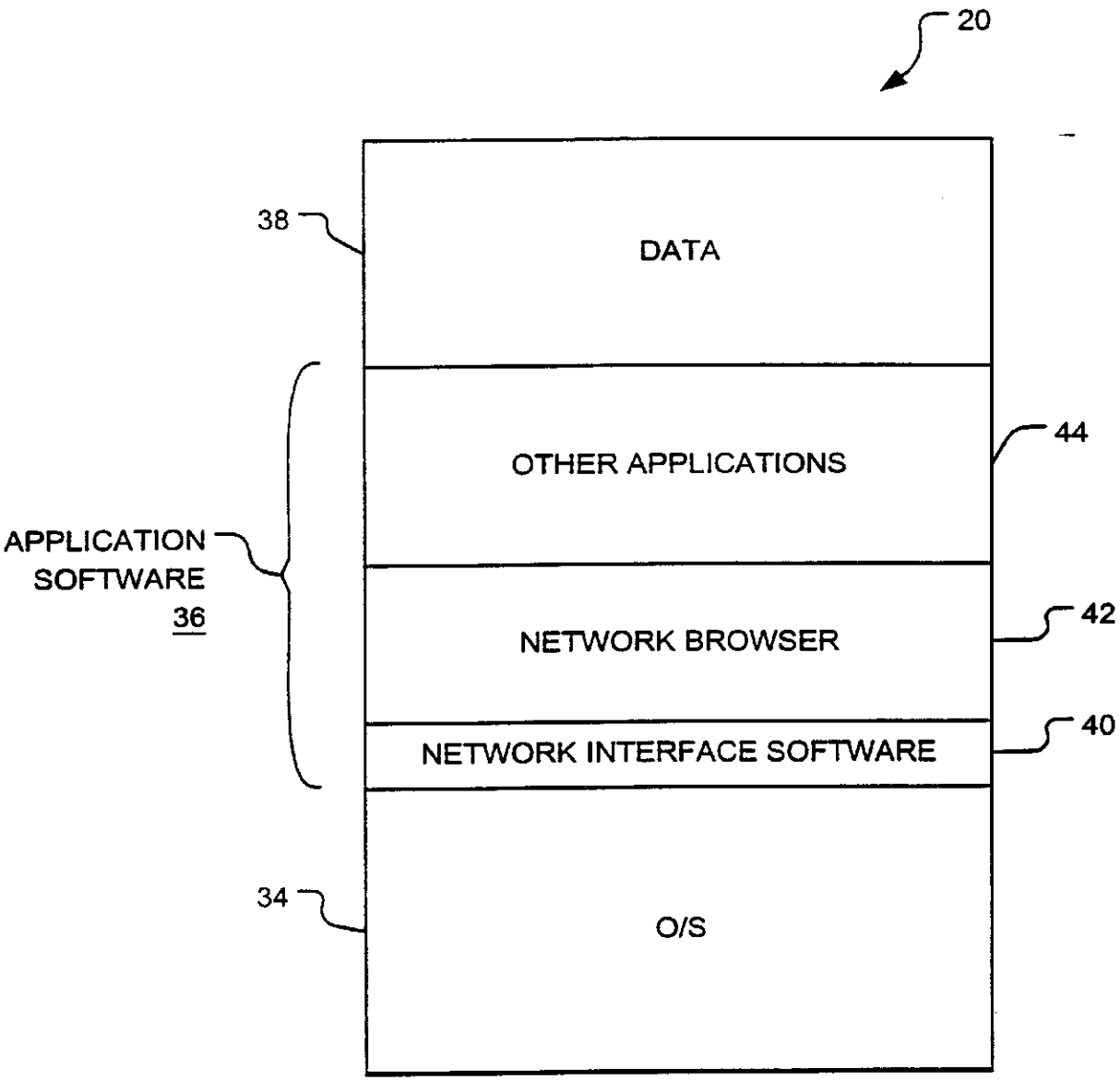

20
38
DATA
OTHER APPLICATIONS
44
APPLICATION SOFTWARE 36
NETWORK BROWSER
42
NETWORK INTERFACE SOFTWARE
40
34
O/S

FIG. 3

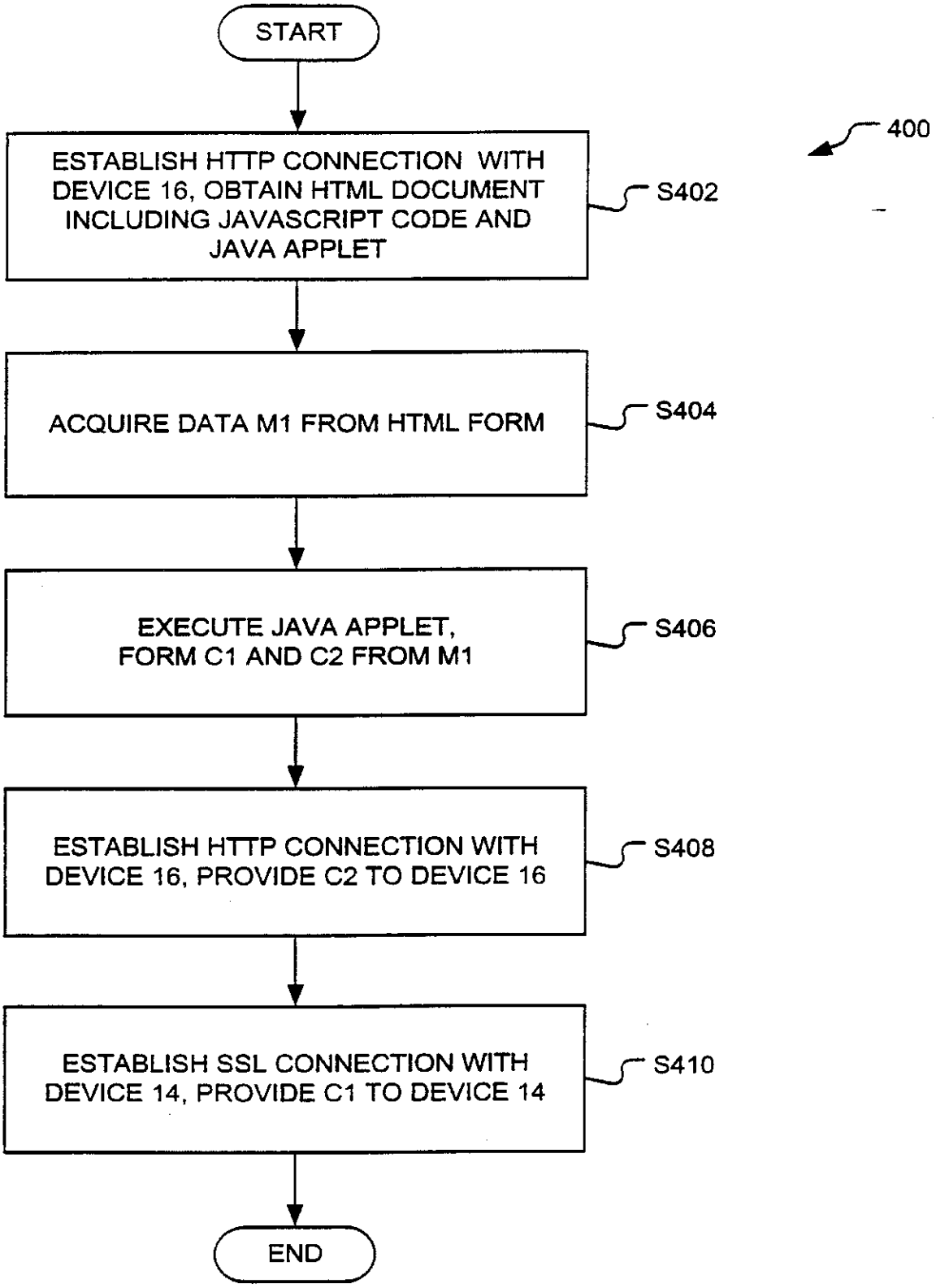

START
400
ESTABLISH HTTP CONNECTION WITH DEVICE 16, OBTAIN HTML DOCUMENT INCLUDING JAVASCRIPT CODE AND JAVA APPLET
S402
ACQUIRE DATA M1 FROM HTML FORM
S404
EXECUTE JAVA APPLET, FORM C1 AND C2 FROM M1
S406
ESTABLISH HTTP CONNECTION WITH DEVICE 16, PROVIDE C2 TO DEVICE 16
S408
ESTABLISH SSL CONNECTION WITH DEVICE 14, PROVIDE C1 TO DEVICE 14
S410
END

FIG. 4

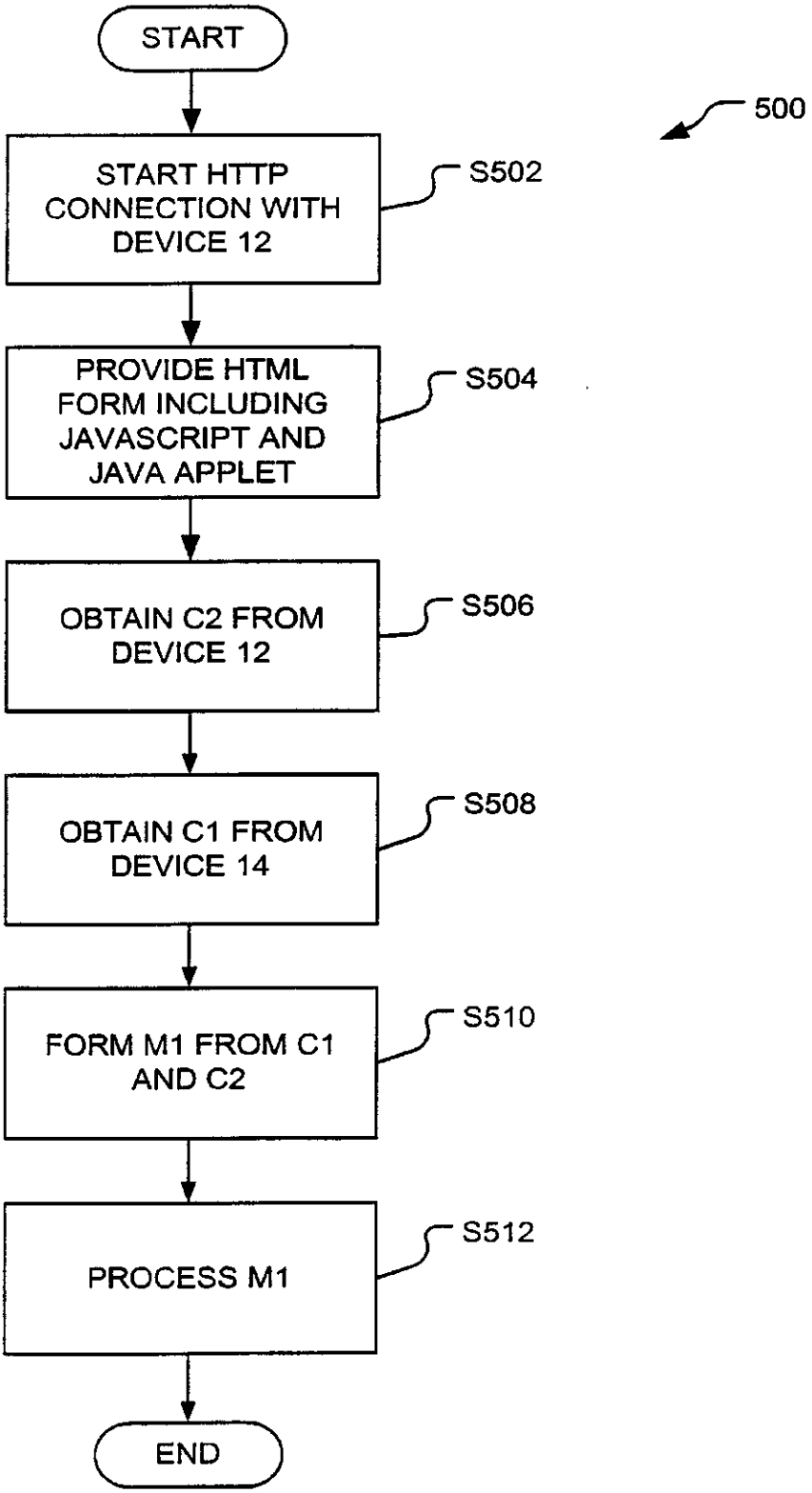

START
500
START HTTP CONNECTION WITH DEVICE 12
S502
PROVIDE HTML FORM INCLUDING JAVASCRIPT AND JAVA APPLET
S504
OBTAIN C2 FROM DEVICE 12
S506
OBTAIN C1 FROM DEVICE 14
S508
FORM M1 FROM C1 AND C2
S510
PROCESS M1
S512
END

FIG. 5

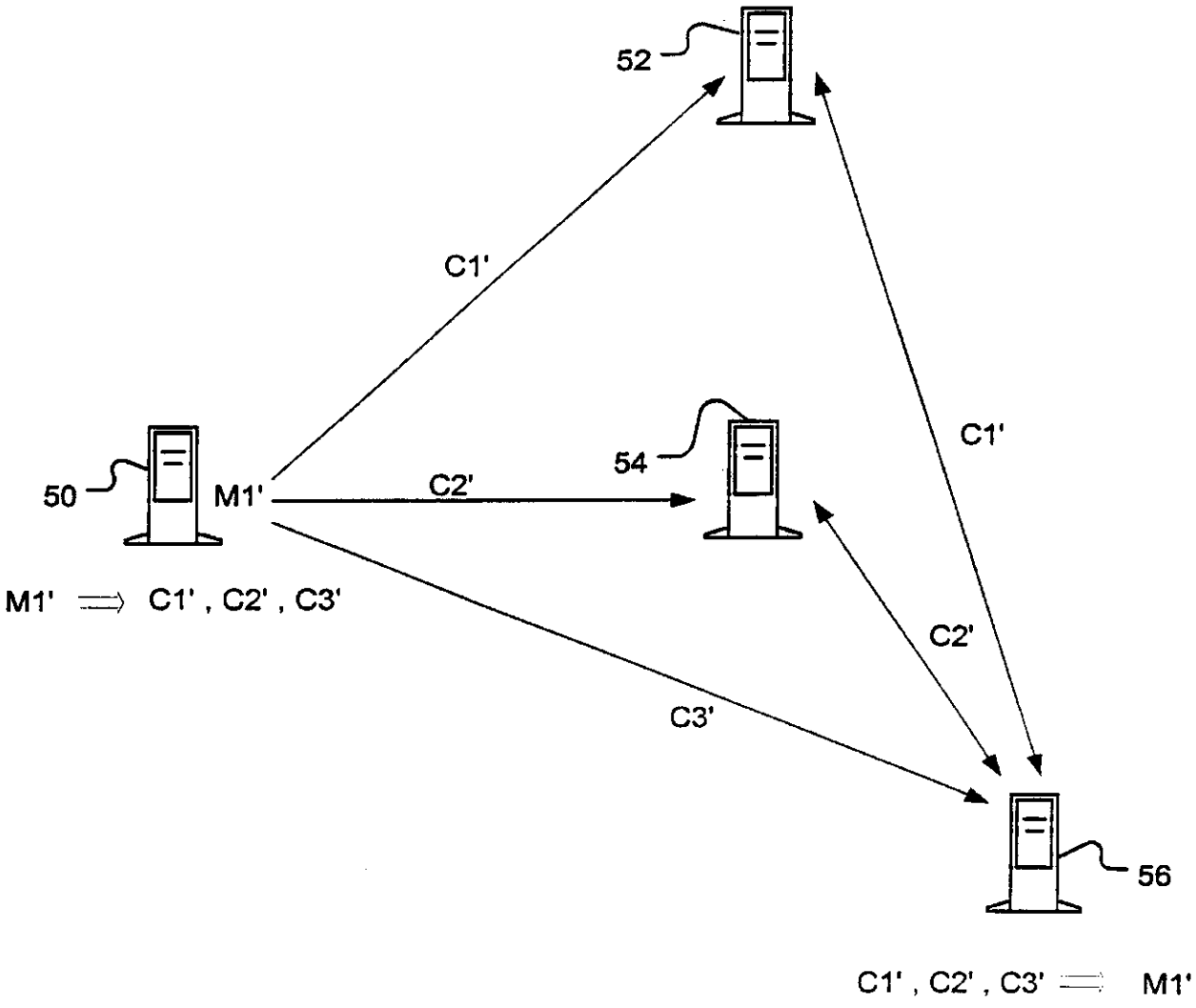


FIG. 6

INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/CA 99/00838

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	GB 2 332 833 A (INTERACTIVE MAGAZINES LIMITED) 30 June 1999 (1999-06-30) abstract page 1, line 1 - line 3 page 1, line 25 -page 2, line 14 claims 1-12	1-19
A	WO 96 29667 A (SANDBERG DIMENT ERIK) 26 September 1996 (1996-09-26) abstract page 2, line 1 - line 23 page 4, line 12 - line 24; figure 2	1-19

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 January 2000	02/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Adkhis, F

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter nal Application No
PCT/CA 99/00838

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2332833 A	30-06-1999	AU 1775099 A	19-07-1999
		WO 9934547 A	08-07-1999
WO 9629667 A	26-09-1996	US 5826245 A	20-10-1998
		AU 5366096 A	08-10-1996

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H04N 21/475 (2011.01)

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PCT/US2014/053241

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28 August 2014 (28.08.2014)

(25) Filing Language: English

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(30) Priority Data:
14/017,746 4 September 2013 (04.09.2013) US

(71) Applicant: **AKAMAI TECHNOLOGIES, INC.** [US/US]; 8 Cambridge Center, Cambridge, MA 02142 (US).

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(74) Agents: **MATT, Joshua, T.** et al.; Akamai Technologies, Inc., 8 Cambridge Center, Cambridge, MA 02142 (US).

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(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

[Continued on next page]

(54) Title: SERVER-SIDE SYSTEMS AND METHODS FOR REPORTING STREAM DATA

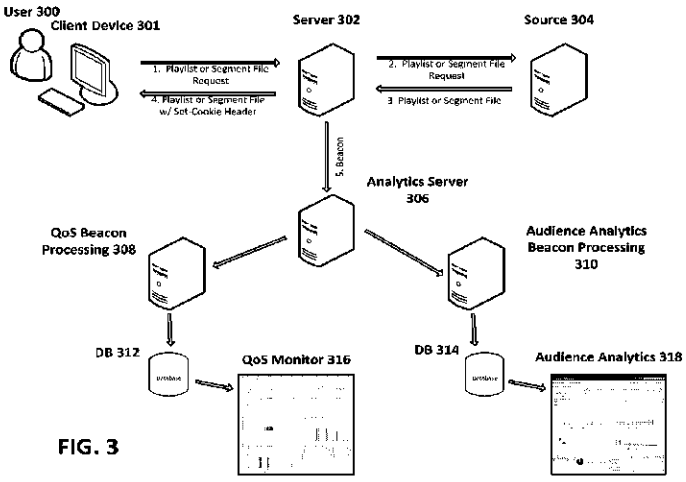


FIG. 3

(57) Abstract: According to the disclosure hereof, the functionality of a server can be extended to collect data on content streams that the server is delivering to clients, and to beacon certain data back an analytics system to facilitate monitoring of, reporting on, and analysis of the delivery of content streams. At various stages of the streaming process, a server can read and update state information (for example cookie data) on the requesting client reflecting, for example, status in playing a particular stream. Based on the client's requests and the state information at each stage, the server can beacon appropriate information about the stream and its playback status back to the analytics system. The teachings hereof are particularly useful, without limitation, in streaming media analytics and for segment-based streaming approaches, including over HTTP.

WO 2015/034752 A1

Published:

— *with international search report (Art. 21(3))*

SERVER-SIDE SYSTEMS AND METHODS FOR REPORTING STREAM DATA

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BACKGROUND

Technical Field

This patent document relates generally to the delivery of content over computer networks, including in particular streaming content from a server to a client, and to the monitoring, reporting, and analysis of such content delivery.

Brief Description of the Related Art

Streaming content from a server to a client device is known in the art, and is often used for delivering media, such as streaming audio or video. A variety of techniques are known for streaming both live content and on-demand content. For example, real-time message protocol (RTMP) provides a way for a media server to send content to a client over one or more virtual channels and a control channel. More recently, HTTP-based streaming has become more widely used. Typically, with HTTP based streaming, a given media stream is represented by multiple chunks or segments which can be requested independently by a client player. Each segment is downloaded by the client and then played in order. In order to know what the segments are available and where to find them (e.g., the URIs to use for requesting them), a client generally first obtains a file like a playlist or manifest, which contains the segment locations or indicates how to construct the segment locations (e.g., how to construct the URIs).

For example, HTTP Live Streaming (HLS) is a framework that provides for a master playlist, media playlist, and media segments. A master playlist contains references to one or more media playlists. Typically, the master playlist contains references (URIs) to different versions of the same stream, each represented for example by a different media playlist. This can be used to provide streams having different resolutions or at multiple different bitrates,

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and a client can choose amongst them. A client player may dynamically choose an appropriate bitrate based on network conditions, buffer size/status, and/or device processing power, so as to effect adaptive bitrate streaming.

In HLS, a media playlist references (typically by URI) the media segments that make up the stream for the given bitrate, resolution, or the like, and allow the client player to individually request each segment. Like master playlists, media playlists may be implemented as m3u8 files. Media segments contain the actual media data (e.g., video, audio, multimedia container file). For HLS, the media segments are often MPEG-2 transport streams, designated as ts files.

Other segmented streaming based approaches include HTTP Dynamic Streaming, Smooth Streaming and MPEG-DASH.

To serve a stream, a given server or collection of replicated servers can be used to stream the content to requesting client devices in accord with the protocols described above. In some cases, however, a distributed computing system such as a "content delivery network" (CDN) is used to stream content across the Internet. A CDN is typically operated and managed by a service provider, who provides the content delivery service on behalf of third parties. A "distributed system" of this type typically refers to a collection of autonomous computers linked by a network or networks, together with the software, systems, protocols and techniques designed to facilitate various services, such as content delivery or the support of outsourced site infrastructure. This infrastructure is shared by multiple tenants, the content providers. The infrastructure is generally used for the storage, caching, or transmission of content – such as streaming media, but potentially also web pages and applications – on behalf of such content providers or other tenants. The platform may also provide ancillary technologies used therewith including, without limitation, DNS query handling, provisioning, data monitoring and reporting, content targeting, personalization, and business intelligence.

In a known system such as that shown in FIG. 1, a distributed computer system 100 is configured as a CDN and has a set of machines 102 distributed around the Internet. Typically, most of the machines are servers located near the edge of the Internet, i.e., at or adjacent end user access networks. A network operations command center (NOCC) 104 may be used to administer and manage operations of the various machines in the system. Third party sites affiliated with content providers, such as web site 106, offload delivery of content

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to the distributed computer system 100 and, in particular, to the CDN servers (which are sometimes referred to as "edge" servers in light of the possibility that they are near an "edge" of the Internet). Such servers may be grouped together into a point of presence (POP) 107 at a particular geographic location.

The CDN servers are typically located at nodes that are publicly-routable on the Internet, within or adjacent nodes that are located in mobile networks, in or adjacent enterprise-based private networks, or in any combination thereof.

Typically, content providers offload their content delivery by aliasing (e.g., by a DNS CNAME) given content provider domains or sub-domains to domains that are managed by the service provider's authoritative domain name service. The server provider's domain name service directs end user client machines 122 that desire content to the distributed computer system (or more particularly, to one of the CDN serves in the platform) to obtain the content more reliably and efficiently. The CDN servers respond to the client requests, for example by fetching requested content from a local cache, from another CDN server, from the origin server 106 associated with the content provider, or other source.

Although not shown in detail in FIG. 1, the distributed computer system may also include other infrastructure, such as a distributed data collection system 108 that collects usage and other data from the CDN servers and passes that data to other back-end systems 110, 112, 114 and 116 to facilitate monitoring, logging, alerts, billing, management and other operational and administrative functions. Distributed network agents 118 monitor the network as well as the server loads and provide network, traffic and load data to a DNS query handling mechanism 115. A distributed data transport mechanism 120 may be used to distribute control information (e.g., metadata to manage content, to facilitate load balancing, and the like) to the CDN servers. The CDN may include a network storage subsystem (sometimes referred to herein as "NetStorage") which may be located in a network datacenter accessible to the CDN servers and which may act as a source of content, such as described in U.S. Patent No. 7,472,178, the disclosure of which is incorporated herein by reference.

As illustrated in FIG. 2, a given machine 200 in the CDN comprises commodity hardware (e.g., a microprocessor) 202 running an operating system kernel (such as Linux® or variant) 204 that supports one or more applications 206. To facilitate content delivery services, for example, given machines typically run a set of applications, such as an HTTP proxy 207, a

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name server 208, a local monitoring process 210, a distributed data collection process 212, and the like. The HTTP proxy 207 typically includes a manager process for managing a cache and delivery of content from the machine. For streaming media, the machine may include one or more media servers, such as a Windows® Media Server (WMS) or Flash server, as required by the supported media formats.

In a typical operation, a content provider identifies a content provider domain or sub-domain that it desires to have served by the CDN. The CDN service provider associates (e.g., via a canonical name, or CNAME, or other aliasing technique) the content provider domain with a CDN hostname, and the CDN provider then provides that CDN hostname to the content provider. When a DNS query to the content provider domain or sub-domain is received at the content provider's domain name servers, those servers respond by returning the CDN hostname. That network hostname points to the CDN, and that hostname is then resolved through the CDN name service. To that end, the CDN name service returns one or more IP addresses. The requesting client application (e.g., browser) then makes a content request (e.g., via HTTP or HTTPS) to a CDN server machine associated with the IP address. The request includes a host header that includes the original content provider domain or sub-domain. Upon receipt of the request with the host header, the CDN server checks its configuration file to determine whether the content domain or sub-domain requested is actually being handled by the CDN. If so, the CDN server applies its content handling rules and directives for that domain or sub-domain as specified in the configuration. These content handling rules and directives may be located within an XML-based "metadata" configuration file, as described in US Patent No. 7,240,100, the teachings of which are hereby incorporated by reference.

The CDN platform can be considered an overlay across the Internet on which communication efficiency can be improved. Improved communications on the overlay can help when a CDN server needs to obtain content from an origin server 106, or otherwise when accelerating non-cacheable content for a content provider customer. Communications between CDN servers and/or across the overlay may be enhanced or improved using improved route selection, protocol optimizations including TCP enhancements, persistent connection reuse and pooling, content & header compression and de-duplication, and other techniques such as those described in U.S. Patent Nos. 6,820,133, 7,274,658, 7,607,062, and 7,660,296, among others, the disclosures of which are incorporated herein by reference.

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For live and on-demand streaming delivery, the CDN may include a delivery subsystem leveraging the CDN platform, such as described in U.S. Patent No. 7,296,082, and U.S. Publication Nos. 2011/0173345 and 2012/0265853, the disclosures of which are incorporated herein by reference.

Regardless of the particular delivery infrastructure, a streaming content provider often wants to know certain things about the delivery of their content to end-users. For example, the size of the audience for a particular stream, how many plays a stream receives, and other audience metrics may all be important. Quality of service metrics, such as how often a user re-started a stream – also may be important. In some cases, stream metrics can be obtained using a client-beaconing system, in which a client player sends information about the stream it is playing to some designated machine, which processes this information to generate aggregate statistics on the stream. However, this requires adapting each client player to have appropriate logic, and the universe of players is constantly changing and expanding.

It would be advantageous to have a solution that is able to provide stream monitoring and reporting and analysis capabilities based on collecting data from the server side, without relying on a beacon sent from the client player. It would be advantageous to have such solution compatible with recent technologies for streaming, such as HTTP streaming and/or other chunk/segment based streaming. Collecting data on such streams at the server is challenging because the server generally has limited knowledge about an individual stream, as it is typically receiving a multitude of requests from various clients for various segments of streams.

The teachings herein address these needs and also provide other benefits and improvements that will become apparent in view of this disclosure. The teachings herein may be used by a CDN to provide a monitoring and reporting and analytics system for its participating content providers, but they are not limited to the CDN use case, as they may be implemented in conjunction with any streaming content system.

SUMMARY

This patent document describes, among other things, systems and methods for collecting and reporting stream data to facilitate monitoring of, reporting on, and analysis of the delivery of

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content streams. In particular, systems and methods are described herein for collecting and reporting data related to quality-of-service and audience statistics for streaming media, though other use cases are possible.

In one implementation of the teachings hereof, servers that are streaming content to client players are modified to collect data about the streams. The servers may be CDN servers, though this is not a limitation. The servers send the data to a back-end analytics system, which aggregates and processes the information.

At various stages of the streaming process, a server can set, update, and read state information on the requesting client reflecting, for example, its status in playing a particular stream. Based on the client's request and such state information at each stage, the server can beacon appropriate information about the stream back to the analytics system. The state information can be stored on the client in cookies or using other client-side storage mechanisms, including other standards-based approaches that enable a client to store and return state information with requests to servers, either with or without server request. The teachings hereof apply without limitation to streaming media analytics, and to segment-based streaming approaches including over HTTP.

Assume, for example, that a client player requests a master playlist for an HLS stream from a server. When the server receives the request, the server can read state information (e.g., from the HTTP cookie) on the client, if it exists, or if not, generate and set the state information. The state information might include such kinds of information as a client identifier, user identifier, a stream identifier (e.g., which might be name of master playlist or derived from it), a time stamp, and/or other things, as will be described in more detail later in this document. The server can respond to the client request, and the server can also generate and send a beacon message to the analytics system in light of the client request.

Assume the client then sends a request for a media playlist. The server can read the previously stored state information, update it to reflect current status, and use the information in the request (including the state information) to generate another beacon. Likewise, the receipt of requests for media segments of the stream can cause the server to read and update the state information on the client, and generate beacons.

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The beacon messages can indicate a variety of information at each stage, e.g., indicating perhaps that the client is attempting to play or playing the stream, the status of the playback, identifying the media stream being played, identifying what version of the stream (bitrate), and/or other relevant data. As indicated above, the server can send these messages at certain points (e.g., upon receiving the particular requests for playlists, or media segments, or at certain intervals, etc.) to the analytics system. Hence this approach can be used as an alternative or supplement to client-side systems in which a client application (player) with a plugin or other logic periodically beacons information to the back-end analytics system, potentially alleviating the need for integrating such logic into all client player applications.

The specific timing and messaging implementation will typically vary with the design goals and the streaming protocol. Thus, the teachings hereof apply to streams or circumstances that employ one playlist, rather than the HLS approach of master and media playlist used in the example above. For example, the teachings can also be applied to HTTP Dynamic Streaming (HDS), Smooth Streaming, or MPEG-DASH, which generally use a reference file referred to as a manifest rather than a playlist.

The teachings hereof also apply to situations where a client makes a series of media segment requests, irrespective of playlist/manifest requests. For example, the server may send beacons in response to media segment requests, updating and setting the client state information after each such request.

As those skilled in the art will recognize, the foregoing description refers to examples of the invention and is not necessarily meant to reflect all possible embodiments. Other embodiments are described and/or will be apparent in view of the description below and in light of one skilled in the art's understanding of this disclosure. The teachings hereof may be realized in a variety of systems, methods, apparatus, and non-transitory computer-readable media.

BRIEF DESCRIPTION OF THE DRAWINGS

The teachings of this document will be more fully understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

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FIG. 1 is a diagram illustrating one embodiment of a known distributed computer system configured as a content delivery network (CDN);

FIG. 2 is a diagram illustrating one embodiment of a machine on which a content delivery network server in the system of FIG. 1 can be implemented;

FIG. 3 is a diagram illustrating one embodiment of a system for stream monitoring, reporting and analytics;

FIG. 4 illustrates one embodiment of a message sequence amongst certain machines shown in FIG. 3;

FIG. 5 is a diagram illustrating one embodiment of logic process flow in the server 302 shown in FIG. 3; and,

FIG. 6 is a block diagram illustrating hardware in a computer system that may be used to implement the teachings hereof.

DETAILED DESCRIPTION

The following description sets forth embodiments of the invention to provide an overall understanding of the principles of the structure, function, manufacture, and use of the methods and apparatus disclosed herein. The systems, methods and apparatus described herein and illustrated in the accompanying drawings are non-limiting examples; the claims alone define the scope of protection that is sought. The features described or illustrated in connection with one exemplary embodiment may be combined with the features of other embodiments. Such modifications and variations are intended to be included within the scope of the present invention. The allocation of functions to particular computer machines is not limiting, as the functions recited herein may be combined or split amongst different machines in a variety of ways. All patents, publications and references cited herein are expressly incorporated herein by reference in their entirety.

Introduction

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According to this disclosure, a system of servers can collect and beacon data about streams they are delivering. The data can be beaconed to a back-end analytics system, so as to facilitate monitoring of, reporting on, and analysis of the content streams for a stream content provider. The back-end analytics system aggregates data from many beacons to determine and report on quality-of-service, audience size, audience engagement, viewing duration, and other audience-related metrics, client player statistics, and other information. Hence, this system can be used to provide real-time and/or post-event reporting of content streams.

Preferably the content streams are media streams delivering audio, video, or multimedia (e.g., container files with encoded audio/video presentations) to a client. Preferably the media streams are segmented media streams using a manifest or playlist(s) to define the location of stream segments. Non-limiting examples of suitable streaming protocols include HTTP Live Streaming (HLS), HTTP Dynamic Streaming (HDS), and Smooth Streaming, and MPEG-DASH. The server-side beaconing approach described in this disclosure alleviates the need for client-side code or integration of plugin or other logic into the client, which is advantageous given the ever-increasing array of client players in use.

The teachings hereof may be implemented in a content delivery network server used for streaming content, or more particularly, in the HTTP proxy servers described earlier with respect to FIGS. 1-2. More specifically, the proxy server application running in the machine 200 can be modified in accordance with the teachings hereof to provide the disclosed functionality.

System Architecture

FIG. 3 illustrates one non-limiting embodiment of a system for server-side collection of stream data. In the following description, conventions and nomenclature associated with HTTP and HTTP live streaming (HLS) will be used for illustrative purposes; however, the approach would apply equally for other segmented streaming protocols.

In this embodiment, beaconing logic is placed within content servers that are delivering the streams. The system is designed to have a given content server 302 in the system beacon back relevant information about the stream at certain points in time. The information may be in the comparable format as a client-side plugin generated beacon would generate. In the illustrated embodiment, the logic of when to trigger these beacons is based on server 302

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responses to client requests for the master playlist, media playlist, or media segments. In order to keep track of sessions, unique viewers, and determine when to trigger a beacon, two cookies are used in this example. However the number of cookies may vary by implementation.

Turning to FIG. 3, user 300 operates a client device 301 running a client media player application. Assume that the client has already obtained the address of a media server via, for example, DNS lookup made by its local DNS server. (In the case of a CDN, the DNS process may have involved an aliasing process to be pointed to the CDN DNS system, and subsequently a particular machine in the CDN, as described earlier in connection with FIGS. 1-2.)

In FIG. 3, the client issues HTTP requests (e.g., HTTP GET request) for playlist files for a given stream, and then the actual media segments for that stream. (The specific request/response sequence will be discussed in more detail below.) When the server 302 receives a request, it serves the playlist or the media segment from cache, as the case may be, if it has a valid cached copy. If not, the server 302 can go forward in a proxy operation to an origin server or some other remote storage mechanism, designated as source 304. The source 304 responds with the playlist or media segment, as the case may be, and the server 302 transmits it to the client 301 in response to the client's request. When responding, the server 302 sets one or more cookies on the client with state information.

At certain times in this flow, generally after receiving a request for a playlist or media segment, the server 302 can send a beacon to a remote machine 306 running an analytics application. This machine 306 ingests the beacon messages and extracts certain information which it transmits to a quality of service (QoS) machine 308, and other information to an audience analytics machine 310. The QoS machine 308 aggregates and collates the data by stream, storing the data in a database 312 so it may later be queried and used to drive a QoS monitoring application available to content providers via a web portal or other user interface. The audience analytics machine 310 aggregates and collates the data by stream, storing the data in a database 314 so it may later be queried and used to drive an audience analytics monitoring application available to content providers via, e.g., the web portal.

The two cookies used in the current embodiment to store state information are now described.

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A CLIENT_VIEWER_COOKIE is a persistent cookie used to determine unique viewers and is set at the top level of the delivery hostname whenever a request is received without this cookie present. In one implementation, it can contain a client viewer identifier generated by a hash of client IP address and random string. The viewer ID is unique and anonymous.

A CLIENT_SESSION_COOKIE is a session cookie used to keep track of individual stream playback sessions and determine when and how to beacon back data. The cookie is set at the path of the requested object down to the stream identifier level, and may include such fields as a unique session ID (e.g., hash value of client viewer ID and current timestamp at the server 302), current timestamp, master playlist name, and an indication of the state of the stream playback, for example.

In this embodiment, the client session ID is set or reset in the following scenarios:

Scenario 1 – New Viewer: A playlist request (e.g., master or media playlist) is received without the CLIENT_SESSION_COOKIE present

Note: If a media playlist request comes in without this cookie it is assumed the user is requesting this media playlist directly and therefore this request can be treated as if it were the 'master'

Scenario 2 – Existing Viewer Requesting New Master Playlist Within Same Event: A master playlist request is received with the CLIENT_SESSION_COOKIE present but the requested master filename does not match the originally requested master filename in the cookie

Note: There is a predefined regex to differentiate a master playlist filename from a media playlist filename

Scenario 3 – Existing Viewer Restarting Stream After Being Idle For More Than N Seconds: A master playlist request is received with the CLIENT_SESSION_COOKIE present AND the requested filename matches the originally requested 'master' filename in the cookie AND the timestamp is greater than N seconds, where N is configurable (e.g., N = 300 seconds)

Note: There is a predefined regex to differentiate a master playlist filename from a media playlist filename

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Note: The assumption is that a new master playlist request after a stream has been idle for more than N seconds indicates the user is restarting the stream and therefore it is considered a new session.

Three types of beacons are being sent from the server 302 to the analytics machine 306 in this embodiment: Attempt, Play Started, and Playing. The parameters included in each beacon type are explained below in the Beacons section of this document. A typical HLS request flow includes a master playlist request, one or more media playlist requests, and then multiple media segment requests. The first master playlist request/response triggers the "Attempt" beacon and subsequent master playlist requests are ignored from a beaconing standpoint. The first media playlist request/response triggers the 'Play Started' beacon and all subsequent media playlist requests are ignored from a beaconing standpoint. The first media segment request/response after M seconds (where M is configurable; M might be for example 270 seconds) triggers the "Playing" beacon and all subsequent media segment requests are ignored from a beaconing standpoint for the next M seconds. The process of beaconing every M or more seconds for each stream continues until the stream is stopped and no additional requests are being made.

It is emphasized that a variety of beacon types can be triggered at different points in the request flow, still leveraging the teachings hereof, and the teachings hereof are accordingly not limited to any particular beacon type or beacon timing. Typically the specific beacon types will be driven by the particular implementation and design goals. Other beacon types might include: an error beacon (generated and sent by the server 302, for example, when the requested content was not available or caused an error of some sort at the server 302 or at the source 304 as a result of the forward request), a bitrate beacon (generated and sent by the server 302, for example, when the client changes the bitrate of the stream, for example by requesting a media playlist for a different bitrate or media segments of a different bitrate than before, due to adaptive bitrate streaming logic), or a heartbeat beacon (generated and sent by the server 302, for example, in place of Playing beacons but with reduced data payload to lighten downstream system processing burdens). These are merely examples.

Furthermore, the beaconing timing will vary with the particular streaming protocol. For example, in protocols having a single playlist or manifest (such as HDS, Smooth Streaming, etc.), the server 302 can set cookie(s) upon receiving a request for the playlist/manifest, and

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send a "Play Attempt" beacon. As requests for the segments are received with the cookies, the server 302 can send a "Play" beacon, and update the state information in the cookies. The first request for a segment might result in a "Play Started" beacon instead of a "Play" beacon – but again, the particular beacons will vary.

System Workflow

FIG. 4 illustrates the message sequence amongst a client device 301, the content server 302, and the analytics machine 306 in the current embodiment.

The sequence begins with the client device 301 sending a request for a master playlist to the server 302. Assume that the client device 301 does not have a CLIENT_VIEWER_COOKIE or CLIENT_SESSION_COOKIE set. The receipt of the master playlist request triggers the server 302 to send a beacon to the analytics machine 306 with certain information, such as a stream identifier, and an indication that there has been an "Attempt" at playing the stream. (A more detailed list of potential information is in the Beacon section of this document, below.) The server 302 serves the master playlist and sets the cookies, CLIENT_VIEWER_COOKIE and CLIENT_SESSION_COOKIE. The server's 302 retrieval of the playlist file itself, e.g., from local cache or a source 304, is not shown in FIG. 4 but it would also occur. Note that the specific timing of sending the beacon is merely illustrative – it could occur before or after retrieving and serving the requested content, as required by a particular design implementation. It some embodiments, the beacons can include server 302 performance information (such as start/end timestamps or time deltas indicating how long it took the server 302 to respond to the client's request), in which case the server 302 should be configured to send the beacon after sending the response. In other embodiments, the "Attempt" or "Play Started" beacons could even be retained until the media segments were requested, and then sent, so as to avoid sending the beacons if the client aborts the streaming process.

Continuing the sequence shown in FIG. 4, the client device 301 sends a request for a media playlist that appeared on the master playlist. The CLIENT_VIEWER_COOKIE and CLIENT_SESSION_COOKIE are received with this request and, based on the fact that a media playlist request is being made, the information in the media playlist request, and/or information in the cookies, the server 302 generates another beacon to the analytics machine 306. In this example, it sends a beacon indicating "Play Started." As before, the beacon may

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contain information from the request and/or cookies. The server 302 updates the CLIENT_SESSION_COOKIE (e.g., with a new timestamp and/or new status indicating that the media playlist had been requested) and sets the updated cookie on the client device, along with serving the requested media playlist.

Note that in some situations or with some protocols, a client device might simply begin by requesting a non-master playlist (in the context of HLS, this would represent a media playlist without an initial request for a master playlist, in the context of HDS, it would represent a manifest request). The logic of the server 302 can accommodate this scenario. The server 302 can set a CLIENT_VIEWER_COOKIE and CLIENT_SESSION_COOKIE, and can send an "Attempt" and/or "Play Started" beacon as a result of such as non-master playlist request.

Next, the client device 301 sends a request for an actual media segment file (such as a .ts file). The server 302 receives this request along with the CLIENT_VIEWER_COOKIE and CLIENT_SESSION_COOKIE. The request for the media segment triggers the server 302 to send a "Playing" beacon to the analytics machine 306. As before, the beacon may contain information from the request and/or cookies. The cookies are updated to reflect the new status, and the media segment is served to the client device 301. Subsequently a client device requests other media segments, as it is now playing the stream. To avoid overloading the analytics machine 306, the server 302 is configured (in this example) to send the "Playing" beacon no more than every N seconds, which is a configurable value. Thus the server 302 examines the CLIENT_SESSION_COOKIE sent with the media segment request, and based on the timestamp, the server 302 determines whether to send a new "Playing" beacon.

Also shown in FIG. 4 is a second request for a media playlist, e.g., which is intended to illustrate that the client might request a mix of media playlists and/or media segments as the stream is playing. For example, a client may need to switch to another media playlist because it needs to change bitrate (due to an adaptive bitrate streaming decision that the current bandwidth is suboptimal). The server 302 can be configured to track such media playlist changes and beacon accordingly, ignore such subsequent media playlist requests, or alternatively could examine them and check the timestamp, and send a "Playing" beacon if the timestamp is less than N seconds (a configurable value). Implementations will vary.

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At some point, the client device 301 stops sending requests for media segments, and the server 302 stops sending "Playing" beacons. This may be because the user has stopped the stream, the user has paused the stream, or the stream is finished.

In this embodiment, the end of the stream is not marked by a beacon from the server 302. The analytics machine 306 or other downstream processing can be configured to treat the end of the beacons as the end of the stream (e.g., after some time T it is assumed that the stream is over). To separate the stopping or pausing of a stream from the normal end of the stream, the server 302 could be configured to send a "Finished" beacon when the client requests a media segment that is known to be the last media segment in a media playlist.

FIG. 5 shows an embodiment of logical flow within a server 302. Not all logic with respect to responding to a client request is shown, but rather certain logical flow useful to illustrate the beaconing process. This process flow starts when the server 302 receives a request (e.g., an HTTP 'Get') from a client device (500). The server 302 checks whether the client device 300 has a CLIENT_VIEWER_COOKIE (504), and if not, generates and sets the CLIENT_VIEWER_COOKIE on the client, e.g., using the hash approach describe earlier (506). If it is present, the server 302 extracts relevant data such as the viewer id from the CLIENT_VIEWER_COOKIE. The server 302 then checks for a CLIENT_SESSION_COOKIE – if there is none, then the server 302 generates and sets a CLIENT_SESSION_COOKIE on the client (508). The server 302 then sends an "Attempt" beacon. It is assumed in this flow that if there is no CLIENT_SESSION_COOKIE, then it is an initial request which is reflected as an "Attempt" (presumably the request is for a master playlist, but it could be for a media playlist).

Continuing with FIG. 5, if the CLIENT_SESSION_COOKIE is present, the server 302 extracts relevant data such as the session id. The server 302 checks to see what the client is requesting. If the request is for a master playlist (510), the server 302 checks the time stamp from the CLIENT_SESSION_COOKIE (512). If the timestamp is less than M seconds, then this is treated as part of a prior streaming session for which the master playlist is merely being re-requested, so another "Attempt" beacon is not sent. If the timestamp is more than M seconds old (where M is configurable; it might be, e.g., 300 seconds, as noted above), then the request is treated as a new stream request so the CLIENT_SESSION_COOKIE is reset with a new session identifier and the "Attempt" beacon is sent (514, 516).

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A request for a media playlist (518) causes the server 302 to check the status stored in the CLIENT_SESSION_COOKIE (520). If the status is not in the 'playing' state, then the server 302 updates the CLIENT_SESSION_COOKIE with a new timestamp and sets the status to 'Playing' (522). The server 302 sends the "Play Started" beacon (524). If the status is in the 'Playing' state, then the media playlist request is treated as a re-request of a media playlist. As mentioned previously, this kind of request could be ignored from a beaconing standpoint, or examined depending on the particular implementation.

A request for a media segment (516) results in the server 302 checking the timestamp of the CLIENT_SESSION_COOKIE to see if it is more than N seconds old (configurable value) (528). As noted above, the value N prevents the server 302 from sending "Playing" beacons too frequently. Hence, if the timestamp is less than N seconds old, the server 302 does not send a beacon. If the timestamp is more than N second old, then the server 302 updates the timestamp in the CLIENT_SESSION_COOKIE to the current time, and then sends a "Playing" beacon (530, 532).

Exemplary Pseudo-Code

The following pseudo-code describes the server 502 operation shown in the example of FIG. 5.

```
Request Handling Configuration

   1. Detect whether the client request is for master playlist
   2. If CLIENT_VIEWER_COOKIE cookie is not preset
        a. Compute the client ID hash based on client IP and
           random string
        b. Set CLIENT_VIEWER_COOKIE downstream
   3. If CLIENT_VIEWER_COOKIE cookie is present
        a. Extract client ID from the cookie
   4. If CLIENT_SESSION_COOKIE cookie is not present
        a. Generate session ID using CLIENT_VIEWER_ID and
           SERVER_CURRENT_TIME hash
        b. Set downstream cookie CLIENT_SESSION_COOKIE with
           session ID
        c. Initialize A_VALUE to I
   5. If CLIENT_SESSION_COOKIE cookie is present
        a. Extract the time from CLIENT_SESSION_COOKIE
        b. If the request is for master playlist
```


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1. If time in the CLIENT_SESSION_COOKIE is over M seconds old
    a. Set A_VALUE to I
    b. Reset CLIENT_SESSION_COOKIE with updated timestamp (current time)
2. If the request file name is different than the master playlist name inside the CLIENT_SESSION_COOKIE
    a. Set A_VALUE to I
    b. Reset CLIENT_SESSION_COOKIE with new master playlist and updated timestamp (current time)

c. If the request is for media playlist
1. If CLIENT_SESSION_COOKIE is NOT in PLAYING state
    a. Set A_VALUE to S
    b. Reset CLIENT_SESSION_COOKIE with update timestamp and set the state to "p"
2. If CLIENT_SESSION_COOKIE is in PLAYING state
    a. Ignore this additional request for media playlist

d. If the request is for media segment
1. Extract stream bitrate of the request
2. If CLIENT_SESSION_COOKIE is in PLAYING state
    a. If the session time is over N seconds
        i. Set A_VALUE to P
    b. Set down stream CLIENT_SESSION_COOKIE with updated time

Beacon-generating configuration

1. Extract and construct event name, device types, application names, stream name, device type, application name, user location, timestamp, etc., or other information derived from the URL or HTTP request to create key-value pairs to be inserted into appropriate beacon.
2. If A_VALUE is I
    a. Send I beacon // ["Attempt" beacon]
3. If A_VALUE is S
    a. Send S beacon // ["Play Started" beacon]

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```
4. If A_VALUE is P
     a. Send P beacon // ["Playing" beacon]
```

It should be understood that the particular beaconing logic and flow described above is one example only. As mentioned before, the times and circumstances at which a beacon is generated is usually dependent on particular design goals and implementations, and on the protocol (HLS, HDS, Smooth Streaming) which is being targeted. In some cases, it may make sense to send only subset of the beacons described above, or to supply beacons only triggered by media segment requests, or to adopt some other variant of the examples given above (including sending other/additional types of beacons as taught herein).

Cookies & Beacons

The following table provides an example implementation of the cookies mentioned in the description above.

Cookie Name	Type	Attributes
CLIENT_VIEWER_ID	Persistent	CLIENT_VIEWER_ID – Unique ID assign for each client
CLIENT_SESSION_COOKIE	Session	Sid - Unique ID assign for each session Timestamp – timestamp of last cookie update Master – Name of the master playlist associated with this session Status – Status of the session (e.g., Attempt, Play Started, Playing, Bitrate shift, Error, and so on)

The following table provides an example of the contents of the beacon messages that can be sent by the server 302 to the analytics machine 306.

Beacon Types	Description	Attributes
I	Initiate/Attempt	beacon_id=I b=[Analytics Report ID] s=0 [Sequence Number] en=[Event Name] tt=[Stream Title] ac=[Requested File Name]

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		sa=[Device Type] d=[Client Viewer ID] c=[Client Session ID] al=[Application Type] cg=[User Agent] geo=[geographic location/country code derived from request]
S	Play Started	beacon_id =S b=[Analytics Report ID] s=1 [Sequence Number] en=[Stream Title] tt=[Stream Title] ac=[Master Playlist Name] sa=[Device Buckets] d=[Client Viewer ID] c=[Client Session ID] al=[Application Bucket] cg=[User Agent]
P	Playing	beacon_id =P b=[Analytics Report ID] s=2 [Sequence Number] en=[Stream Title] tt=[Stream Title] ac=[Master Playlist Name] sa=[Device Buckets] d=[Client Viewer ID] c=[Client Session ID] rb=[Requested Bitrate] al=[Application Bucket] cg=[User Agent] tt=[Stream Title] ac=[Request File Name] cg=[User Agent]

The user agent is an HTTP header that the server 302 can extract from the client request. The user agent string contains information about the client machine and the application that is sending the request. The server 302 can read the user-agent to determine the device and/or application and then place these into predefined categories (e.g., "device type" or "application type") for the back-end analytics system to use.

For example, the server 302 can map the client request into hardware device buckets representing particular manufacturers, particular models, or device families, or based on operating system, or other categorization of the machine requesting the content. For application types, the server 302 can map the client request into application buckets representing particular players, whether a dedicated media player or a browser, etc.,

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browsers, media frameworks, particular application developers/companies, or other aspect of the application that is requesting the content.

Examples of Metrics For Reporting/Analytics

The analytics machine 306 and associated processing systems 308, 310 aggregate and process the beacon messages from servers 302 to prepare reports, graphs, charts, and other user displays for the delivered media streams. Based on the beacon data, the system can prepare and display metrics such as:

a. Audience Size
b. Plays
c. Play Duration
d. Audience Size
e. Plays
f. Play Duration
g. Unique Viewers
h. Bitrate Plays - ability to see distribution of requested bitrates, as well as data indicating bitrate upshifts/downshifts, errors, and the like
i. Time
j. Event Name
k. Stream Name (master playlist)
l. Device Type
m. Application Type
n. Other things like network or internet service provider (ISP) where the server 302 is located
o. Geography – down to region/state level
p. Other custom defined dimensions

Computer Based Implementation

The client devices, servers, and other computer apparatus described herein may be implemented with conventional computer systems, as modified by the teachings hereof, with the functional characteristics described above realized in special-purpose hardware, general-purpose hardware configured by software stored therein for special purposes, or a combination thereof.

Software may include one or several discrete programs. A given function may comprise part of any given module, process, execution thread, or other such programming construct.

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Generalizing, each function described above may be implemented as computer code, namely, as a set of computer instructions, executable in one or more microprocessors to provide a special purpose machine. The code may be executed using conventional apparatus – such as a microprocessor in a computer, digital data processing device, or other computing apparatus – as modified by the teachings hereof. In one embodiment, such software may be implemented in a programming language that runs in conjunction with a proxy on a standard Intel hardware platform running an operating system such as Linux. The functionality may be built into the proxy code, or it may be executed as an adjunct to that code.

While in some cases above a particular order of operations performed by certain embodiments is set forth, it should be understood that such order is exemplary and that they may be performed in a different order, combined, or the like. Moreover, some of the functions may be combined or shared in given instructions, program sequences, code portions, and the like. References in the specification to a given embodiment indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic.

FIG. 6 is a block diagram that illustrates hardware in a computer system 600 in which embodiments of the invention may be implemented. The computer system 600 may be embodied in a client, server, personal computer, workstation, tablet computer, wireless device, mobile device, network device, router, hub, gateway, or other device.

Computer system 600 includes a microprocessor 604 coupled to bus 601. In some systems, multiple microprocessor and/or microprocessor cores may be employed. Computer system 600 further includes a main memory 610, such as a random access memory (RAM) or other storage device, coupled to the bus 601 for storing information and instructions to be executed by microprocessor 604. A read only memory (ROM) 608 is coupled to the bus 601 for storing information and instructions for microprocessor 604. As another form of memory, a non-volatile storage device 606, such as a magnetic disk, solid state memory (e.g., flash memory), or optical disk, is provided and coupled to bus 601 for storing information and instructions. Other application-specific integrated circuits (ASICs), field programmable gate arrays (FPGAs) or circuitry may be included in the computer system 600 to perform functions described herein.

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Although the computer system 600 is often managed remotely via a communication interface 616, for local administration purposes the system 600 may have a peripheral interface 612 communicatively couples computer system 600 to a user display 614 that displays the output of software executing on the computer system, and an input device 615 (e.g., a keyboard, mouse, trackpad, touchscreen) that communicates user input and instructions to the computer system 600. The peripheral interface 612 may include interface circuitry and logic for local buses such as Universal Serial Bus (USB) or other communication links.

Computer system 600 is coupled to a communication interface 616 that provides a link between the system bus 601 and an external communication link. The communication interface 616 provides a network link 618. The communication interface 616 may represent an Ethernet or other network interface card (NIC), a wireless interface, modem, an optical interface, or other kind of input/output interface.

Network link 618 provides data communication through one or more networks to other devices. Such devices include other computer systems that are part of a local area network (LAN) 626. Furthermore, the network link 618 provides a link, via an internet service provider (ISP) 620, to the Internet 622. In turn, the Internet 622 may provide a link to other computing systems such as a remote server 630 and/or a remote client 631. Network link 618 and such networks may transmit data using packet-switched, circuit-switched, or other data-transmission approaches.

In operation, the computer system 600 may implement the functionality described herein as a result of the microprocessor executing code. Such code may be read from or stored on a non-transitory computer-readable medium, such as memory 610, ROM 608, or storage device 606. Other forms of non-transitory computer-readable media include disks, tapes, magnetic media, CD-ROMs, optical media, RAM, PROM, EPROM, and EEPROM. Any other non-transitory computer-readable medium may be employed. Executing code may also be read from network link 618 (e.g., following storage in an interface buffer, local memory, or other circuitry).

The client device may be a conventional desktop, laptop or other Internet-accessible machine running a web browser or other rendering engine, but as mentioned above the client may also be a mobile device. Any wireless client device may be utilized, e.g., a cellphone, pager, a personal digital assistant (PDA, e.g., with GPRS NIC), a mobile computer with a smartphone

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client, tablet or the like. Other mobile devices in which the technique may be practiced include any access protocol- enabled device (e.g., iOS™-based device, an Android™-based device, other mobile-OS based device, or the like) that is capable of sending and receiving data in a wireless manner using a wireless protocol. Typical wireless protocols include: WiFi, GSM/GPRS, CDMA or WiMax. These protocols implement the ISO/OSI Physical and Data Link layers (Layers 1 & 2) upon which a traditional networking stack is built, complete with IP, TCP, SSL/TLS and HTTP. The WAP (wireless access protocol) also provides a set of network communication layers (e.g., WDP, WTLS, WTP) and corresponding functionality used with GSM and CDMA wireless networks, among others.

In a representative embodiment, the mobile device is a cellular telephone that operates over GPRS (General Packet Radio Service), which is a data technology for GSM networks. Generalizing, a mobile device as used herein is a 3G- (or next generation) compliant device that includes a subscriber identity module (SIM), which is a smart card that carries subscriber-specific information, mobile equipment (e.g., radio and associated signal processing devices), a man-machine interface (MMI), and one or more interfaces to external devices (e.g., computers, PDAs, and the like). The techniques disclosed herein are not limited for use with a mobile device that uses a particular access protocol. The mobile device typically also has support for wireless local area network (WLAN) technologies, such as Wi-Fi. WLAN is based on IEEE 802.11 standards. The teachings disclosed herein are not limited to any particular mode or application layer for mobile device communications.

It should be understood that the foregoing has presented certain embodiments of the invention that should not be construed as limiting. For example, certain language, syntax, and instructions have been presented above for illustrative purposes, and they should not be construed as limiting. It is contemplated that those skilled in the art will recognize other possible implementations in view of this disclosure and in accordance with its scope and spirit. The appended claims define the subject matter for which protection is sought.

It is noted that trademarks appearing herein are the property of their respective owners and used for identification and descriptive purposes only, given the nature of the subject matter at issue, and not to imply endorsement or affiliation in any way.

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CLAIMS

1. A computer-implemented method for monitoring delivery of a content stream having a plurality of segments, comprising:

with at least one server that has a microprocessor coupled to a storage device storing computer-readable instructions for execution by the microprocessor:

receiving a first client request for a first playlist of a content stream, the first playlist referencing one or more second playlists;

generating and setting first state information on the client device;

receiving a second client request for a second playlist of a content stream, the second playlist referencing one or more segments in the content stream;

receiving the first state information from the client device with the second client request, updating the first state information to create second state information, and setting the second state information on the client device;

receiving a third client request for a particular segment on the second playlist;

receiving the second state information from the client device with the third client request;

generating a message in response to at least one of (i) the first client request; (ii) the second client request with the first state information, and (iii) the third client request with the second state information;

sending the message to a remote machine;

wherein the message comprises an identifier of the content stream.

2. The method of claim 1, wherein updating the first state information comprises updating any of a timestamp and a playback status.

3. The method of claim 1, wherein the message comprises at least one of: a client identifier, a user identifier, and a playback status.

4. The method of claim 1, wherein the at least one server generates a message in response to (i) the first client request, generates a second message in response to (ii) the second client request with the first state information, and generates a third message in response to (iii) the

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third client request with the second state information, wherein each of the messages (i) (ii) and (iii) comprise an identifier of the content stream.

5. The method of claim 1, wherein the first state information comprises information stored in one or more cookies, and the second state information comprises updated information stored in the one or more cookies.

6. The method of claim 1, wherein the content stream comprises a media stream.

7. The method of claim 1, wherein the first, second and third client requests are each HTTP requests.

8. A computer-implemented method for monitoring delivery of a content stream having a plurality of segments, comprising:

with at least one server that has a microprocessor and a storage device storing computer-readable instructions for execution by the microprocessor:

receiving a first client request for a file associated with a content stream, the file being any of a playlist referencing one or more segments in the content stream and a manifest referencing one or more segments in the content stream;

generating and setting first state information on the client device;

receiving a second client request for a particular segment referenced in the file;

receiving the first state information from the client device with the second client request;

generating a message in response to at least one of (i) the first client request, and (ii) the second client request with the first state information;

sending the message to a remote machine;

wherein the message comprises an identifier of the content stream.

9. The method of claim 8, further comprising, with the at least one server,

upon receipt of the first state information with the second client request, updating the first state information to create second state information; and,

setting the second state information on the client device.

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10. The method of claim 9, wherein updating the first state information comprises updating any of a timestamp and a playback status.

11. The method of claim 8, wherein the message comprises at least one of: a client identifier, a user identifier, and a playback status.

12. The method of claim 8, wherein the at least one server generates a message in response to (i) the first client request, and generates another message in response to (ii) the second client request with the first state information, wherein each of the messages comprise an identifier of the stream.

13. The method of claim 8, wherein the first state information comprises information stored in one or more cookies.

14. The method of claim 8, wherein the content stream comprises a media stream.

15. The method of claim 8, wherein the first and second client requests are each HTTP requests.

16. A computer-implemented method for monitoring delivery of a content stream having a plurality of segments, comprising:

with at least one server that has a microprocessor and a storage device storing computer-readable instructions for execution by the microprocessor:

receiving a first client request for a first segment of a content stream;

receiving first state information from the client device with the first client request, updating the first state information to create second state information, and setting the second state information on the client device;

receiving a second client request for a second segment of the content stream;

receiving the second state information from the client device with the second client request;

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generating a message in response to at least one of (i) the first state information and the first client request with the first state information, and (ii) the second client request with the second state information;

sending the message to a remote machine;

wherein the message comprises an identifier of the stream.

17. The method of claim 16, wherein updating the first state information comprises updating any of a timestamp and a playback status.

18. The method of claim 16, wherein the message comprises at least one of: a client identifier, a user identifier, and a playback status.

19. The method of claim 16, wherein the at least one server generates a message in response to (i) the first client request with the first state information, and generates another message in response to (ii) the second client request with the second state information, wherein each of the messages comprise an identifier of the content stream.

20. The method of claim 16, wherein the first state information comprises information stored in one or more cookies, and the second state information comprises updated information stored in the one or more cookies.

21. The method of claim 16, wherein the content stream comprises a media stream.

22. The method of claim 16, wherein the first and second client requests are each HTTP requests.

23. A computer-implemented method for monitoring delivery of a content stream having a plurality of segments, comprising:

with at least one server that has a microprocessor and a storage device storing computer-readable instructions for execution by the microprocessor:

receiving a first client request for a first segment of a content stream;

generating and setting first state information on the client device;

receiving a second client request for a second segment of the content stream;

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receiving the first state information from the client device with the second client request, updating the first state information to create second state information, and setting the second state information on the client device;

generating a message in response to at least one of (i) the first client request, and (ii) the second client request with the first state information;

sending the message to a remote machine;

wherein the message comprises an identifier of the stream.

24. The method of claim 23, wherein updating the first state information comprises updating any of a timestamp and a playback status.

25. The method of claim 23, wherein the message comprises at least one of: a client identifier, a user identifier, and a playback status.

26. The method of claim 23, wherein the at least one server generates a message in response to (i) the first client request, and generates another message in response to (ii) the second client request with the first state information, wherein each of the messages comprise an identifier of the content stream.

27. The method of claim 23, wherein the first state information comprises information stored in one or more cookies, and the second state information comprises updated information stored in the one or more cookies.

28. The method of claim 23, wherein the content stream comprises a media stream.

29. The method of claim 23, wherein the first and second client requests are each HTTP requests.

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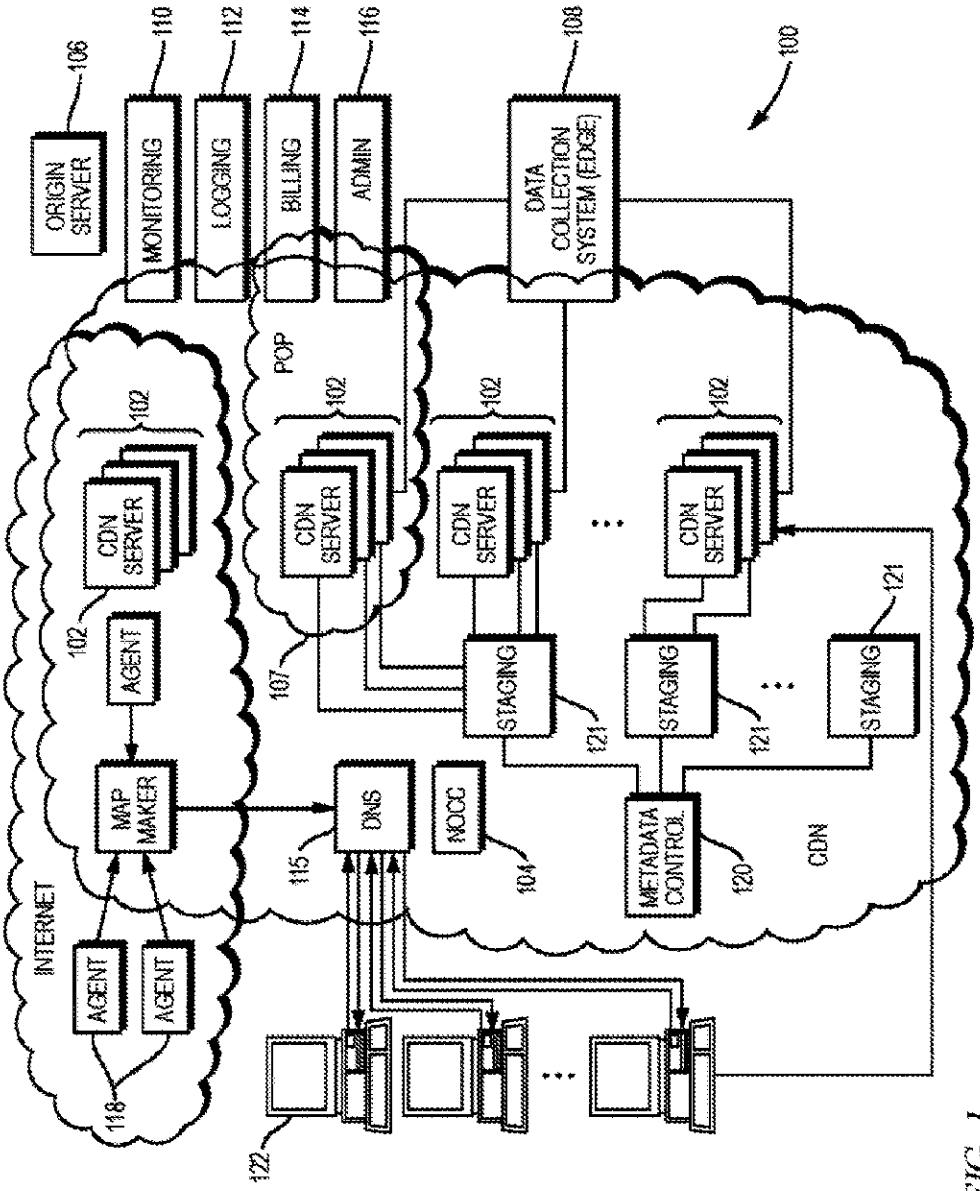

100
106
ORIGIN SERVER
110
MONITORING
112
LOGGING
114
BILLING
116
ADMIN
108
DATA COLLECTION SYSTEM (EDGE)
POP
102
CDN SERVER
AGENT
MAP MAKER
DNS
115
MDOC
104
STAGING
121
METADATA CONTROL
120
CDN
INTERNET
118
122
107

FIG. 1

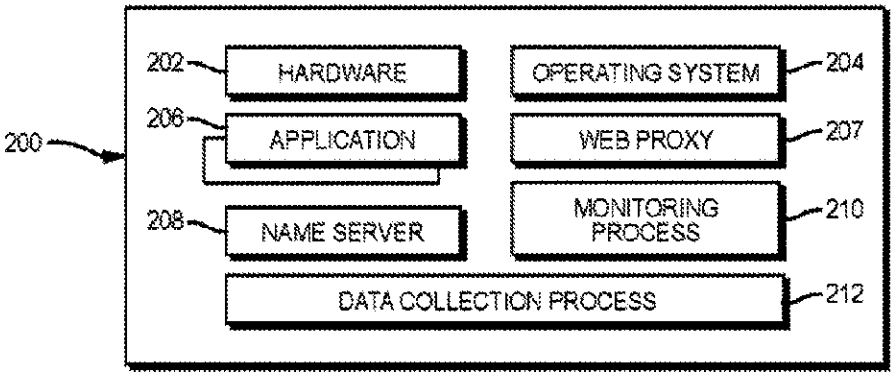

200
202
HARDWARE
204
OPERATING SYSTEM
206
APPLICATION
207
WEB PROXY
208
NAME SERVER
210
MONITORING PROCESS
212
DATA COLLECTION PROCESS

FIG. 2

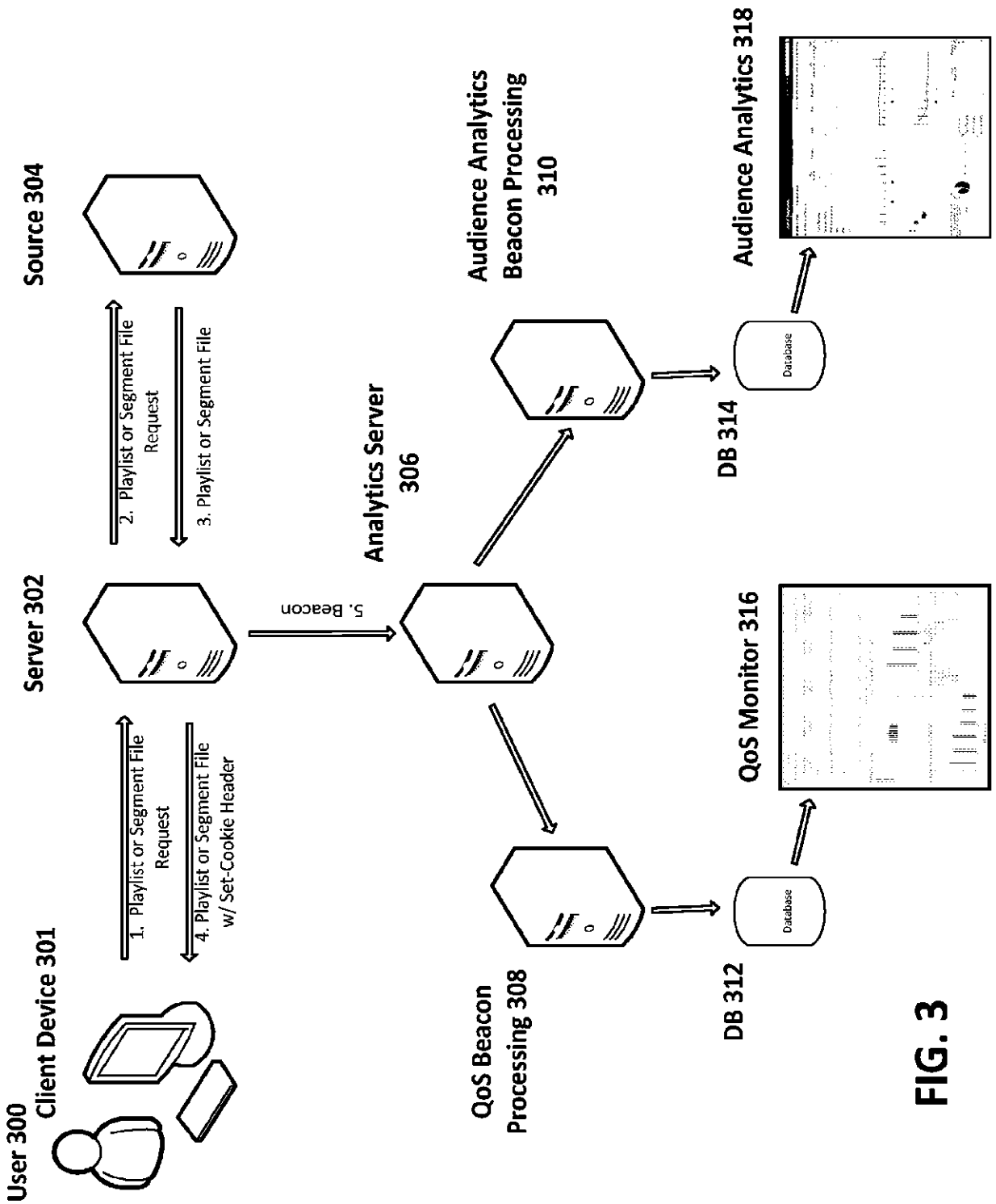

User 300
Client Device 301
Server 302
Source 304
Analytics Server 306
QoS Beacon Processing 308
Audience Analytics Beacon Processing 310
DB 312
DB 314
QoS Monitor 316
Audience Analytics 318
1. Playlist or Segment File Request
2. Playlist or Segment File Request
3. Playlist or Segment File
4. Playlist or Segment File w/ Set-Cookie Header
5. Beacon
Database
Database

FIG. 3

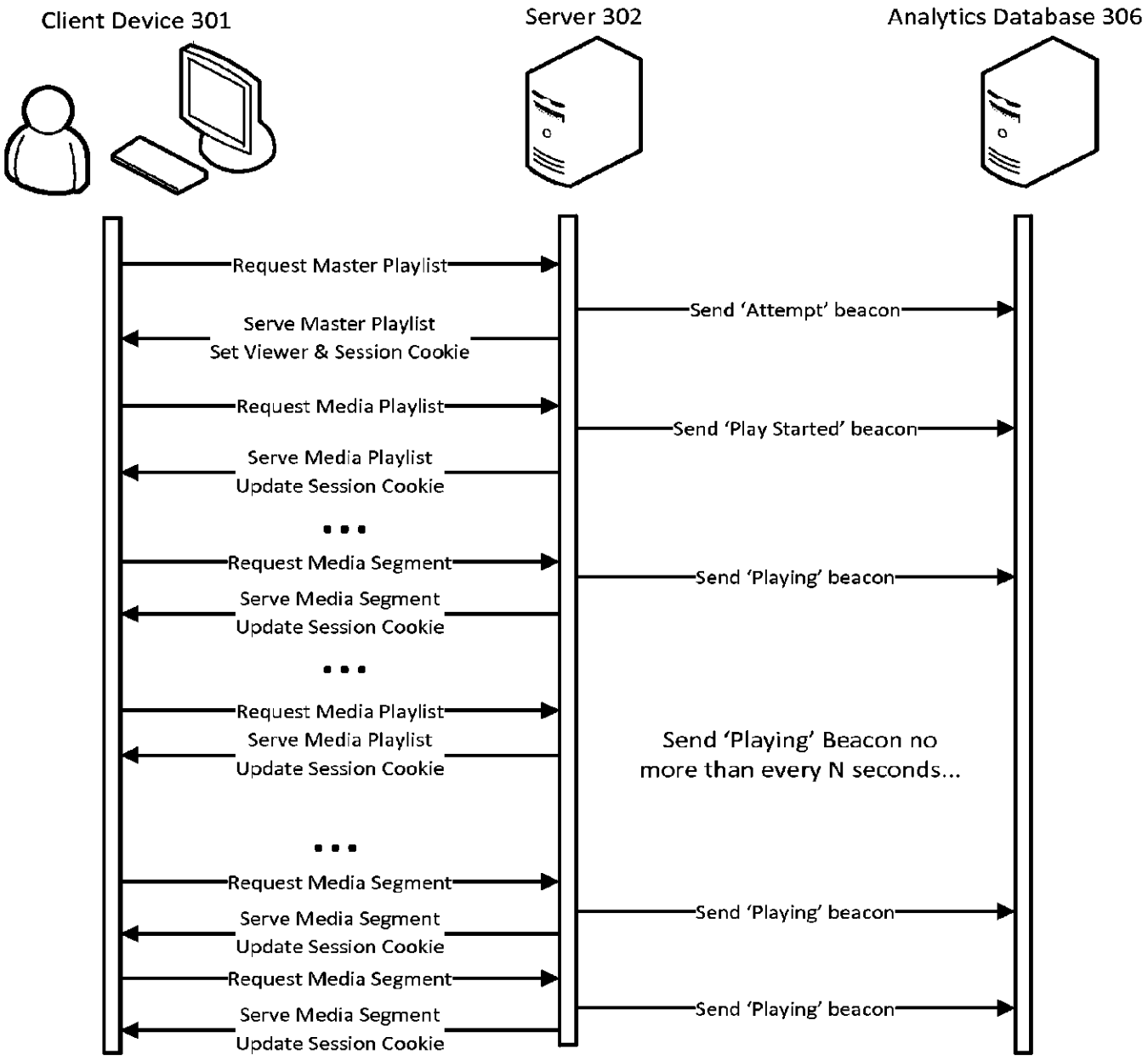
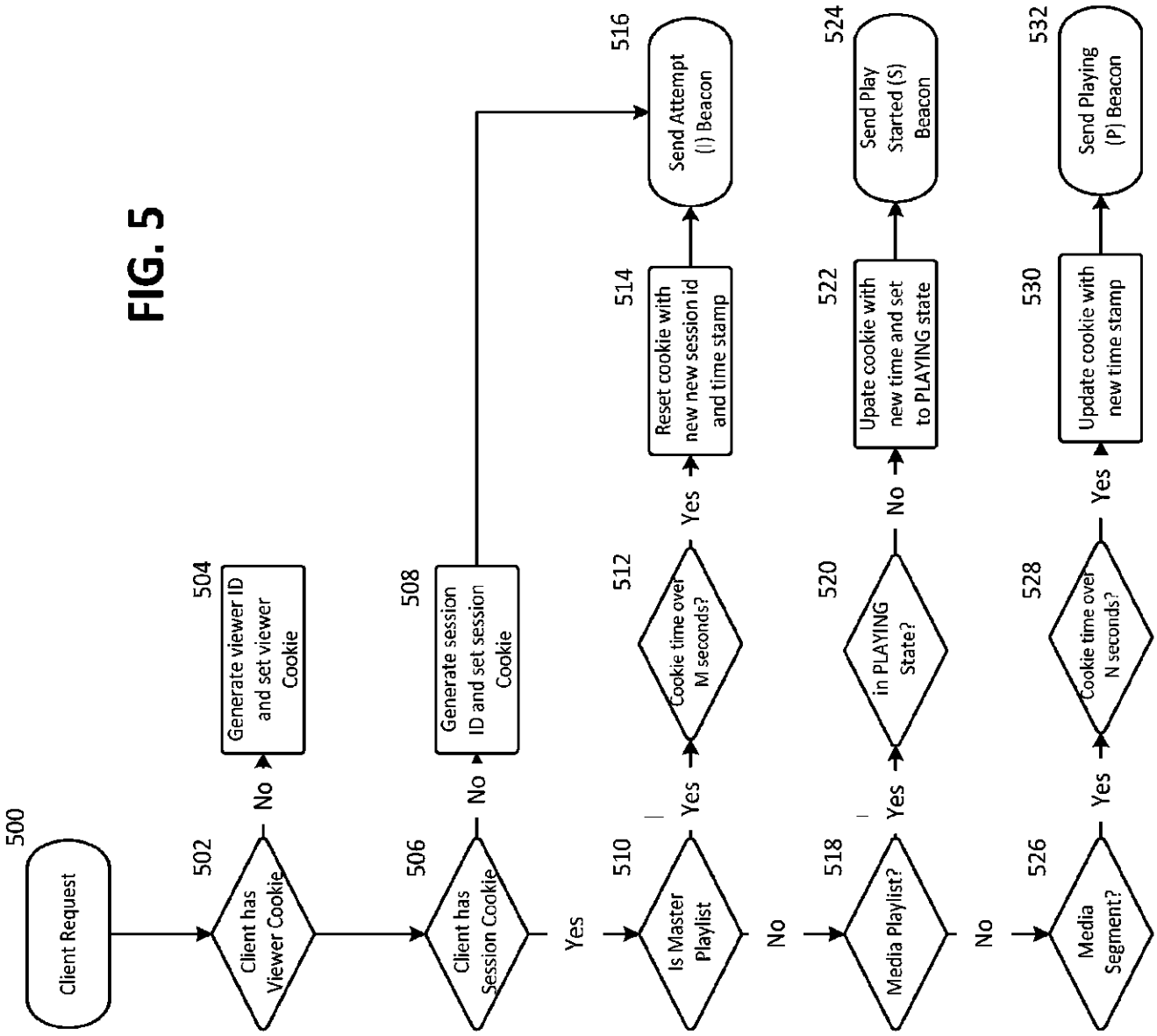

Client Device 301
Server 302
Analytics Database 306
Request Master Playlist
Serve Master Playlist
Set Viewer & Session Cookie
Request Media Playlist
Serve Media Playlist
Update Session Cookie
Request Media Segment
Serve Media Segment
Update Session Cookie
Request Media Playlist
Serve Media Playlist
Update Session Cookie
Request Media Segment
Serve Media Segment
Update Session Cookie
Request Media Segment
Serve Media Segment
Update Session Cookie
Send 'Attempt' beacon
Send 'Play Started' beacon
Send 'Playing' beacon
Send 'Playing' Beacon no more than every N seconds...
Send 'Playing' beacon
Send 'Playing' beacon

FIG. 4

FIG. 5


500
Client Request
502
Client has Viewer Cookie
No
504
Generate viewer ID and set viewer Cookie
Yes
506
Client has Session Cookie
No
508
Generate session ID and set session Cookie
Yes
510
Is Master Playlist
Yes
512
Cookie time over M seconds?
Yes
514
Reset cookie with new new session id and time stamp
516
Send Attempt (|) Beacon
No
518
Media Playlist?
Yes
520
in PLAYING State?
No
522
Upate cookie with new time and set to PLAYING state
524
Send Play Started (S) Beacon
No
526
Media Segment?
Yes
528
Cookie time over N seconds?
Yes
530
Update cookie with new time stamp
532
Send Playing (P) Beacon

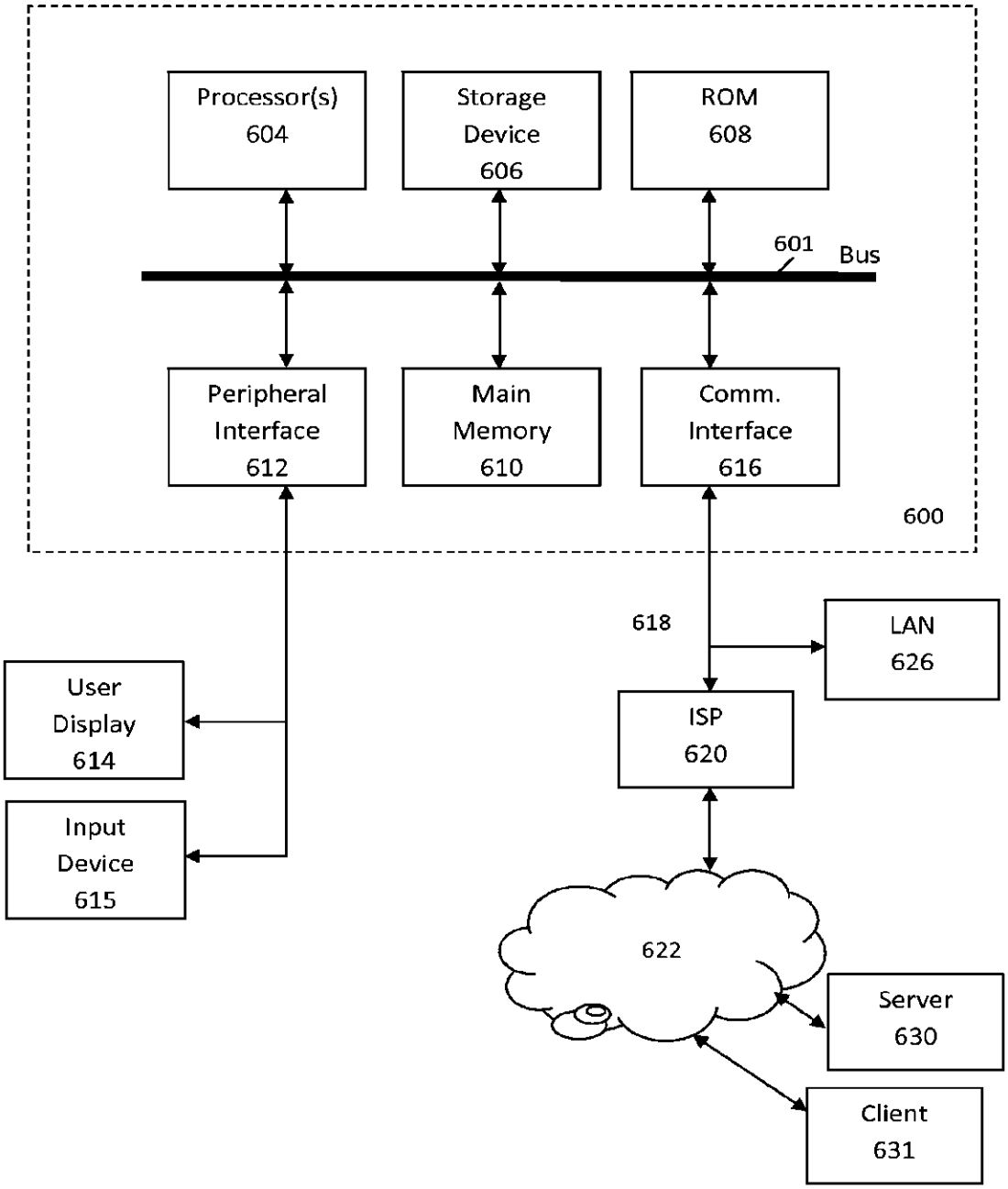

Processor(s)
604
Storage
Device
606
ROM
608
601
Bus
Peripheral
Interface
612
Main
Memory
610
Comm.
Interface
616
600
618
LAN
626
User
Display
614
ISP
620
Input
Device
615
622
Server
630
Client
631

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/053241

A. CLASSIFICATION OF SUBJECT MATTER

H04N 21/2387(2011.01)i, H04N 21/475(2011.01)i, H04N 21/472(2011.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N 21/2387; G06F 15/16; H04L 29/08; G06F 17/60; H04L 29/06; H04N 21/475; H04N 21/472

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: content stream, delivery, monitor, playlist, client, request, state information, identifier, and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2013-0173819 A1 (HSIN-HUA LEE et al.) 04 July 2013 See paragraphs [0099], [0117]-[0119]; figures 8-9; and claims 1, 20.	1-29
A	US 2013-0110916 A1 (SWAMINATHAN SIVASUBRAMANIAN et al.) 02 May 2013 See paragraph [0054]; figure 9; and claim 5.	1-29
A	US 2005-0216572 A1 (MICHAEL MAN-HAK TSO et al.) 29 September 2005 See paragraphs [0025]-[0028].	1-29
A	US 2013-0097312 A1 (MAINAK MAZUMDAR et al.) 18 April 2013 See paragraphs [0107]-[0119]; and figure 9.	1-29
A	US 2007-0143493 A1 (RICHARD MONTGOMERY MULLING et al.) 21 June 2007 See paragraphs [0039]-[0049]; and figures 1-3.	1-29

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2014 (15.12.2014)	**15 December 2014 (15.12.2014)**

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International Application Division
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Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2014/053241

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		WO 2009-124011 A3	30/12/2009
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		US 8713168 B2	29/04/2014
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		WO 2012-040371 A1	29/03/2012
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2014/053241

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		WO 2007-064987 A3	29/05/2008

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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 597 869 A1

(12) EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

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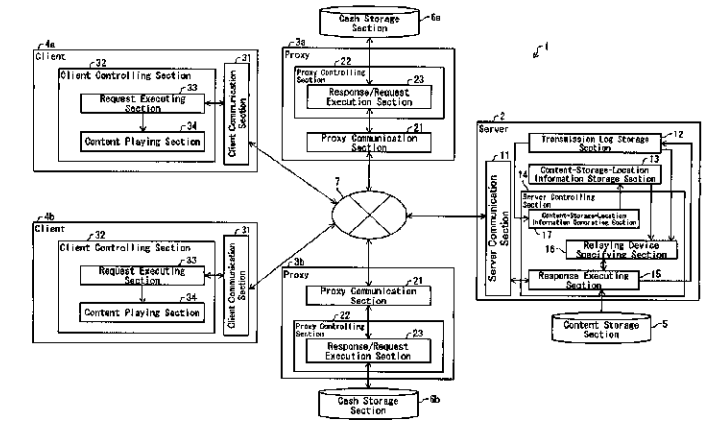
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(54) CONTENT DISTRIBUTION DEVICE, CONTENT PLAYBACK DEVICE, CONTENT DISTRIBUTION SYSTEM, METHOD FOR CONTROLLING A CONTENT DISTRIBUTION DEVICE, CONTROL PROGRAM, AND RECORDING MEDIUM

(57) A content distributing device in the present invention receives a request message to request to transmit content. Then, in a case where a device transmitted the request message is a relaying device for receiving the content thus requested and possessing and transferring the content to another device, the content distributing device transmits the content thus requested to the relaying device, or, in a case where a device transmitted the request message is a content playing device for playing the content thus requested, the content distributing device transmits, to the content playing device, an instruction to acquire the content from a relaying device which has transmitted before the content thus requested.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to a content distribution service in which a server distributes content to the client in response to a request from a client for playing the content.

Background Art

[0002] There has been conventionally and widely used techniques for providing content, such as moving images, via communication networks. Examples of the techniques encompass a video on demand (VOD) service in which a request is transmitted from a client which plays content and, in response to the request, the content is distributed to the client from a server which manages the content. In the content distribution services such as the VOD, content is provided to clients by means of a streaming method, a download method, or a progressive download method.

[0003] The following Patent Literature 1 discloses an example where a content distribution service is provided by means of the progressive download method. The Patent Literature 1 discloses a content distribution service system in which a request for content is transmitted to a server from a client with use of HTTP and the client plays the content in response to the request.

Citation List

Patent Literature

[0004]

Patent Literature 1: Japanese Patent Application Publication, Tokukai, No. 2005-110244 A(Publication Date: April 21, 2005)

Summary of Invention

Technical Problem

[0005] Whatever method (the streaming method, the download method, or the progressive download method) is used, it is necessary to continuously transfer a great amount of data to a client from a server in a case where a content distribution service is provided, specifically, different kinds of content are distributed to a plurality of clients. When the number of clients increases and a load of a network, which is used to transmit the data from the server, and a load of the server exceed their limits, the data transfer is, for example, delayed. This decreases quality of the content distribution service.

[0006] The present invention has been made in view of the aforementioned problem, and an object of the present invention is to achieve (A) a content distributing device, (B) a content playing device, (C) a content distributing system, (D) a method for controlling the content distributing device, (E) a controlling program, and (F) a recording medium, each of which, reduces, in a content distributing system in which content is distributed to a client from a server, reduces an increase in load of the server and a network and for data transmission from the server.

Solution to Problem

[0007] In order to achieve aforementioned object, a content distributing device for transmitting, in response to a request, a content to a source which is a sender of the request, in accordance with the present invention, includes: determining means for determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; content transmitting means for transmitting, in response to the request, the content thus requested to the relaying device in a case where the determining means determines that the source is a relaying device; content-storage-location information generating means for generating content-storage-location information by associating (A) the content transmitted by the content transmitting means with (B) an address of the relaying device, which is a destination to which the content is to be transmitted, or an address of the content playing device, to which the content is to be transferred from the relaying device; and content-acquiring-location instructing means for transmitting, in response to the request, an instruction to the content playing device which is the source in a case where the determining means determines that the source is a content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address that the content-storage-location information associates with the content thus requested or (ii) a content playing device indicated by an address that the content-storage-location information associates with the content thus requested.

[0008] In order to achieve aforementioned object, a method for controlling content distributing device for transmitting, in response to a request, a content to a source which is a sender of the request, the method in accordance with the present invention includes: a determining step of determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; a content transmitting step of transmitting, in response to the request, the content thus requested to the relaying device in a case where it is determined that, in the determining step, the source is a relaying device; a content-storage-location information generating step of generating content-storage-location information by associating (A) the content transmit-

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ted in the content transmitting step with (B) an address of the relaying device, which is a destination to which the content is to be transmitted, or an address of the content playing device, to which the content is to be transferred from the relaying device; and a content-acquiring-location instructing step of transmitting, in response to the request, an instruction to the content playing device which is the source in a case where it is determined that, in the content-storage-location information generating step, the source is the content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address associated, in the content-storage-location information, with the content thus requested or (ii) a content playing device indicated by an address associated, in the content-storage-location information, with the content thus requested.

[0009] According to the arrangement, upon receipt of the request from the relaying device, the content transmitting means transmits the content thus requested to the relaying device which is the source, and the content-storage-location information generating means generates the content-storage-location information by associating (A) the content transmitted from the content transmitting means with (B) the address of the relaying device, which is the destination of the content, or the address of the content playing device, to which the content is transferred from the relaying device. Further, upon receipt of the request from the content playing device, the content-acquiring-location instructing means transmits, to the content playing device which is the source, the instruction to acquire the content from (I) the relaying device indicated by an address associated, in the content-storage-location information, with the content thus requested or (II) the content playing device indicated by an address associated, in the content-storage-location information, with the content thus requested. Here, the relaying device and the content playing device possess the content thus acquired, and the content-storage-location information is information indicating which relaying device or content playing device possesses a content.

[0010] That is, the content distributing device associates (A) a content which has been transmitted before with (B) a relaying device or a content playing device which possesses the content, and, upon receipt of a request from a certain content playing device, the content distributing device does not directly transmit the content to the content playing device which is the source, but transmits, to the content playing device which is the source, an instruction to acquire the content from a relaying device or a content playing device which possesses the content thus requested. The content playing device, which is the source, acquires the content thus requested from a designated relaying device or a designated content playing device. Therefore, if the designated relaying device or the designated content playing device possesses the content, it is possible to complete transmission and reception of the content with use of only (A) the content playing device which is the source and (B) the designated relaying device or the designated content playing device. That is, the content playing device, which is the source, can acquire content, without carrying out a process for transmitting the content.

[0011] This makes it possible to reduce (A) a load of a network, which is used to transmit data from the content distributing device, and (B) a load of the content distributing device. Among processes carried out by the content distributing device, the relaying device, and the content playing device, a process for transmitting and receiving the content is a process which applies the heaviest load, and the process applies the heaviest load of the network among the content distributing device, the relaying device, and the content playing device. However, even if, for example, the number of content playing devices is increased and the number of requests to the content distributing devices is therefore increased, it is possible to reduce (A) an increase in load of the network which is used to transmit data from the content distributing device and (B) an increase in load of the content distributing device. Therefore, a large number of content playing devices can acquire contents, without increasing throughput of the content distributing device or capacity of the network.

Advantageous Effects of Invention

[0012] As described above, a content distributing device for transmitting, in response to a request, a content to a source which is a sender of the request, in accordance with the present invention, includes: determining means for determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; content transmitting means for transmitting, in response to the request, the content thus requested to the relaying device in a case where the determining means determines that the source is a relaying device; content-storage-location information generating means for generating content-storage-location information by associating (A) the content transmitted by the content transmitting means with (B) an address of the relaying device, which is a destination to which the content is to be transmitted, or an address of the content playing device, to which the content is to be transferred from the relaying device; and content-acquiring-location instructing means for transmitting, in response to the request, an instruction to the content playing device which is the source in a case where the determining means determines that the source is a content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address that the content-storage-location information associates with the content thus requested or (ii) a content playing device indicated by an address that the content-storage-location information associates with the content thus requested.

[0013] A method for controlling content distributing de-

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vice for transmitting, in response to a request, a content to a source which is a sender of the request, the method in accordance with the present invention includes: a determining step of determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; a content transmitting step of transmitting, in response to the request, the content thus requested to the relaying device in a case where it is determined that, in the determining step, the source is a relaying device; a content-storage-location information generating step of generating content-storage-location information by associating (A) the content transmitted in the content transmitting step with (B) an address of the relaying device, which is a destination to which the content is to be transmitted, or an address of the content playing device, to which the content is to be transferred from the relaying device; and a content-acquiring-location instructing step of transmitting, in response to the request, an instruction to the content playing device which is the source in a case where it is determined that, in the content-storage-location information generating step, the source is the content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address associated, in the content-storage-location information, with the content thus requested or (ii) a content playing device indicated by an address associated, in the content-storage-location information, with the content thus requested.

[0014] This makes it possible to reduce (A) a load of the network, which is used to transmit data from the content distributing device and (B) a load of the content distributing device.

[0015] Additional objects, features, and strengths of the present invention will be made clear by the description below. Further, the advantages of the present invention will be evident from the following explanation in reference to the drawings.

Brief Description of Drawings

[0016]

Fig. 1
Fig. 1 is a view illustrating Embodiment 1 of the present invention, and illustrates a schematic configuration of a content distributing system in accordance with Embodiment 1 and main configurations of devices constituting the content distributing system.
Fig. 2
Fig. 2 is a view showing an exemplary transmission log stored in a transmission log storage section included in the content distributing system.
Fig. 3
Fig. 3 is a view illustrating exemplary content-storage-location information stored in a content-storage-location information storage section included in the content distributing system.
Fig. 4
Fig. 4 is a flowchart showing an exemplary process which is carried out by a server constituting the content distributing system.
Fig. 5
Fig. 5 is a flowchart showing an exemplary process which is carried out by a proxy constituting the content distributing system.
Fig. 6
Fig. 6 is a flowchart showing an exemplary process which is carried out by a client constituting the content distributing system.
Fig. 7
Fig. 7 is a view illustrating an exemplary operation sequence of a content distributing system in Example of Embodiment 1.
Fig. 8
Fig. 8 is a view illustrating exemplary HTTP messages which are transmitted/received as a request or a response. (a), (c), and (d) of Fig. 8 show HTTP messages of respective requests illustrated in Fig. 7, and (b), (e), and (f) of Fig. 8 show HTTP messages of respective responses illustrated in Fig. 7.
Fig. 9
Fig. 9 is a view illustrating exemplary HTTP messages which are transmitted/received as a request or a response. (a), (c), and (d) of Fig. 9 show HTTP messages of respective requests illustrated in Fig. 7, and (b), (e), and (f) of Fig. 9 show HTTP messages of respective responses illustrated in Fig. 7.
Fig. 10
Fig. 10 is a view illustrating exemplary HTTP messages which are transmitted/received as a request or a response. (a), (c), and (d) of Fig. 10 show HTTP messages of respective requests illustrated in Fig. 7, and (b), (e), and (f) of Fig. 10 show HTTP messages of respective responses illustrated in Fig. 7.
Fig. 11
Fig. 11 is a view illustrating Embodiment 2 of the present invention, and illustrates a schematic configuration of a content distributing system in accordance with Embodiment 2 and main configurations of devices constituting the content distributing system.
Fig. 12
Fig. 12 is a view showing an exemplary transmission log stored in a transmission log storage section included in the content distributing system.
Fig. 13
Fig. 13 is a view illustrating exemplary content-storage-location information stored in a content-storage-location information storage section included in the content distributing system.
Fig. 14
Fig. 14 is a flowchart showing an exemplary process which is carried out by a server constituting the content distributing system.
Fig. 15

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Fig. 15 is a flowchart showing an exemplary process which is carried out by a client which serves as a content playing device and constitutes the content distributing system.

Fig. 16

Fig. 16 is a flowchart showing an exemplary process which is carried out by a client which serves as a relaying device and constitutes the content distributing system.

Fig. 17

Fig. 17 is a view illustrating an exemplary operation sequence of a content distributing system in Example of Embodiment 2.

Fig. 18

Fig. 18 is a view illustrating example HTTP messages which are transmitted/received as a request or a response. (a), (c), and (d) of Fig. 18 show HTTP messages of respective requests illustrated in Fig. 17, and (b), (e), and (f) of Fig. 18 show HTTP messages of respective responses illustrated in Fig. 17.

Fig. 19

Fig. 19 is a view illustrating example HTTP messages which are transmitted/received as a request or a response. (a), (c), and (d) of Fig. 19 show HTTP messages of respective requests illustrated in Fig. 17, and (b), (e), and (f) of Fig. 19 show HTTP messages of respective responses illustrated in Fig. 17.

Fig. 20

Fig. 20 is a view illustrating Embodiment 3 of the present invention, and illustrates a schematic configuration of a content distributing system in accordance with Embodiment 3 and main configurations of devices constituting the content distributing system.

Fig. 21

Fig. 21 is a format of content dealt by the content distributing system.

Fig. 22

Fig. 22 is a flowchart showing an exemplary process which is carried out by a server constituting the content distributing system.

Fig. 23

Fig. 23 is a flowchart showing an exemplary process which is carried out by a client which serves as a content playing device and constitutes the content distributing system.

Fig. 24

Fig. 24 is a view illustrating an exemplary operation sequence of a content distributing system in Example of Embodiment 3.

Fig. 25

Fig. 25 is a view showing an exemplary transmission log stored in a transmission log storage section included in the content distributing system.

Fig. 26

Fig. 26 is a view illustrating exemplary content-storage-location information stored in a content-storage-location information storage section included in the content distributing system.

Fig. 27

Fig. 27 is a view illustrating exemplary HTTP messages which are transmitted/received as a request or a response. (a), (c), and (d) of Fig. 27 show HTTP messages of respective requests illustrated in Fig. 24, and (b), (e), and (f) of Fig. 27 show HTTP messages of respective responses illustrated in Fig. 24.

Fig. 28

Fig. 28 is a view illustrating exemplary HTTP messages which are transmitted/received as a request or a response. (a) and (b) of Fig. 28 show HTTP messages of respective requests illustrated in Fig. 24, and (c) and (d) of Fig. 28 show HTTP messages of respective responses illustrated in Fig. 24.

Fig. 29

Fig. 29 is a view illustrating Embodiment 4 of the present invention, and illustrates a schematic configuration of a content distributing system in accordance with Embodiment 4 and main configurations of devices constituting the content distributing system.

Fig. 30

Fig. 30 is a view illustrating exemplary content-storage-location information stored in a content-storage-location information storage section included in the content distributing system.

Fig. 31

Fig. 31 is a flowchart showing an exemplary process which is carried out by a server constituting the content distributing system.

Fig. 32

Fig. 32 is a flowchart showing an exemplary process which is carried out by a client which serves as a content playing device and constitutes the content distributing system.

Fig. 33

Fig. 33 is a view illustrating an exemplary operation sequence of a content distributing system in Example of Embodiment 4.

Fig. 34

Fig. 34 is a view illustrating an exemplary HTTP message which is transmitted and received as a response.

Fig. 35

Fig. 35 is a view illustrating exemplary MPD data which is meta data of content dealt by a content distributing system in accordance with Embodiment 5 of the present invention.

Fig. 36

Fig. 36 is a view illustrating exemplary MPD data which is dealt by the content distributing system.

Fig. 37

Fig. 37 is a view illustrating an exemplary external resource which is dealt by the content distributing system.

Fig. 38

Fig. 38 is a view illustrating exemplary MPD data and an example external resource which are dealt by the content distributing system.

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Fig. 39
Fig. 39 is a flowchart showing an exemplary process which is carried out by a server constituting the content distributing system.
Fig. 40
Fig. 40 is a flowchart showing an exemplary process which is carried out by a client which serves as a content playing device and constitutes the content distributing system.
Fig. 41
Fig. 41 is a view illustrating an exemplary operation sequence of a content distributing system in Example of Embodiment 5.

Description of Embodiments

<Embodiment 1>

[0017] The description will discuss Embodiment 1 of the present invention with reference to Fig. 1 to Fig. 10. First, an outline of a content distributing system 1 of Embodiment 1 will be described with reference to Fig. 1.

[Outline of content distributing system 1]

[0018] Fig. 1 illustrates a schematic configuration of the content distributing system 1 in accordance with Embodiment 1 and main configurations of devices constituting the content distributing system 1. As illustrated in Fig. 1, the content distributing system 1 includes a server (content distributing device) 2, proxies (relaying devices, content acquiring devices) 3a and 3b, and clients (content playing devices, content acquiring devices) 4a and 4b. The content distributing system 1 also includes: a content storage section 5 connected to the server 2; and cache storage sections 6a and 6b connected to the respective proxies 3a and 3b.

[0019] As illustrated in Fig. 1, the server 2, the proxies 3a and 3b, and the client 4a and 4b are connected to one another via a network 7. Note that the network 7 is not particularly limited, provided that the aforementioned devices can be communicated with one another. Accordingly, the network 7 may be a wired communication network or a wireless communication network.

[0020] Note that, in the following description, the proxies 3a and 3b will be called generally as a proxy 3; the cache storage sections 6a and 6b, a cache storage section 6; and the client 4a and 4b, a client 4.

[0021] Further, the present invention is not limited to the example illustrated in Fig. 1, in which the content distributing system 1 includes two proxies 3 and two clients 4. The content distributing system 1 may include one proxy or three or more proxies, and may include three or more clients 4. That is, the content distributing system 1 only needs to include at least one proxy 3 and a plurality of clients 4.

[0022] In Embodiment 1, a content distributed by the server 2 is assumed to be a video content for a VOD service, and a format of the content is assumed to be a MP4 file format. Further, a transfer protocol on the network 7 in the content distributing system 1 is assumed to use the HTTP, which is widely used as a general file transferring protocol. Note that, in Embodiment 1, the content distributed by the server 2 and the transfer protocol on the network 7 in the content distributing system 1 are not limited to this configuration.

[Server 2]

[0023] The server 2 is a content distributing device which receives a request message (request) to request to transmit a content from the proxy 3 and the client 4 (content acquiring device) and transmits a response message (response) in response to the request message thus received. As described above, the server 2 is connected to the content storage section 5 which stores contents such as moving images, and manages the contents stored in the content storage section 5. Note that the content storage section 5 may be provided inside the server 2.

[0024] Note that the server 2 may simultaneously distribute the same content to an unspecified number of devices, may distribute a content to a single device, or may simultaneously distribute the same content to a predetermined number of devices.

[0025] As illustrated in Fig. 1, the server 2 includes: a server controlling section 14 for collectively controlling operations of the server 2; a server communication section 11 which is provided so that the server 2 can communicate to an external device; a transmission log storage section 12 in which a response transmitted by the server 2 is stored; and a content-storage-location information storage section 13 for storing content-storage-location information (details will be described below). The server controlling section 14 includes: a response executing section (determining means, content transmitting means, content-acquiring-location instructing means, transmission record creating means) 15; a relaying device specifying section (content-acquiring-location instructing means, distance calculating means) 16; and a content-storage-location information generating section (content-storage-location information generating means) 17.

[0026] The response executing section 15 receives, via the server communication section 11, a request message to request to transmit a content, and then the response executing section 15 transmits, to a device (proxy 3 or client 4) which is the sender of the request message, a response message in response to the request message thus received.

[0027] Specifically, the response executing section 15 is ready to receive the request message to request to transmit the content, and, upon receiving, via the server communication section 11, the request message to request to transmit the content, the response executing section 15 checks a header of the request message in

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order to determine whether or not the request message thus received is transmitted via the proxy 3. For example, it may be so configured that in a case of receiving a request message which includes a "Via" header, the response executing section 15 determines that the request message thus received has been transmitted by the proxy 3 in response to a request message of the client 4, whereas, in a case of receiving a request message which does not include the "Via" header, the response executing section 15 may determine that the request message thus received has been transmitted directly from the client 4.

[0028] Upon receipt of the request message to request the content directly from the client 4, the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to specify address information (e.g., URI of proxy 3 etc.) of the proxy 3 which (possibly) possesses the content that the client 4 requests. Then, the response executing section 15 receives, from the relaying device specifying section 16, the address information of the proxy 3 which possesses the content that the client 4 requests. After that, in response to the request message from the client 4, the response executing section 15 transmits, to the client 4, an instruction (i.e., a response message) to acquire such a requested content based on the address information specified by the relaying device specifying section 16. For example, by giving, to "Location field", with use of a "305 USE Proxy" serving as the response message, the address information specified by the relaying device specifying section 16, the response executing section 15 transmits, to the client 4, an instruction to transmit, to the proxy 3 which (possibly) possesses the content that the client 4 requests, the request message of the content.

[0029] When receiving, from the proxy 3, the request message to request the content, the response executing section 15 determines whether or not the request message thus received is a conditional request such as "If-Modified-Since". In a case where the request message thus received is not a conditional request, the response executing section 15 reads out a requested content from the content storage section 5 and transmits such a read-out content to the proxy 3 in response to the request message of the proxy 3.

[0030] Meanwhile, in a case where the request message thus received is a conditional request, the response executing section 15 then determines whether or not data held by the proxy 3 is latest. To put it another way, the response executing section 15 determines whether or not the data of the content held by the proxy 3 and data of the same content stored in the content storage section 5 are identical to each other.

[0031] In a case where the data of the content held by the proxy 3 is not latest, the response executing section 15 reads out a requested content from the content storage section 5, and, in response to the request message transmitted from the proxy 3, transmits the content thus read out to the proxy 3. Meanwhile, in a case where the data of the content held by the proxy 3 is latest, the response executing section 15 transmits, to the proxy 3, in response to the request message transmitted from the proxy 3, a response message that the data of the content held by the proxy 3 is latest. The response executing section 15 transmits, to the proxy 3, for example, "304 NOT modified" serving as the response message that the data of the content held by the proxy 3 is latest.

[0032] Further, the response executing section 15 creates a transmission log (response transmission record) based on the response message thus sent, and causes the transmission log storage section 12 to store the transmission log thus created. The transmission log created by the response executing section 15 will be described later in detail.

[0033] As for the content to be transmitted from the response executing section 15 to the proxy 3, for example, "Cache-Control: must-revalidate" or "Cache-Control: proxy-revalidate" may be added to a header of the content. Accordingly, when the proxy 3 which receives the content uses, i.e., transmits the content held by the cache storage section 6 in response to another request, it is possible to confirm the server 2 before the transmission of the content from the proxy 3, as to whether or not the content is the latest version.

[0034] In response to an instruction of the response executing section 15, the relaying device specifying section 16 specifies which proxy 3 (possibly) possesses the content that the client 4 requests.

[0035] Specifically, the relaying device specifying section 16 reads out content-storage-location information from the content-storage-location information storage section 13 in response to the instruction of the response executing section 15. With reference to the content-storage-location information thus read out, the relaying device specifying section 16 specifies, as address information of a device from which the content is acquired, the address information (e.g., URI) of the proxy 3 associated with the content that the client 4 requests. The relaying device specifying section 16 transmits the address information thus specified to the response executing section 15.

[0036] In a case where the content-storage-location information for the content that the client 4 requests is not stored in the content-storage-location information storage section 13, the relaying device specifying section 16 may specify, as address information of a device from which the content is acquired, predetermined (default) address information of the content that the client 4 requests. Alternatively, in a case where the content-storage-location information storage section 13 does not store the content-storage-location information for the content that the client 4 requests, the relaying device specifying section 16 may select, at random, from proxies 3 connected to the server 2 via the network 7, address information of a device from which the content is acquired.

[0037] In a case where the content-storage-location in-

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formation storage section 13 contains a plurality of pieces of content-storage-location information containing a plurality of pieces of address information of proxies 3 associated with the content requested by the client 4, the relaying device specifying section 16 may specify a plurality of pieces of address information as address information of a device from which the content is acquired, and may make a content-storage-location list containing the plurality of pieces of address information thus specified. Alternatively, in a case where the relaying device specifying section 16 specifies the plurality of pieces of address information as address information of a device from which the content is acquired, the relaying device specifying section 16 may make a content-storage-location list by adding priorities to the plurality of pieces of address information.

[0038] In a case where the content-storage-location information storage section 13 contains the plurality of pieces of content-storage-location information containing the respective plurality of pieces of address information of the proxies 3 associated with the content that the client 4 requests, the relaying device specifying section 16 may specify address information of a proxy 3, which address information is contained in the latest content-storage-location information (which means that date and time contained in the content-storage-location information are the latest), as the address information of the device from which the content is acquired. In a case where a plurality of pieces of address information are specified as the address information of the device from which the content is acquired, the relaying device specifying section 16 may make a content-storage-location list by adding priorities to the pieces of address information in such a manner that, for example, later date and time contained in content-storage-location information are given a higher priority.

[0039] Further, in a case where the content-storage-location information storage section 13 contains the plurality of pieces of content-storage-location information containing the respective plurality of pieces of address information of proxies 3 associated with the content that the client 4 requests, the relaying device specifying section 16 may specify an address of a proxy 3 as an address of a device from which the content is acquired, which address of the proxy 3 has a shortest distance between the proxy 3 and the client 4 on the basis of a physical or network-structural distance and is contained in the content-storage-location information. Also in a case where the plurality of pieces of address information are specified as the address information of the device from which the content is acquired, the relaying device specifying section 16 may make a content-storage-location list on the basis of, for example, the distance between the proxy 3 and the client 4 on the physical or network structure. That is, the relaying device specifying section 16 may make the content-storage-location list by adding priorities to the plurality of pieces of address information in such a manner that address information with a shorter distance gets a higher priority. Specifically, the relaying device specifying section 16 may make a content-storage-location list in such a manner that (A) a plurality of physical or network-structural distances between proxies 3 indicated by the plurality of addresses and clients 4 transmitted the request are calculated on the basis of the plurality of addresses contained in respective plurality of pieces of content-storage-location information, (B) the plurality of addresses, which are contained in the plurality of pieces of content-storage-location information, respectively, are arranged so that an address with a shorter distance gets a higher priority, and (C) priorities are assigned to the plurality of addresses.

[0040] In a case where, for example, the server 2 already has (A) URIs of the clients 4 transmitted the request message and (B) URIs of the proxies 3 connected to the server 2 via the network 7, the relaying device specifying section 16 may make a content-storage-location list in such a manner that (I) domain names of the clients 4 transmitted the request message are found out on the basis of URIs of the clients 4, (II) proxies 3 are arranged so that, in each level of the domain names thus found out, the shorter physical or network-structural distance between a client 4 and a proxy 3 gets a higher priority, and (III) priorities are assigned to the plurality of pieces of address information.

[0041] Specifically, in a case where the URI of the client 4 is, for example, "http://client.co.jp", the relaying device specifying section 16 may make a content-storage-location list in view of a second level domain name. Specifically, the relaying device specifying section 16 may make the content-storage-location list by (i) selecting proxies 3 whose second level domain name is "co.jp" and (ii) arranging the proxies 3 thus selected in such a manner that the shorter physical or network-structural distance between the proxy 3 and the client 4 gets a higher priority. In a case where no proxy 3 has "co.jp" as the second level domain name, the relaying device specifying section 16 may make a content-storage-location list by (A) selecting proxies 3 whose first level domain name is "jp" and (B) arranging the proxies 3 in such a manner that the shorter physical or network-structural distance between the proxy 3 and the client 4 gets a higher priority.

[0042] In a case where the URI of the client 4 is not an organizational type JP domain name such as "co.jp", but is a geographical type JP domain name such as "kaisha.chiyoda.tokyo.jp" or "pref.fukuoka.jp" in which a prefecture label or a city (city, ward, town, village) label is contained, the relaying device specifying section 16 may make a content-storage-location list by selecting (I) labels (prefecture labels or city labels) to which proxies 3 are attached are same as those to which the clients 4 are attached or (II) labels to which proxies 3 are attached are resemble to those to which the clients 4 are attached.

[0043] Similarly, in a case where server 2 already contains information on an IP address of the client 4 which has transmitted the request message, an IP address of the proxy 3 connected to the server 2 via the network 7,

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and the like, the relaying device specifying section 16 may select, with reference to a network address section on a high-order-bit side of the IP address of the client 4 which has transmitted the request message, a proxy 3 having a short physical or network-structural distance between the proxy 3 and the client 4.

[0044] In addition, a connecting path between the server 2 and the client 4 and a network status are checked in advance with use of, for example, a general method such as a routing technology, a network monitoring, or traffic analysis, and, on the basis of the connecting path and the network status specified by the relaying device specifying section 16, a more appropriate proxy may be selected. For example, before the relaying device specifying section 16 transmits, to client 4, an instruction to designate a proxy 3 for acquiring the content, the connecting path between the server 2 and the client 4 is checked with use of a "traceroute" command or a "tracert" command, and, on the basis of a result of such check, the relaying device specifying section 16 may select a proxy 3 which is closer to the client 4.

[0045] Further, the relaying device specifying section 16 may specify, in view of load statuses of the proxies 3, a proxy 3 which (possibly) possesses the content that the client 4 requests and has a low load. More specifically, the relaying device specifying section 16 may specify, with reference to the transmission log stored in the transmission log storage section 12, address information of the device from which the content is acquired.

[0046] For example, the relaying device specifying section 16 may carry out the following processes: the relaying device specifying section 16 determines, with reference to the transmission log stored in the transmission log storage section 12, whether or not each proxy 3 has transmitted or received the content within a predetermined time period; and the relaying device specifying section 16 specifies, as the address information of the device from which the content is acquired, address information of a proxy 3 which (i) has transmitted or received no content within the predetermined time period and (ii), in the content-storage-location information thus read out, is associated with the content that the client 4 requests. Note that the predetermined time period may be set in accordance with the content associated with the proxy 3.

[0047] In a case where the content-storage-location information storage section 13 contains the plurality of pieces of content-storage-location information containing the respective plurality of pieces of address information of the proxies 3 associated with the content that the client 4 requests, the relaying device specifying section 16 may specify, as the address information of the device from which the content is acquired, address information of a proxy 3 which (A) has transmitted or received no content within a predetermined time period and (B) is contained in the latest content-storage-location information.

[0048] Further, the relaying device specifying section 16 may specify, in view of the number of accesses to the server 2 from the proxies 3, a proxy 3 which (possibly) possesses the content that the client 4 requests. For example, it can be considered that, if a proxy 3 has a large number of accesses to the server 2, the proxy 3 caches a large number of contents. Accordingly, the relaying device specifying section 16 may specify a proxy 3 whose number of accesses to the server 2 is a predetermined lower limit or more. Note that the relaying device specifying section 16 may specify the number of accesses to the server 2 with reference to the transmission log stored in the transmission log storage section 12. Specifically, the relaying device specifying section 16 may specify, as the address information of the device from which the content is acquired, an address of a proxy 3 whose number of accesses to the server 2 is a predetermined lower limit or more, which address of the proxy 3 is selected from the proxies 3 associated with the contents, which are requested by the clients 4, of the content-storage-location information.

[0049] Further, in a case where the plurality of pieces of address information are associated with the content that the client 4 requests, the relaying device specifying section 16 may specify, as the address information of the device from which the content is acquired, an address information of a proxy 3 having a largest number of accesses to the server 2.

[0050] Furthermore, in order not to concentrate accesses to a specific proxy 3, the relaying device specifying section 16 may specify a proxy 3 whose number of accesses to the server 2 is a predetermined upper limit or less.

[0051] The content-storage-location information generating section 17 generates, on the basis of the transmission log stored in the transmission log storage section 12, content-storage-location information for specifying address information of a proxy 3 which (possibly) possesses content, and causes the content-storage-location information storage section 13 to store the content-storage-location information.

[0052] Specifically, the content-storage-location information generating section 17 generates content-storage-location information by associating, with reference to a transmission log that the server 2 has transmitted the content to a proxy 3, (A) the content which has been transmitted by the server 2, (B) address information of the proxy 3 which is a destination of the content, and (C) date and time when the server 2 has transmitted the content. Alternatively, the content-storage-location information generating section 17 generates content-storage-location information by associating (A) the content which is confirmed, by the server 2, that the content is the latest version with reference to a transmission log indicating that the server 2 has transmitted a response message that the content held by the proxy 3 is the latest version, (B) address information of the proxy 3 which possesses the content, and (C) date and time when the server 2 has transmitted the response message.

[0053] Note that the content-storage-location informa-

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tion generating section 17 may generate content-storage-location information every time when a predetermined transmission log is added to the transmission log storage section 12, or may generate content-storage-location information by reading out the transmission log per predetermined time period.

[0054] The transmission log storage section 12 stores a transmission log in which (A) transmission date and time of a response message that the server 2 has transmitted to the proxy 3 or to the client 4, (B) address information of the device which receives the response message, (C) contents of the response message, and (D) a content requested by a request message in response to the response message are associated with one another. Examples of the transmission log stored in the transmission log storage section 12 encompass data illustrated in Fig. 2. Fig. 2 is a view showing an exemplary transmission log stored in the transmission log storage section 12.

[0055] As shown in Fig. 2, the transmission log associates (A) "Date" which is date and time when a response message is transmitted, (B) "destination address" which is address information of a device which receives the response message, (C) "transmitted contents" which indicates the contents of the response message, and (D) "content ID" which indicates the content requested by a request message in response to the response message.

[0056] "200 OK", "305 USE Proxy", or "304 Not Modified", which is the contents of the response message, is stored as the "transmitted contents". In a case where the "transmitted contents" is "305 USE Proxy", the "305 USE Proxy" contains, in parentheses, information indicative of a proxy 3 which is designated by the relaying device specifying section 16, i.e., "305 Use Proxy (proxy 1)" as shown in Fig. 2.

[0057] "200 OK" is contained in a response message transmitted when the content is transmitted in response to the request for the content. Thus, a transmission log of the response message "200 OK" is referred to as a content transmission log. "305 USE Proxy" is contained in a response message to provide a device with the content from a designated proxy. Thus, a transmission log of the response message "305 USE Proxy" is referred to as an acquiring instruction log. "304 Not Modified" is contained in a response message which notifies a device that the content is the latest version, the transmission log of the response message "304 Not Modified" is referred to as a version notification log.

[0058] The response executing section 15 creates a transmission log based on a transmitted response message, so that the content-storage-location information generating section 17 can make, on the basis of the transmission logs, content-storage-location information for specifying address information of a proxy 3 which (possibly) possesses a content (as described above). The relaying device specifying section 16 can refer to the transmission log in order to specify a proxy 3 which has transmitted or received no content within a predetermined time period.

[0059] With reference to a transmission log stored in the transmission log storage section 12, for example, the relaying device specifying section 16 specifies, as a proxy 3 which has transmitted or received a content within a predetermined time period, a proxy 3 which is associated with "200 OK" or "304 Not Modified" as the transmitted contents.

[0060] The content-storage-location information storage section 13 stores content-storage-location information in which (A) a content, (B) address information of a proxy 3 which (possibly) possesses the content, and (C) date and time when the proxy 3 acquires the content are associated with one another. Examples of the content-storage-location information stored in the content-storage-location information storage section 13 may encompass data shown in Fig. 3. Fig. 3 is a view showing exemplary content-storage-location information stored in the content-storage-location information storage section 13. To put it another way, the content-storage-location information is information in which the content and the address information indicative of a location where the content is stored are associated with each other.

[0061] As shown in Fig. 3, the content-storage-location information is information in which (A) "Date" which is date and time when the proxy 3 acquires a content, (B) "content ID" (content identification information) which identifies the content, and (C) "storage-location address" which is address information of the proxy 3 which possesses the content are associated with one another.

[0062] The content-storage-location information generating section 17 generates content-storage-location information based on a transmission log. Accordingly, as described above, the relaying device specifying section 16 can specify, with reference to the content-storage-location information, address information of a proxy 3 which (possibly) possesses the content.

[0063] Note that, like the content storage section 5, the transmission log storage section 12 and the content-storage-location information storage section 13 may be provided outside the server 2 and connected to the server 2, instead of being provided in the server 2.

[Proxy 3]

[0064] The proxy 3 is a device for transmitting a requested content and also for requesting and acquiring a content. As described above, the proxy 3 is connected to the cache storage section 6 which stores, for example, a content received from the server 2. In a case where the cache storage section 6 includes a requested content, the proxy 3 reads out the requested content from the cache storage section 6 and then transmits the requested content to the client 4. Meanwhile, in a case where the cache storage section 6 does not include the requested content, the proxy 3 requests the content to the server 2. Note that the cache storage section 6 may be provided in the proxy 3.

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[0065] As illustrated in Fig. 1, the proxy 3 includes: a proxy controlling section 22 for collectively controlling operations of the proxy 3; and a proxy communication section 21 with which the proxy 3 communicates to an external device. The proxy controlling section 22 includes a response/ request execution section 23.

[0066] The response/request execution section 23 is provided for transmitting, to the client 4, a content designated by a request message which has been received from the client 4 to request the content.

[0067] Specifically, the response/request execution section 23 is ready to receive, from the client 4, a request message to request to transmit a content, and, upon receipt of the request message from the client 4 via the proxy communication section 21, the response/request execution section 23 confirms whether or not a requested content is stored in the cache storage section 6.

[0068] In a case where the requested content is not stored in the cache storage section 6, the response/request execution section 23 confirms a "Host" field of the request message transmitted from the client 4, and transmits, to the server 2 indicated by a URI written in the "Host" field, the request message of the content that the client 4 requests. Then, the response/request execution section 23 acquires the content from the server 2, and causes the cache storage section 6 to store the content thus acquired. After that, the response/request execution section 23 transmits the requested content to the client 4.

[0069] Further, in a case where the requested content is stored in the cache storage section 6, the response/request execution section 23 acts such that, in order to confirm whether or not data of the content stored in the cache storage section 6 is the latest, the response/request execution section 23 makes a request message provided with a conditional request, such as "If-Modified-Since" in which time information indicative of time when the proxy 3 acquires the content is written, and transmits, to the server 2, the request message provided with the conditional request thus made.

[0070] In a case where the response/request execution section 23 receives, from the server 2, a response message "304 NOT Modified" in response to the request message provided with the conditional request, the response/request execution section 23 determines that the content stored in the cache storage section 6 is the latest data. Then the response/request execution section 23 reads out the content from the cache storage section 6, and transmit, to the client 4, the content thus read out.

[0071] Meanwhile, in a case where the content stored in the cache storage section 6 is not the latest data, the server 2 transmits the latest content in response to the request message provided with the conditional request, and the response/request execution section 23 acquires the content transmitted from the server 2. The response/request execution section 23 causes the cache storage section 6 to store the content thus acquired, and then transmits, to the client 4, the content thus required.

[0072] Note that the response/request execution section 23 may be configured to transmit the content to the client 4 while the content contains, in its header, "Cache-Control: must-revalidate" or "Cache-Control which has been added by the server 2. Accordingly, in a case where the content, which has been acquired by the client 4 serving as a destination of the content, is transmitted in response to another request, it is possible to cause the client 4 to always transmit, to the server 2, an inquiry as to whether or not the content is the latest version, before the client 4 transmits the content.

[0073] That is, in Embodiment 1, the proxy 3 is a device for transmitting a request of a content and acquiring the content, and is also a relaying device for possessing such a requested content and relaying the requested content to another device (e.g., client 4) to which the requested content is transmitted from the relaying device.

[Client 4]

[0074] The client 4 is a device for requesting and acquiring a content, and playing the content thus acquired. Although not illustrated in Fig. 1, the client 4 includes an input section for accepting a user's operation, and requests a content on the basis of an input operation accepted by the input section.

[0075] As illustrated in Fig. 1, the client 4 includes: a client control section 32 for collectively controlling operations of the client 4; and a client communication section 31 with which the client 4 communicates to an external device. The client control section 32 includes: a request executing section 33 and a content playing section 34.

[0076] The request executing section 33 generates a request message to request to transmit a content, transmit the request message to the server 2 via the client communication section 31, and receives a response message in response to the request message. In the present invention, as described above, the request executing section 33 receives, from the server 2, the response message which is (A) information for specifying a proxy and (B) an instruction for transmitting, to the proxy, a request message to request the content. Upon receipt of the response message from the server 2, the request executing section 33 transmits, to such a designated proxy 3, the request message to request to transmit the content in response to the instruction from the server 2. Then, the request executing section 33 acquires the content from the proxy 3 designated by the server 2.

[0077] The content playing section 34 plays the content acquired by the request executing section 33. In a case where, for example, the acquired content is a moving image, the content playing section 34 decodes the acquired content. Then, the content playing section 34 causes an external display device (not shown) to output a moving image and audio thud obtained by decoding.

[0078] That is, in Embodiment 1, the client 4 is a device for transmitting a request for a content and acquiring the content, and also serves as a content playing device for acquiring and playing the requested content.

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[Processes carried out by each device]

[0079] The following description will discuss, with reference to Figs. 4 to 6, processes carried out by the server 2, the proxy 3, and the client 4. First, a process carried out by the server 2 will be described below with reference to Fig. 4.

[Process carried out by server 2]

[0080] Fig. 4 is a flowchart showing an exemplary process which is carried out by the server 2. The response executing section 15 is ready to receive a request message to request to transmit a content. When the response executing section 15 receives, via the server communication section 11, the request message to request to transmit the content (S401), the response executing section 15 checks a header of the request message thus received, so as to determine whether or not the request message thus received is transmitted via a proxy 3 (S402).

[0081] In a case where the received request message is one transmitted from the client 4 (NO in S402), the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to specify a proxy 3 from which the client 4 acquires the content. In response to the instruction from the response executing section 15, the relaying device specifying section 16 reads out content-storage-location information from the content-storage-location information storage section 13 (S403). With reference to the content-storage-location information thus read out, the relaying device specifying section 16 specifies, as address information of a device from which the content should be acquired, a URI of the proxy 3 associated with the content that the client 4 requests (S404). The relaying device specifying section 16 transmits such specified address information to the response executing section 15. The response executing section 15 transmits, to the client 4, from the proxy 3 indicated by an address contained in the address information which has been specified by the relaying device specifying section 16, a response message to instruct the client 4 to acquire a requested content (S405). The response executing section 15 creates a transmission log based on the response message which has been transmitted to the client 4, and adds the transmission log thus created to the transmission log storage section 12 (S410).

[0082] Meanwhile, in a case where the request message thus received is one transmitted by the proxy 3 (YES in S402), the response executing section 15 then determines whether or not the received request message is a conditional request such as "If-Modified-Since" (S406). In a case where the received request message is not a conditional request (NO in S406), the response executing section 15 reads out, from the content storage section 5, the content requested by the proxy 3, and, in response to the request message from the proxy 3, transmits the content thus read out to the proxy 3 (S407). After that, the response executing section 15 creates a transmission log based on the response message which has been transmitted to the proxy 3, and adds the transmission log thus created to the transmission log storage section 12 (S410).

[0083] In a case where the received request message is provided with a conditional request (YES in S406), the response executing section 15 determines whether or not data of the content held by the proxy 3 is the latest (S408). In a case where the data of the content kept by the proxy 3 is not the latest (NO in S408), the response executing section 15 reads out, from the content storage section 5, the content requested by the proxy 3, and, in response to the request message from the proxy 3, transmits to the proxy 3 the content thus read out (S407). Meanwhile, in a case where the data of the content held by the proxy 3 is the latest (YES in S408), the response executing section 15 transmits, to the proxy 3, a response message that the data of the content held by the proxy 3 is the latest, in response to the request message from the proxy 3 (S409). Then, the response executing section 15 adds, to the transmission log storage section 12, the response message which has been transmitted to the proxy 3 (S410).

[0084] Note that, in a case where the response executing section 15 transmits the content to the proxy 3 in S407, "Cache-Control: must-revalidate" or "Cache-Control: proxy-revalidate", for example, is added to the header of the content. Accordingly, in a case where the proxy 3 serving as a destination of a content transmits the content held by the cache storage section 6 in response to another request, it is possible to always cause the proxy 3 to transmit, to the server, an inquiry as to whether or not the content is the latest, before the proxy 3 transmits the content.

[Process carried out by proxy 3]

[0085] The following description will discuss a process carried out by the proxy 3. Fig. 5 is a flowchart showing an exemplary process which is carried out by the proxy 3.

[0086] As shown in Fig. 5, the response/request execution section 23 is ready to receive a request message to request to transmit a content from the client 4. Upon receipt of the request message from the client 4 via the proxy communication section 21 (S421), the response/request execution section 23 confirms whether or not such a requested content is stored in the cache storage section 6 (S422).

[0087] In a case where the requested content is not stored in the cache storage section 6 (NO in S422), the response/request execution section 23 refers to a "Host" field of the request message which has been transmitted from the client 4, and transmits, to the server 2 indicated by a URI written in the "Host" field, the request message to request the content transmitted by the client 4 (S423). Then, the response/request execution section 23 ac-

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quires the content from the server 2 (S424), and causes the cache storage section 6 to store the content thus acquired (S425). After that, the response/request execution section 23 transmits, to the client 4, the content thus requested (S426).

[0088] In a case where the requested content is stored in the cache storage section 6 (YES in S422), the response/ request execution section 23 creates a request message provided with a conditional request, such as "If-Modified-Since" in which time information indicative of time when the content has been acquired is written, and transmits, to the server 2, the request message provided with the conditional request thus made (S427).

[0089] In a case where the response/request execution section 23 receives a response message "304 NOT Modified" from the server 2 in response to the request message provided with the conditional request (YES in S428), the response/ request execution section 23 reads out the content thus stored from the cache storage section 6, and transmits to the client 4 the content thus read out (S426).

[0090] Meanwhile, in a case where the content stored in the cache storage section 6 is not the latest data, the server 2 transmits the latest content in response to the request message provided with the conditional request, and the response/request execution section 23 acquires the latest content transmitted from the server 2 (S424). The response/request execution section 23 causes the cache storage section 6 to store the content thus acquired (S425), and then transmits the requested content to the client 4 (S426).

[0091] Note that, in S426, the response/request execution section 23 transmits the content to the client 4 while the content contains, in its header, "Cache-Control: must-revalidate" or "Cache-Control which has been added by the server 2. Accordingly, in a case where the content, which has been acquired by the client 4 serving as a destination of a content, is transmitted in response to another request, it is possible to keep such a state that the client 4 should always transmits, to the server 2, an inquiry as to whether or not the content is the latest version, before the client 4 transmits the content.

[Process carried out by client 4]

[0092] The following description will discuss, with reference to Fig. 6, a process carried out by the client 4. Fig. 6 is a flowchart showing an exemplary process, which is carried out by the client 4.

[0093] As shown in Fig. 6, the request executing section 33 transmits, to the server 2, a request message to request to transmit a content (S441). In response to the request message, the request executing section 33 receives a response message to instruct the request executing section 33 to acquire a content from a designated proxy 3 (S442). In response to such an instruction from the server 2, the request executing section 33 transmits the request message to the proxy 3 designated by the server 2 (S443). Then, in response to the request message, the request executing section 33 acquires the content from the proxy 3 which has received the request message (S444).

[Example 1]

[0094] Fig. 7 illustrates Example 1, and Embodiment 1 will be described in detail below. Example 1 shows an operation example of the content distributing system 1 that instructs the client 4 about from which proxy 3 the client 4 is to acquire the content. Fig. 7 is a view illustrating an example operation sequence of the content distributing system 1 in Example 1.

[0095] Note that Example 1 is based on the following presumption. A content 1 and a content 2 are stored in the content storage section 5, and both the cache storage sections 6a and 6b cash no content. Further, the server 2 is set so that the content 1 is acquired from the proxy 3a as its default and the content 2 is acquired from the proxy 3b as its default. Furthermore, when the process shown in Fig. 7 is started in Example 1, a transmission log and content-storage-location information are not stored in the transmission log storage section 12 and the content-storage-location information storage section 13, respectively. Still further, the response executing section 15 creates the transmission log of Fig. 2 every time when a response message is transmitted, and the content-storage-location information generating section 17 generates the content-storage-location information of Fig. 3 every time when a content transmission log or a version notification log (transmission log whose "transmitted contents" is "200 OK" or "304 Not Modified") is added to the transmission log storage section 12.

[0096] Further, one session is defined as a sequence starting from a time at which the client 4 transmits a request message and ending a time at which the client 4 receives a response message in response to the request message is regarded as one session.

[0097] As shown in Fig. 7, in a session 110, the client 4a transmits, to the server 2, a request message to request to transmit the content 1 (request 111). In the server 2 which has received the request 111, the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to specify a proxy 3 to acquire the content 1. In response to the instruction, the relaying device specifying section 16 confirms whether or not the content-storage-location information is stored in the content-storage-location information storage section 13 (process 112). Here, the content-storage-location information storage section 13 does not contain the content-storage-location information indicative of the proxy 3 to acquire the content 1, the relaying device specifying section 16 specifies the default proxy 3a as the proxy 3 to acquire the content 1. The response executing section 15 transmits, to the client 4a, the response message to instruct the client 4a to acquire a requested content from the proxy 3 indicated by address information specified

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by the relaying device specifying section 16 (response 113). Then, the response executing section 15 creates a transmission log based on the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 114).

[0098] Then, in the session 120, the client 4a, which has received the response 113, transmits, to proxy 3a, the request message to request to transmit the content 1 (request 121). The proxy 3a, which received the request 121, confirms whether or not the content 1 is stored in the cache storage section 6a (process 122). Here, the content 1 is not stored in the cache storage section 6a, so that the proxy 3a transmits, to the server 2, the request message based on the request 121 (request 123). In the server 2 which has received the request 123 from the proxy 3a, the response executing section 15 transmits the content 1 to the proxy 3a (response 124). The proxy 3a received the response 124 stores the acquired content 1 in the cache storage section 6a and caches the content 1 (process 125). After that, the proxy 3a transmits, to the client 4a, the content 1 as a response to the request 121 (response 126). Note that, after transmitting the response 124, the response executing section 15 creates a transmission log based on the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 127). Further, the content-storage-location information generating section 17 generates content-storage-location information in which the content 1 and address information of the proxy 3a are associated with each other, and causes the content-storage-location information storage section 13 to store the content-storage-location information (process 128).

[0099] Next, in the session 130 and the session 140, the client 4b acquires the content 2. Operations of the client 4b, the proxy 3b, and the server 2 in the session 130 and the session 140 are similar to those of the client 4a, the proxy 3a, and the server 2 in the session 110 and the session 120, except that data acquired in the sessions 110 and 120 is different from that acquired in the sessions 130 and 140. Therefore description thereof will be omitted.

[0100] When the session 140 is completed, the content 1 is in a state of being cached in the cache storage section 6a of the proxy 3a and the content 2 is in a state of being cached in the cache storage section 6b of the proxy 3b. That is, the content-storage-location information storage section 13 stores (A) the content-storage-location information in which the content 1 and the proxy 3a are associated with each other and (B) content-storage-location information in which the content 2 and the proxy 3b are associated with each other.

[0101] In the session 150, the client 4a transmits, to the server 2, a request message to request to transmit the content 2 (request 151). In the server 2 received the request 151, the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to designate a proxy 3 to acquire the content 2. In response to the instruction, the relaying device specifying section 16 confirms whether or not the content-storage-location information is stored in the content-storage-location information storage section 13 (process 152). Here, the content-storage-location information storage section 13 stores the content-storage-location information in which the content 2 and the proxy 3b associated with each other, the relaying device specifying section 16 specifies the proxy 3b to acquire the content 2. The response executing section 15 transmits, to the client 4a, a response message to instruct the client 4a to acquire a requested content from the proxy 3 specified by the relaying device specifying section 16 (response 153). Then, the response executing section 15 creates a transmission log based on the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 154).

[0102] Next, in the session 160, in response to the instruction of the server 2, the client 4a received the response 153 transmits, to the proxy 3b, the request message to request to transmit the content 2 (request 161). The proxy 3b received the request 161 confirms whether or not the content 2 is stored in the cache storage section 6b (process 162). The content 2 is already stored in the cache storage section 6b, so that the proxy 3b transmits, to the server 2, the request message, based on the request 121, provided with a conditional request "If-Modified-Since", in order to confirm whether or not the content 2 stored in the cache storage section 6b is the latest data (request 163). Because the proxy 3b is used to transmit the request 163 and the request 163 is a request message contained in the conditional request, the response executing section 15 in the server 2 received the request 163 confirms whether or not the content 2 held by the proxy 3b is the latest data (process 164). The response executing section 15 determines that the content 2 held by the proxy 3b is the latest data, and transmits, to the proxy 3b, a response message "304 NOT Modified" (response 165). The proxy 3b received the response 165 reads out the content 2 stored in the cache storage section 6b, and, in response to the request 161, transmits the read out content 2 to the client 4a (response 166). Note that, after transmitting response 165, the response executing section 15 creates a transmission log based on the response message, and adds the transmission log to the transmission log storage section 12 (process 167). Further, the content-storage-location information generating section 17 generates the content-storage-location information in which the content 2 and address information of the proxy 3b are associated with each other, and causes the content-storage-location information storage section 13 to store the content-storage-location information (process 168).

[0103] As described above, in Embodiment 1, in a case where the client 4 requests the content from the server 2 and the server 2 has transmitted the same content to the proxy before, the server 2 determines that the proxy 3 cashes the content, and transmits, to the client 4, an instruction to acquire the content from the proxy 3 which

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has been determined to possess the requested content.

[0104] Embodiment 1 is assumed to be applied to a VOD service in which a moving image content is used with an MP4 file format. Accordingly, in terms of loads to the server 2, the proxy 3, and the network 7, "transmission and reception of content" applies the heaviest loads.

[0105] Accordingly, the number of request and response in the sessions 110 and 120 and the sessions 130 and 140 in Example 1 is larger in the present invention than in a conventional method. "Transmission and reception of the content" in the present invention, however, is almost similar to that in the conventional method, except that the content is transmitted and received via the proxy 3 in the present invention. However, because of the sessions 110 and 120 and the sessions 130 and 140, it is possible to carry out "transmission and reception of the content" in the session 160 between the proxy 3b and the client 4a. This particularly decreases (A) a processing load of the server 2 and (B) an amount of transmission information (network load) of a network between the server 2 and the proxy 3.

[0106] For the sake of easy explanation, the following is the simplest example, specifically, an example where two proxies 3, two clients 4, and two kinds of contents managed by the server 2 are used. In a case of an actual content distribution service such as VOD, however, various and many contents are transmitted and received in an extremely huge system. Therefore, the present invention is greatly effective in reducing a load of the server 2 and a load of the network between the server 2 and the proxy 3. To put it another way, in the conventional methods, when the number of clients 4 becomes larger, processing loads especially of the server 2 and to a network between the server 2 and the client 4 become greatly higher, depending on the number of the clients 4. However, by using the present invention, the server 2 can efficiently utilize a throughput of the proxy 3 and a cash function. As a result, the load of the server 2 and the load of the network between the server 2 and the proxy 3 can be shared by the proxy 3 or by the network between the proxy 3 and the client 4.

[HTTP Message in Embodiment 1]

[0107] The requests and responses involved in the operation sequence illustrated in Fig. 7 will be described in detail with reference to Figs. 8 through 10. Figs. 8 through 10 are views each illustrating example HTTP messages transmitted/responded as requests or responses. Fig. 8 shows example HTTP messages transmitted/responded in the sessions 110 and 120. Fig. 9 shows example HTTP messages transmitted/responded in the sessions 130 and 140. Fig. 10 shows example HTTP messages transmitted/responded in the sessions 150 and 160.

[0108] (a), (b), (c), (d), (e), and (f) of Fig. 8 show HTTP messages of the request 111, the response 113, the request 121, the request 123, the response 124, and the response 126 of Fig. 7, respectively.

[0109] (a), (b), (c), (d), (e), and (f) of Fig. 9 show HTTP messages of the request 131, the response 133, the request 141, the request 143, the response 144, and the response 146 of Fig. 7, respectively.

[0110] (a), (b), (c), (d), (e), and (f) of Fig. 10 show HTTP messages of the request 151, the response 153, the request 161, the request 163, the response 165, and the response 166 of Fig. 7, respectively.

[HTTP messages in sessions 110 and 120]

[0111] The HTTP messages in the sessions 110 and 120 will be described below with reference to Fig. 8. Note that (a) through (f) of Fig. 9 correspond to (a) through (f) of Fig. 8, respectively, and that Fig. 9 is different from Fig. 8 only in that a content 1, a proxy 3a, and a client 4a in Fig. 8 are changed to a content 2, a proxy 3b, and a client 4b in Fig. 9, respectively. Therefore, description of the HTTP messages in the sessions 130 and 140 with reference to Fig. 9 will be omitted. Note also that, of all the components of the HTTP messages, (i) components specific to the present invention will be primarily described below and (ii) description of well-known components of the HTTP messages will be appropriately omitted.

(Request 111 to request content)

[0112] As illustrated in (a) of Fig. 8, the HTTP message, which serves as the request 111 (i) transmitted from the client 4a to the server 2 and (ii) requesting the content 1, contains a request line and a header which notifies additional information.

[0113] The request line illustrated in (a) of Fig. 8 contains "GET" followed by additional information, which "GET" indicates a method for acquiring a content and which information specifies what content to be acquired. Specifically, the information is described in the form of "/content name". This means that the HTTP message illustrated in (a) of Fig. 8 serves as a request for transmission of the content 1 described by "content 1" in the request line.

[0114] Headers illustrated in (a) of Fig. 8 include a "Host" header for specifying a server to acquire the content, and the "Host" header shows an address, "example.com", indicative of the address of the server 2.

[0115] The headers illustrated in (a) of Fig. 8 also include an "Accept" header indicative of a data format that can be processed by the client 4a, and the "Accept" header shows, "video/mp4", indicative of video data in MP4 format. This allows the client 4a (the sender of the request) to inform the server 2 (the recipient of the request) that the client 4a is capable of receiving video data in MP4 format.

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(Response 113 specifying device from which content is to be acquired)

[0116] As illustrated in (b) of Fig. 8, the HTTP message, which serves as the response 113 (i) transmitted from the server 2 to the client 4a and (ii) specifying a device from which the content is to be acquired, contains a response line and a header.

[0117] The response line illustrated in (b) of Fig. 8 contains information instructing to use a proxy 3 specified by a "Location" header. Specifically, the instruction is described in the form of "status number (space) message". This means that the HTTP message illustrated in (b) of Fig. 8 serves as a response for instructing the client 4a to request the content 1 from the proxy 3 designated by the "Location" header described below.

[0118] The header illustrated in (b) of Fig. 8 includes the "Location" header for specifying a proxy to be used, and the "Location" header contains address information, "http://example-proxy1.com", indicative of an address of the proxy 3 to be used. From this, the client 4a (the recipient of the response) obtains the address information of the proxy 3 (the device that the client 4a requests the content 1).

(Request 121 requesting content from specified proxy 3)

[0119] As illustrated in (c) of Fig. 8, the HTTP, which serves as the request 121 (i) transmitted from the client 4a to the proxy 3a and (ii) requesting the content 1, contains a request line and headers.

[0120] The request line illustrated in (c) of Fig. 8 contains "GET" followed by a URL, which "GET" indicates a method for acquiring the content and which URL is of the content to be requested. Specifically, the URL is described in the form of "http://name of a server storing a content/content name." This means that the HTTP message illustrated in (c) of Fig. 8 serves as a request for transmission of a content 1 stored in the server 2.

[0121] As in the case of the request 111, the headers illustrated in (c) of Fig. 8 include a "Host" header and an "Accept" header.

(Request 123 from proxy 3a to server 2 for content)

[0122] As illustrated in (d) of Fig. 8, the HTTP message, which serves as the request 123 (i) transmitted from the proxy 3 to the server 2 and (ii) requesting the content 1, contains a request line and headers.

[0123] The request line illustrated in (d) of Fig. 8 contains "GET" followed by a URL, which "GET" indicates a method for acquiring a content and which URL is of the content to be requested. Specifically, the URL is described in the form of "/ content name." This means that the HTTP message illustrated in (a) of Fig. 8 serves as a request for transmission of the content 1 described by "content 1" in the request line.

[0124] As in the case of the request 111, the headers illustrated in (d) of Fig. 8 include a "Host" header and an "Accept" header. The headers also include a "Via" header indicative of a transmission path of the message, which "Via" header contains an address, "example-proxy1.com", indicative of an address of a device via which the message is transferred. From this, the server 2 which received the request finds out via which device (which is the proxy 3a in the present case) the request was transmitted.

(Response 124 to transmit content from server 2 to proxy 3a)

[0125] As illustrated in (e) of Fig. 8, the HTTP message, which serves as the response 124 to transmit the content 1 from the server 2 to the proxy 3a, contains (i) a response line, (ii) headers, and (iii) a body containing the "content 1."

[0126] The response line illustrated in (e) of Fig. 8 contains information indicating that the request has been successfully received, that is, information indicating that the content thus requested is to be transmitted. Specifically, the response line is described in the form of "status number (space) response message".

[0127] The headers contain information regarding a content to be transmitted. In the example illustrated in (e) of Fig. 8, the headers include (i) a "Date" header indicative of date and time when the content was transmitted, (ii) a "Cache-Control" header issuing an instruction regarding a cache of the content, and (iii) a "Content-Type" header indicative of a type of the content to be transmitted.

[0128] In the example, the "Cache-Control" header contains "must-revalidate" causing the proxy 3a to confirm, before the cache of the content is transmitted to other devices, whether or not the content to be transmitted is the latest data. The "Content-Type" header contains "video/mp4" indicating that the content is video data in MP4 format.

[0129] The body illustrated in (e) of Fig. 8 contains "[binary-data: content1]" indicative of the data of the content 1.

(Response 126 to transmit content from proxy 3a to client 4a)

[0130] As illustrated in (f) of Fig. 8, the HTTP message, which serves as the response 126 to transmit the content 1 from the proxy 3a to the client 4a, contains a response line, headers, and a body.

[0131] The response line illustrated in (f) of Fig. 8 contains information indicating that the request has been successfully received, that is, information indicating that the content thus requested is being transmitted. Specifically, the response line is described in the form of "status number (space) response message".

[0132] The headers contain information regarding a content to be transmitted. In the example illustrated in (f)

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of Fig. 8, the headers include (i) a "Cache-Control" header issuing an instruction regarding the cache of the content to be transmitted, (ii) a "Content-Type" header indicative of a type of the content, and (iii) a "Via" header indicative of a transmission path of the message.

[0133] As in the case of the response 124, the "Cache-Control" header and the "Content-Type" header illustrated in (f) of Fig. 8 contain "must-revalidate" and "video/mp4", respectively. A "Via" header (i) indicates that a request containing the "Via" header has been transmitted via a certain device and (ii) contains address information indicative of an address of the device via which the request has been transmitted. The response 124 contains address information, "example-proxy1.com", indicative of an address of the proxy 3a which is a device via which the response 124 was transmitted.

[0134] The body illustrated in (f) of Fig. 8 contains actual data (binary data) of the content 1. The "[binary-data: content1] in (f) of Fig. 8 indicates the data of the content 1.

[HTTP message in sessions 150 and 160]

[0135] The following description will discuss, with reference to Fig. 10, the HTTP messages in the sessions 150 and 160. Note that (a) through (c) and (f) of Fig. 10 correspond to (a) through (c) and (f) of Fig. 8, respectively, and that Fig. 10 is different from Fig. 8 only in that the content 1 and the proxy 3a in Fig. 8 are changed to a content 2 and a proxy 3b in Fig. 10, respectively. Therefore, description of the HTTP messages serving as the request 151, the response 153, the request 161, and the response 166 will be omitted here.

(Request 163 requesting content from proxy 3b to server 2 with condition)

[0136] As illustrated in (d) of Fig. 10, the HTTP message, which serves as the request 163 (i) transmitted from the proxy 3b to the server 2 and (ii) requesting the content 2 with conditions, contains a request line and headers.

[0137] The request line illustrated in (d) of Fig. 10 contains "GET" followed by a URL, which GET indicates a method for acquiring a content and which URL is of the content to be requested. Specifically, the URL is described in the form of "/content name."

[0138] The headers illustrated in (d) of Fig. 10 include (i) an "If-Modified-Since" header which requests a latest version of the content if the content is updated after date and time recorded in the "If-Modified-Since" header, (ii) an "Accept" header, (iii) a "Host" header, and (iv) a "Via" header. The "If-Modified-Since" header contains date and time "Sun, 31 May 2013 15:03:08 GMT" when the proxy 3b cached the content 2 requested by the request 163. This allows the server 2, which is a device that has received the request 163, to determine, based on the date and time when the proxy 3b cached the content 2, whether or not the content 2 stored in the proxy 3b is the latest data.

(Response 165 transmitted from server 2 to proxy 3b)

[0139] As illustrated in (e) of Fig. 10, the HTTP message, which serves as the response 165 (i) transmitted from the server 2 to the proxy 3b and (ii) indicating that the content 2 stored in the proxy 3b is the latest data, contains a response line and a header.

[0140] The response line illustrated in (e) of Fig. 10 contains (i) the response message that the proxy 3b has not updated the content since the date and time when the proxy 3b cached the content and (ii) a status number of the response message. Specifically, the response line is described in the form of "status number (space) response message."

[0141] The header illustrated in (e) of Fig. 10 is a "Date" header indicative of date and time when the response 165 was transmitted.

<Embodiment 2>

[0142] Embodiment 2 of the present invention illustrates an example where a client 4 has a function as and acts as a proxy so that it is possible to widely distribute (i) a processing load of a server 2 and (ii) a network load which is used to transmit data from the server 2.

[0143] More specifically, in Embodiment 2, the client 4, which includes a storage section, (i) caches an acquired content in the storage section, (ii) specifies, based on response messages previously transmitted from the server 2, a device (proxy 3 or client 4) that (possibly) possesses the content, and then (iii) transmits, to a device (client 4) which has requested the content, an instruction to acquire the content from the device thus specified.

[0144] That is, in Embodiment 2, the client 4 (i) is a device that requests a content and then acquires the content and (ii) acts as (a) a relaying device (proxy) that stores the content thus requested and then transfers the content to another device or (b) a playing device that acquires the content thus requested and then plays the content.

[0145] Note that (i) the proxy 3 and a client 4 acting as a proxy are hereinafter each referred to as a relaying device and (ii) a client 4 that acquires a requested content and then plays the content is hereinafter referred to as a content playing device.

[0146] The following description will discuss Embodiment 2 with reference to Figs. 11 through 19. Embodiment 2 is (i) different from Embodiment 1 only in that the client 4 in Embodiment 2 has a function also as a proxy and (ii) similar to Embodiment 1 in regard to the rest of the points. Therefore, the following description will mainly discuss the point in which Embodiment 2 is different from Embodiment 1.

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[Outline of Content Distribution System 1a]

[0147] First, an outline of a content distribution system 1a of Embodiment 2 will be described with reference to Fig. 11. Fig. 11 is a view illustrating a schematic configuration of the content distribution system 1a, and illustrates main configuration of devices constituting the content distribution system 1a. As illustrated in Fig. 11, the content distribution system 1a includes the server 2, the proxy 3, a client 4c, and a client 4d. The content distribution system 1a further includes (i) a content storage section 5 connected to the server 2, (ii) a cache storage section 6 connected to the proxy 3, and (iii) client storage sections 8c and 8d connected to the client 4c and the client 4d, respectively.

[0148] Hereinafter, the client storage sections 8c and 8d are generally referred to as a client storage section 8.

[0149] Since the proxy 3 of Embodiment 2 is similar to the proxy 3 of Embodiment 1 in terms of a configuration and an operation process, the details of the proxy 3 of Embodiment 3 will be omitted here.

[Server 2]

[0150] The server 2 of Embodiment 2 has a configuration identical to that of the server 2 of Embodiment 1. However, since the client 4 of Embodiment 2 acts as a proxy in some cases, part of operations of a response executing section 15, a relaying device specifying section 16, and a content-storage-location information generating section 17 of Embodiment 2 are different from the operations of the corresponding members of Embodiment 1.

[0151] The response executing section 15 (i) receives, via a server communication section 11, a request message requesting transmission of a content, which request message has been transmitted from a relaying device or a content playing device and then (ii) transmits, to the relaying device or the content playing device depending on which one of the devices transmitted the request message, a response message in response to the request message thus received.

[0152] Specifically, the response executing section 15, which is ready to receive a request message to request to transmit a content, (i) receives the request message via the server communication section 11 and then (ii) refers to a header of the request message thus received, so as to determine whether or not the request message was transmitted via a relaying device. For example, the response executing section 15 can be configured to receive a request message and then to (i) determine, in a case where the request message contains a "Via" header (transmission path information), that the request message has been transferred from a relaying device that had received the request message from a content playing device or (ii) determine, in a case where the request message does not contain the "Via" header, that the request message was directly transmitted from the content playing device.

[0153] In a case where a request message is not one transmitted from a relaying device (i.e. the response executing section 15 receives the request message directly from a content playing device which is the sender of the request message), the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to specify address information (e.g. a URI of the proxy 3 or the client 4 etc.) of a relaying device that (possibly) possesses a content requested by the content playing device. Then, the response executing section 15 receives, from the relaying device specifying section 16, the address information of the relaying device that possesses the content requested by the content playing device, and then transmits, in response to the request message, a response message to instruct the content playing device to acquire the content from the relaying device. For example, by supplying the address information to the "Location" field with use of "305 USE Proxy", the response executing section 15 transmits, to the content playing device, an instruction (as a response message) to resend the request message to the relaying device that (possibly) possesses the content requested by the content playing device.

[0154] In a case where the request message thus received is one transmitted via the relaying device (i.e. the response executing section 15 receives the request message from the relaying device), the response executing section 15 proceeds to determine whether or not the request message is a conditional request such as "If-Modified-Since". If the request message is not provided with a conditional request, the response executing section 15 reads out, from the content storage section 5, a content requested by the request message, and then transmits, to the relaying device, the content in response to the request message.

[0155] Meanwhile, in a case where the request message is a conditional request, the response executing section 15 proceeds to determine whether or not the data of the content the relaying device possesses is the latest. To put it another way, the response executing section 15 determines whether or not the data of the content the relaying device possesses is identical to that stored in the content storage section 5.

[0156] In a case where the data of the content possessed by the relaying device from which the request message was transmitted, is not the latest data of the content, the response executing section 15 reads out the requested content from the content storage section 5, and then transmits the content thus read out, to the relaying device in response to the request message. In a case where the data of content possessed by the relaying device from which the request message was transmitted, is the latest data of the content, the response executing section 15 transmits, to the relaying device, a response message (in response to the request message) indicating that the relaying device possesses the latest data. Examples of such a response message encompass "304

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NOT modified".

[0157] As in the case of Embodiment 1, the response executing section 15 also creates a transmission log based on the response message thus transmitted, and then stores the transmission log in a transmission log storage section 12.

[0158] Note that, as in the case of Embodiment 1, in a case where the response executing section 15 transmits the content to a relaying device from which a request message has been transmitted, "Cache-Control: must-revalidate" or "Cache-Control: proxy-revalidate", for example, may be added to the header of the content. Accordingly, in a case where the relaying device, which has acquired the content, transmits the content in response to another request, it is possible to always cause the relaying device to transmit, to the server 2, an inquiry as to whether or not the content is the latest, before the relaying device transmits the content.

[0159] The relaying device specifying section 16 is for determining, in accordance with an instruction from the response executing section 15, a relaying device that (possibly) possesses a content requested by a content playing device.

[0160] Specifically, the relaying device specifying section 16 receives an instruction from the response executing section 15, and accordingly reads out, from a content-storage-location information storage section 13, content-storage-location information. By referring to the content-storage-location information, the relaying device specifying section 16 specifies address information of a relaying device associated with the content, as address information of the relaying device from which the content requested by a content playing device is to be acquired. Thereafter, the relaying device specifying section 16 transmits the address information thus specified to the response executing section 15.

[0161] In a case where content-storage-location information for a content requested by a content playing device is not stored in the content-storage-location information storage section 13, the relaying device specifying section 16 can (i) specify predetermined (default) address information as address information of a relaying device from which the content is to be acquired, which predetermined address information is specific to each content requested by a content playing device or (ii) randomly select, out of relaying devices connected to the server 2 via a network 7, a relaying device from which the content is to be acquired.

[0162] In a case where the content-storage-location information storage section 13 stores a plurality of pieces of content-storage-location information containing address information of relaying devices which are each associated with a content requested by a content playing device, the relaying device specifying section 16 can (i) specify the pieces of address information as address information from which the content is to be acquired and then (ii) create a list of the relaying devices from which the content is to be acquired, which relaying devices are indicated by the respective pieces of address information thus identified. In a case where the relaying device specifying section 16 specifies the plurality of pieces of address information as address information each indicative of a location from which the content is to be acquired, the relaying device specifying section 16 can create a list of content storage location by assigning priorities to the plurality of pieces of address information.

[0163] As in the case of Embodiment 1, the relaying device specifying section 16 may (i) select, based on date and time contained in content-storage-location information, a relaying device from which a content is to be acquired or (ii) select, based on physical or network-structural distances between a content playing device and relaying devices, a relaying device from which a content is to be acquired. The relaying device specifying section 16 may also select, in view of the load status of each relaying device, a relaying device which (i) (possibly) possesses a content requested by a content playing device and (ii) has a low load. To be more specific, the relaying device specifying section 16 can select, by referring to a transmission log stored in the transmission log storage section 12, address information of a relaying device from which the content is acquired. In addition, the relaying device specifying section 16 may select, in view of the number of accesses to the server 2 from the relaying devices access, a relaying device that (possibly) possesses a content requested by a content playing device. Note that a process in Embodiment 2 carried out by the relaying device specifying section 16 in order to determine which relaying device (possibly) possesses a content requested by a content playing device is identical to a process in Embodiment 1 carried out by the relaying device specifying section 16 in order to determine which proxy 3 (possibly) possesses a content requested by the client 4. Hence, description of the process in Embodiment 2 will be omitted here.

[0164] The content-storage-location information generating section 17 is for (i) generating, from a transmission log stored in the transmission log storage section 12, content-storage-location information for determining address information of a relaying device that (possibly) possesses a content and then (ii) storing the information in the content-storage-location information storage section 13. Unlike the case of Embodiment 1, the content-storage-location information generating section 17 in accordance with Embodiment 2 includes, as a device that (possibly) possesses a content, not only the proxy 3 but also the client 4.

[0165] Specifically, the content-storage-location information generating section 17 generates content-storage-location information by associating (A) a content transmitted from the server 2, (B) address information to which the content was transmitted, and (C) the date and time when the content was transmitted from the server 2, wherein the content, the address information, and the date and time are specified by referring to a transmission log (content transmission log), which indicates that the

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server 2 has transmitted the content to a relaying device. This is because the relaying device, to which the content has been transmitted, is considered to store the content.

[0166] The content-storage-location information generating section 17 generates content-storage-location information by associating (A) a content confirmed as a latest version, (B) address information of a device (relaying device) which possesses the content, and (C) the date and time when the server 2 transmitted a response message that indicates that the content possessed by the relaying device is the latest version, wherein the content, the address information, and the date and time are specified by referring to a transmission log (version notification log), which indicates that the server 2 has transmitted the response message. This is because the relaying device, to which the response message has been transmitted, stores the latest version of the content.

[0167] The content-storage-location information generating section 17 can generate content-storage-location information by associating (A) a content, (B) address information to which a content acquisition instruction for the content was transmitted, and (C) date and time when the response message was transmitted, wherein the content, the address information, and the date and time are specified by referring to a transmission log (acquisition instructing log), which indicates that the server 2 transmitted to a content playing device the content acquisition instruction to specify a device from which the content is to be acquired. This is because the content playing device, to which the content acquisition instruction has been transmitted, is highly likely to store the content.

[0168] There is a possibility that a playing device, to which a content acquisition instruction for a content has been transmitted, fails to acquire the content. Therefore, it is possible to generate content-storage-location information by utilizing both a content transmission log and an acquisition instructing log. That is, in a case where an acquisition instructing log for a content and a content transmission log indicative of transmission of the content from the server 2 to a relaying device are both available, it is possible to generate content-storage-location information by associating together (i) the content, (ii) an address to which the content acquisition instruction has been transmitted, and (iii) date and time contained in the content transmission log. This is because (a) a playing device is considered to request the content from the server 2 in a case where a relaying device that a content acquisition instruction designates as a device from which the content is to be acquired does not store the content and (b), in a case where the server 2 responds to the request for the content, the content is transmitted to the playing device via a relaying device.

[0169] The content-storage-location information generating section 17 can generate content-storage-location information with use of an acquisition instructing log and a version notification log. That is, in a case where there exist (i) a content transmission log which indicates transmission of a content acquisition instruction instructing a playing device to acquire a content from a certain relaying device and (ii) a version notification log which indicates that the server 2 notified the relaying device that the content possessed by the relaying device is the latest version of the content, the content-storage-location information generating section 17 can generate content-storage-location information by associating together (i) the content, (ii) an address of the playing device to which the content acquisition instruction was transmitted, and (iii) date and time contained in the version notification log.

[0170] The content-storage-location information generating section 17 may generate content-storage-location information (i) whenever a certain transmission log is added to the transmission log storage section 12 or (ii) by reading out a transmission log at the regular intervals.

[0171] Examples of a specific operation of the content-storage-location information generating section 17 in accordance with Embodiment 2 will be described below with reference to Figs. 12 and 13. Fig. 12 is a table illustrating an example of a transmission log stored in the transmission log storage section 12. Fig. 13 is a table illustrating an example of content-storage-location information stored in the content-storage-location information storage section 13. An example of the operation of the content-storage-location information generating section 17 for generating the content-storage-location information illustrated in Fig. 13 will be described below with reference to the transmission log illustrated in Fig. 12.

[0172] First, the content-storage-location information generating section 17 generates content-storage-location information 45 of Fig. 13 by associating together, with use of a transmission log (content transmission log) 42 in which "200 OK" is contained, (i) "content 1", (ii) http://example-proxy1.com, and (iii) "Sun, 31 May 2013 13:53:38 GMT", each of which is contained the transmission log 42.

[0173] Then, the content-storage-location information generating section 17 generates content-storage-location information 46 from (i) a transmission log (acquisition instructing log) 41 in which "305 Use Proxy (proxy 1)" is contained and (ii) the transmission log 42 (a) in which "200 OK" is contained, (b) which has a content ID identical to that of the transmission log 41, and (c) which indicates that "proxy 1" contained in the transmission log 41 has been responded. In other words, the content-storage-location information 46 illustrated in Fig. 13 is generated by associating together "content 1", "http://example-client1.com" which is an address (contained in the transmission log 41) of a designation and "Sun, 31 May 2013 13:53:38 GMT" which is a date and time (contained in the transmission log 42) when the request was transmitted.

[0174] Note that, since "http://example-proxy1.com" is also considered to store "content 1", "http://example-proxy1.com" can be added to address information contained in the content-storage-location information 46.

[0175] Thereafter, the content-storage-location information generating section 17 generates content-stor-

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age-location information 47 illustrated in Fig. 13 by associating together, with use of a transmission log (version notification log) 44 in which "304 Not Modified" is contained, (i) "content 1", (ii) "http://example-client1.com", and (iii) "Mon, 01 Jun 2013 08:05:30 GMT", each of which is contained the transmission log 44.

[0176] Finally, the content-storage-location information generating section 17 generates content-storage-location information 46 from (i) a transmission log (acquisition instructing log) 43 in which "305 Use Proxy (client 1)" is contained and (ii) the transmission log 44 (a) in which "304 Not Modified" is contained, (b) which has a content ID identical to that of the transmission log 43, and (c) which indicates that "client 1" contained in the transmission log 43 has been responded. To put it another way, the content-storage-location information 47 is generated by associating together "content 1", "http://example-client2.com" which is an address (contained in the transmission log 43) of a recipient of a request for a content, and "Mon, 01 Jun 2013 08:05:30 GMT" which is a date and time (contained in the transmission log 44) when the request was transmitted. Note that, since "http://example-client1.com" also is expected to store "content 1", "http://example-client1.com" can be added to address information contained in the content-storage-location information 47.

[Client 4]

[0177] The client 4 in accordance with Embodiment 2 functions also as a proxy. Therefore, unlike the case of Embodiment 1, a client control section 32 in accordance with Embodiment 2 includes a response/request executing section 35 instead of a request executing section 33. A client storage section 8 for caching contents is connected to the client 4. Alternatively, the client storage section 8 can be provided inside the client 4.

[0178] In a case where the client 4 acts as a content playing device, the response/request executing section 35 executes an operation similar to that of the request executing section 33.

[0179] Specifically, the response/request executing section 35 generates a request message requesting transmission of a content, transmits the request message to the server 2 via a client communication section 31, and then receives a response message as a response to the request message. That is, the response/request executing section 35 receives, as the response message from the server 2, (i) information that specifies a relaying device and (ii) an instruction to transmit, to the relaying device, a request message requesting the content. The response/request executing section 35 receives the response message, and then transmits, to the relaying device thus specified by the server 2, the request message requesting transmission of the content. Thereafter, the response/request executing section 35 receives the content from the relaying device, and then stores in the content in the client storage section 8.

[0180] In a case where the client 4 acts as a relaying device, the response/request executing section 35 executes an operation similar to that of a request executing section 23 of the proxy 3.

[0181] Specifically, the response/request executing section 35 acts as a device for transmitting, to a content playing device, a content specified by a request message requesting the content, which request message was transmitted from the content playing device.

[0182] More specifically, the response/request executing section 35, which is ready to receive from a content playing device a request message to request transmission of a content, (i) receives a request message from the content playing device via the client communication section 31 and then (ii) determine whether or not the content thus requested is stored in the client storage section 8.

[0183] In a case where the content is not stored in the client storage section 8, the response/request executing section 35 (i) examines a Host field of the request message and then (ii) transmits a request message to a server 2 whose URL is shown in the Host field, which request message requests the content requested by the content playing device. Thereafter, the response/request executing section 35 acquires the content from the server 2, stores the content thus acquired in the client storage section 8, and then transmits the content to the content playing device.

[0184] In a case where the content is stored in the client storage section 8, the response/request executing section 35, in order to transmit, to the server 2, an inquiry as to whether or not the content stored in the client storage section 8 is the latest data, (i) creates a request message with a conditional request by adding, to a regular request message, "If-Modified-Since" containing information about time at which the relaying device (client 4) has acquired the content and then (ii) transmits, to the server 2, the request message thus created.

[0185] Upon receipt of a "304 NOT Modified" response message from the server 2 in response to the request message, the response/request executing section 35 (i) determines that the content stored in the client storage section 8 is the latest data, (ii) reads out the content from the client storage section 8, and then (iii) transmits the content to the content playing device.

[0186] On the other hand, in a case where the content stored in the client storage section 8 is not the latest data, the server 2 transmits, to the response/request executing section 35, the latest version of the content in response to the request message, and then the response/request executing section 35 receives the content thus transmitted. Thereafter, the response/request executing section 35 stores the content thus received in the client storage section 8, and then transmits the content to the content playing device.

[0187] Note that the response/request execution section 23 may transmit the content to the content playing device while the content contains, in its header,

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"Cache-Control: must-revalidate" or "Cache-Control which has been added by the server 2. Accordingly, in a case where the content, which has been acquired by the content playing device serving as a destination of a content, is transmitted in response to another request, it is possible to cause the content playing device to always transmits, to the server 2, an inquiry as to whether or not the content is the latest version before the content playing device transmits the content.

[Processes carried out by each device]

[0188] The following description will discuss, with reference to Figs. 14 through 16, processes carried out by the server 2 and the client 4. Since a process carried out by the proxy 3 in Embodiment 2 is identical to that in Embodiment 1, description of the process will be omitted here.

[Process carried out by server 2]

[0189] The operation carried out by the server 2 will be described first with reference to Fig. 14. Fig. 14 is a flowchart showing an exemplary process which is carried out by the server 2.

[0190] The response executing section 15 is ready to receive a request message to request to transmit a content. When the response executing section 15 receives, via the server communication section 11, the request message to request to transmit the content (S501), the response executing section 15 refers to a header of the request message thus received, so as to determine whether or not the request message thus received is transmitted via a relaying device (S502).

[0191] In a case where the content playing device has transmitted the received request message (NO in S502), the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to specify a relaying device from which the content playing device acquires the content. In response to the instruction from the response executing section 15, the relaying device specifying section 16 reads out content-storage-location information from the content-storage-location information storage section 13 (S503). With reference to the content-storage-location information thus read out, the relaying device specifying section 16 specifies, as address information of a device from which the content should be acquired, a URI of the relaying device associated with the content that the content playing device requests (S504). The relaying device specifying section 16 transmits such specified address information to the response executing section 15. The response executing section 15 transmits, to the content playing device, from the relaying device indicated by an address contained in the address information which has been specified by the relaying device specifying section 16, a response message to instruct the content playing device to acquire a requested content (S505). The response executing section 15 creates a transmission log based on the response message which has been transmitted to the content playing device, and adds the transmission log thus created to the transmission log storage section 12 (S510).

[0192] Meanwhile, in a case where the relaying device transmits the request message thus received (YES in S502), the response executing section 15 then determines whether or not the received request message is a conditional request such as "If-Modified-Since" (S506). In a case where the received request message is not a conditional request (NO in S506), the response executing section 15 reads out, from the content storage section 5, the content requested by the relaying device, and, in response to the request message from the relaying device, transmits the content thus read out to the relaying device (S507). After that, the response executing section 15 creates a transmission log based on the response message which has been transmitted to the relaying device, and adds the transmission log thus created to the transmission log storage section 12 (S510).

[0193] In a case where the received request message is provided with a conditional request (YES in S506), the response executing section 15 determines whether or not data of the content held by the relaying device is the latest (S508). In a case where the data of the content kept by the relaying device is not the latest (NO in S508), the response executing section 15 reads out, from the content storage section 5, the content requested by the relaying device, and, in response to the request message from the relaying device, transmits to the relaying device the content thus read out (S507). Meanwhile, in a case where the data of the content held by the relaying device is the latest (YES in S508), the response executing section 15 transmits, to the relaying device, a response message that the data of the content held by the relaying device is the latest, in response to the request message from the relaying device (S509). Then, the response executing section 15 adds, to the transmission log storage section 12, the response message which has been transmitted to the relaying device (S510).

[0194] Note that, in a case where the response executing section 15 transmits the content to the relaying device in S507, "Cache-Control: must-revalidate" or "Cache-Control: proxy-revalidate", for example, is added to the header of the content. Accordingly, in a case where the relaying device serving as a destination of a content transmits the content held by the cache storage section 6 in response to another request, it is possible to always cause the relaying device to transmit, to the server, an inquiry as to whether or not the content is the latest, before the relaying device transmits the.

[Process carried out by client 4]

[0195] A process carried out by the client 4 will be described next with reference to Figs. 15 and 16. As described earlier, the client 4 acts as a relaying device or as a content playing device. An operation of the client 4

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in a case where the client 4 acts as a content playing device will be described first with reference to Fig. 15.

(Process carried out by client 4 as content playing device)

[0196] Fig. 15 is a flowchart showing an exemplary process which is carried out by the client 4 serving as a content playing device. As shown in Fig. 15, the response/request executing section 35 transmits, to the server 2, a request message to request to transmit a content (S521). In response to the request message, the response/request executing section 35 receives a response message to instruct the response/request executing section 35 to acquire a content from a designated relaying device (S522). In response to such an instruction from the server 2, the response/request executing section 35 transmits the request message to the relaying device designated by the server 2 (S523). Then, in response to the request message, the response/request executing section 35 acquires the content from the relaying device which has received the request message (S524).

(Process carried out by client 4 as content playing device)

[0197] The description will discuss, with reference to Fig. 16, a process of the content 4 in a case where the client 4 acts as a content playing device. Fig. 16 is a flow chart showing an exemplary process which is carried out by a client 4 acting as a content playing device.

[0198] As shown in Fig. 16, the response/request executing section 35 is ready to receive, from a content playing device (the client 4 different from the one described in the previous example), a request message requesting transmission of a content. The response/request executing section 35 receives the request message from the content playing device via the client communication section 31 (S541), and then determines whether or not the content requested by the request message is stored in the client storage section 8 (S 542).

[0199] In a case where the content is not stored in the client storage section 8 (NO in S542), the response/request executing section 35 examines a Host field of the request message, and then transmits a request message to a server 2 whose URL is shown in the Host field, which request message requests the content requested by the content playing device (S543). The response/request executing section 35 acquires the content from the server 2 (S544), stores the content thus acquired in the client storage section 8 (S545), and then transmits the content to the content playing device (S546).

[0200] In a case where the content requested by the content playing device is stored in the content storage section 8 (YES in S542), the response/request executing section 35 (i) creates a request message provided with a conditional request by adding, to a regular request message, "If-Modified-Since" containing information about time at which the client device 4 has acquired the content and then (ii) transmits the request message thus created to the server 2 (S547).

[0201] Upon receipt of a "304 NOT Modified" response message from the server 2 (YES in S548), the response/request executing section 35 reads out the content stored in the client storage section 8, and then transmits the content to the content playing device (S426).

[0202] On the contrary, in a case where the content stored in the client storage section 8 is not the latest data, the server 2 transmits, to the response/request executing section 35, the latest version of the content as a response to the request message (carrying the conditional request), and then the response/request executing section 35 receives the content thus transmitted (S544). The response/request executing section 35 stores the content thus received in the client storage section 8 (S545), and then transmits the content to the content playing device (S546).

[0203] Note that, in S546, the response/request execution section 23 transmits the content to the content playing device while the content contains, in its header, "Cache-Control: must-revalidate" or "Cache-Control which has been added by the server 2. Accordingly, in a case where the content, which has been acquired by the client 4 serving as a destination of a content, is transmitted in response to another request, it is possible to keep such a state that the content playing device should always transmit, to the server 2, as to whether or not the content is the latest version, before the content playing device transmits the content.

[Example 2]

[0204] The following description will further discuss Embodiment 2 in more detail with reference to Fig. 17 illustrating Example 2. Example 2 will illustrate an exemplary operation of a content distributing system 1a which instructs, to a content playing device (which is a client 4d), from which relaying device (client 4c) the content playing device should acquire a content. Fig. 17 is a view illustrating an example operation sequence of the content distribution system 1a in Example 2.

[0205] Note that Example 2 is carried out on the following conditions. A content 1 is stored in the content storage section 5, and both the client storage sections 8c and 8d and the cache storage section 6 cashes no content. Further, the server 2 is set so that the content 1 is acquired from the proxy 3 as its default. Furthermore, when the process shown in Fig. 17 is started in Example 2, a transmission log and content-storage-location information are not stored in the transmission log storage section 12 and the content-storage-location information storage section 13, respectively. Still further, the response executing section 15 creates the transmission log of Fig. 12 every time when a response message is transmitted, and the content-storage-location information generating section 17 generates the content-storage-location information of Fig. 13 every time when a content transmission

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log or a version notification log (transmission log whose "transmitted contents" is "200 OK" or "304 Not Modified") is added to the transmission log storage section 12.

[0206] Further, Example 2 is carried out on condition that a sequence starting from a time at which the content playing device transmits a request message and ending at a time at which the content playing device receives a response message in response to the request message is considered as a single session.

[0207] As shown in Fig. 17, in a session 210, the client 4c transmits, to the server 2, a request message to request to transmit the content 1 (request 211). In the server 2 which has received the request 211, the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to specify a relaying device to acquire the content 1. In response to the instruction, the relaying device specifying section 16 confirms whether or not the content-storage-location information is stored in the content-storage-location information storage section 13 (process 212). Here, the content-storage-location information storage section 13 does not contain the content-storage-location information indicative of the proxy 3 to acquire the content 1, the relaying device specifying section 16 specifies the default proxy 3a as the proxy 3 to acquire the content 1. The response executing section 15 transmits, to the client 4a, the response message to instruct the client 4c to acquire a requested content from the proxy 3 indicated by address information specified by the relaying device specifying section 16 (response 213). Then, the response executing section 15 creates a transmission log based on the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 214).

[0208] Then, in the session 220, the client 4c, which has received the response 213, transmits, to proxy 3, the request message to request to transmit the content 1 (request 221). The proxy 3 received the request 221 confirms whether or not the content 1 is stored in the cache storage section 6 (process 222). Here, the content 1 is not stored in the cache storage section 6, so that the proxy 3 transmits, to the server 2, the request message based on the request 221 (request 223). In the server 2 which has received the request 223 from the proxy 3, the response executing section 15 transmits the content 1 to the proxy 3 (response 124). The proxy 3a received the response 124 stores the acquired content 1 in the cache storage section 6 and caches the content 1 (process 225). After that, the proxy 3a transmits, to the client 4a, the content 1 as a response to the request 221 (response 226). When acquiring the content 1 from the proxy 3, the client 4c stores the content 1 thus acquired in the client storage section 8c and caches the content 1 (process 227). Note that, after transmitting the response 224, the response executing section 15 creates a transmission log based on the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 228). Further, the content-storage-location information generating section 17 generates content-storage-location information by associating the content 1 and address information of the proxy 3 with each other, and causes the content-storage-location information to be stored in the content-storage-location information storage section 13. Furthermore, the content-storage-location information generating section 17 generates content-storage-location information by associating the content 1 and address information of the client 4c with each other, and causes the content-storage-location information to be stored in the content-storage-location information storage section 13(process 229).

[0209] When the session 220 is completed, the content 1 is in a state of being cached in the cache storage section 6 of the proxy 3 and in the cache storage sections 8c of the client 4c. That is, the content-storage-location information storage section 13 stores (A) the content-storage-location information in which the content 1 and the proxy 3a are associated with each other and (B) content-storage-location information in which the content 1 and the client 4 are associated with each other. That is, in this state, not only the proxy 3 but also the client 4c potentially serves as a relaying device from which the content 1 is acquired.

[0210] Next, in a session 230, the client 4d transmits, to the server 2, a request message to request to transmit the content 1 (request 231). In the server 2 which has received the request 231, the response executing section 15 transmits, to the relaying device specifying section 16, an instruction to specify a relaying device from which the content 1 is to be acquired. The relaying device specifying section 16 receives the instruction, and then checks the content-storage-location information in the content-storage-location information storage section 13 (process 232). At this point, (i) the information stored in the content-storage-location information storage section 13 identifies the proxy 3b and the client 4c both as locations where the content 1 is stored and (ii) the content-storage-location information pointing to the client 4c is later than the content-storage-location information pointing to the proxy 3. Therefore, the relaying device specifying section 16 specifies the client 4c as a relaying device from which the content 1 is to be acquired. The response executing section 15 transmits, to the client 4d, a response message with an instruction to acquire the content 1 from the client 4c thus specified by the relaying device specifying section 16 (response 233). The response executing section 15 creates a transmission log based on the response message, and then adds the transmission log to the transmission log storage section 12 (process 234).

[0211] In a session 240, the client 4d (which has received the response 233) transmits, to the client 4c, a request message (request 241) in accordance with the instruction of the server 2, which request message request to transmit the content 1. The client 4c receives the request 241, and then checks whether or not the content 1 is stored in the client storage section 8c (process 242). Since the content 1 is already stored in the client storage section 8c, the client 4c transmits a conditional

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request message (request 243) to the server 2 in order to examine whether or not the content 1 stored in the client storage section 8c is the latest data, which conditional request message is created by adding "If-Modified-Since" to a request message based on the request 241. The request 243 contains a "Via" header, and is a conditional request. Hence, the response executing section 15 in the server 2 that has received the request 243 verifies whether or not the content 1 stored in the client 4c is the latest data (process 244). The response executing section 15 determines that the content 1 stored in the client 4c is the latest data, and then transmits, to the client 4c, a response message in which "304 NOT Modified" is contained (response 245). Upon receipt of the response 245, the client 4c reads out the content 1 stored in the client storage section 8c, and then transmits, to the client 4d, the content 1 in response to the request 241 (response 246). Subsequent to the transmission of the response 245, the response executing section 15 creates a transmission log based on the response message thus transmitted, and then adds the transmission log to the transmission log storage section 12 (process 247). The content-storage-location information generating section 17 generates content-storage-location information by associating the content 1 with the address information of the client 4c, and then stores the content-storage-location information in the content-storage-location information storage section 13. The content-storage-location information generating section 17 also creates content-storage-location information associating the content 1 with address information of the client 4d, and then stores the content-storage-location information in the content-storage-location information storage section 13 (process 248).

[0212] In Embodiment 2, the client 4 acts as a content playing device or as a relaying device. This gives a greater number of candidates that the server 2 can designate as a relaying device. Therefore, a processing load of the server 2 and a network load which is used to transmit data from the server 2 can be diluted by more widely distributing the loads over the network so that the loads are also shared by the clients 4 and networks between a client 4 and another client 4.

[HTTP Message in Example 2]

[0213] The details of the requests and responses illustrated in the operation sequence diagram of Fig. 17 will be illustrated in Figs. 18 and 19. Figs. 18 and 19 are views each illustrating example HTTP messages transmitted/received as requests and responses, Fig. 18 particularly illustrating HTTP messages in the session 210 and 220, and Fig. 19 particularly illustrating HTTP messages in the sessions 230 and 240.

[0214] (a), (b), (c), (d), (e), and (f) of Fig. 18 illustrate HTTP messages of the request 211, the response 213, the request 221, the request 223, the response 224, and the response 226 of Fig. 17, respectively.

[0215] (a), (b), (c), (d), (e), and (f) of Fig. 19 illustrate HTTP messages of the request 231, the response 233, the request 241, the request 243, the response 245, and the response 246 of Fig. 17, respectively.

[0216] (a) through (f) of Fig. 18 correspond to (a) through (f) of Fig. 8, respectively, and Fig. 18 is different from Fig. 8 only in that the client 4a and the proxy 3a in Fig. 8 are changed to the client 4c and the proxy 3 in Fig. 18, respectively. Also, (a) through (f) of Fig. 19 correspond to (a) through (f) of Fig. 10, respectively, and Fig. 19 is different from Fig. 10 only in that the content 2, the client 4a, and the proxy 3b in Fig. 10 are changed to the content 1, the client 4d, and the client 4c in Fig. 19, respectively. Description other than the above difference has been already made.

<Embodiment 3>

[0217] Embodiment 3 of the present invention will discuss an example where (i) a server 2 specifies a plurality of relaying devices from which a content is acquired and (ii) a content playing device acquires a content by selecting a relaying device from the plurality of relaying devices thus specified, in order to more widely distribute a load of a network between the content playing device and the relaying device.

[0218] Specifically, in Embodiment 3, a client 4, which is the content playing device, (i) selects one relaying device from the plurality of relaying devices specified by the server 2 and (ii) acquires a content from the relaying device thus selected. In a case where a delay occurs in regard to the acquisition of the content while the content is being acquired, the client 4 reselects another relaying device from the plurality of relaying devices specified by the server 2, so as to change the relaying device from which the content is acquired.

[0219] Embodiment 3 will be described below with reference to Figs. 20 through 28. Embodiment 3 differs from Embodiment 2 only in a configuration of the client 4 and a data format of a content which is managed by the server 2, and Embodiment 3 is identical to Embodiment 2 in other points. As such, the difference of Embodiment 3 from Embodiment 2 will be mainly described below.

[Outline of content distribution system 1b]

[0220] First, an outline of a content distribution system 1b of Embodiment 3 will be described with reference to Fig. 20. Fig. 20 is a view illustrating an outline of the content distribution system 1b in accordance with Embodiment 3 and a main configuration of devices constituting the content distribution system 1b. As illustrated in Fig. 20, the content distribution system 1b includes the server 2, proxies 3a, 3b and 3c, and clients 4e and 4f. Further, the content distribution system 1b includes: a content storage section 5 which is connected to the server 2; cache storage sections 6a, 6b, and 6c which are connected to the proxies 3a, 3b, and 3c, respectively;

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and client storage sections 8e and 8f which are connected to the client 4e and 4f, respectively.

[0221] The proxy 3 of Embodiment 3 is identical to the proxy 3 of Embodiment 1 in a configuration and an operation process. As such, details of the proxy 3 will not be discussed here.

[Server 2]

[0222] The server 2 of Embodiment 3 (i) has the same configuration with that of the server 2 of Embodiment 2 and (ii) executes the same operation as that of the server 2 of Embodiment 2. However, in order to allow the content playing device to select a relaying device from which a content is acquired, the server 2 of Embodiment 3 (i) specifies a plurality of relaying devices which (possibly) possess a content that the content playing device requests, (ii) presents, to the content playing device, a content storage location list containing address information of the plurality of relaying devices thus specified, and (iii) instructs the content playing device to acquire a content from one of the relaying devices which exist at an address indicated by the address information contained in the content storage location list thus presented.

[0223] Specifically, upon receipt of a request message to request a content directly from the content playing device, a response executing section 15 transmits, to a relaying device specifying section 16, an instruction to specify address information of a relaying device (e.g., URI of the proxy 3 or the client 4, etc.) which (possibly) possesses the content that the content playing device requests. Then, the response executing section 15 receives a content storage location list, from the relaying device specifying section 16, the content storage location list containing a plurality of pieces of address information of the relaying device which possesses the content that the content playing device requests. Then, the response executing section 15 transmits a response message to the content playing device in response to the request message from the content playing device, the response message instructing to acquire the content that the content playing device requests, from one of the relaying devices of the address indicated by the address information contained in the content storage location list which is created by the relaying device specifying section 16.

[0224] Note that, since other processes of the response executing section 15 are identical to those of Embodiment 2, those processes will not be discussed here.

[0225] In accordance with the instruction from the response executing section 15, the relaying device specifying section 16 (i) specifies a plurality of relaying devices which (possibly) possess a content that the content playing device requests and (ii) creates a content storage location list containing address information of the plurality of relaying devices thus specified.

[0226] Specifically, the relaying device specifying section 16 reads out content-storage-location information from the content-storage-location information storage section 13 in accordance with the instruction of the response executing section 15. With reference to the content-storage-location information thus read out, the relaying device specifying section 16 (i) specifies a plurality of pieces of address information of a relaying device associated with the content that the content playing device requests and (ii) creates a content storage location list containing the plurality of pieces of address information thus specified. The relaying device specifying section 16 transmits the content storage location list thus created to the response executing section 15.

[0227] In a case where the content-storage-location information storage section 13 stores (i) no content-storage-location information containing the content that the content playing device requests or (ii) only one piece of content-storage-location information containing the content that the content playing device requests, the relaying device specifying section 16 may (a) specify predetermined (default) address information as address information of the device from which the content that the content playing device requests is available, and (b) creates a content storage location list containing a plurality of pieces of address information. Further, in a case where the content-storage-location information storage section 13 stores (i) no content-storage-location information containing the content that the content playing device requests or (ii) only one piece of storage location information containing the content that the content playing device requests, the relaying device specifying section 16 may (a) specify, at random, from relaying devices connected to the server 2 via a network 7, address information of the device from which the content is acquired and (b) create a content storage location list.

[0228] Moreover, the relaying device specifying section 16 may create a content storage location list by adding priorities to the pieces of address information thus specified. In this case, as with Embodiment 2, a priority may be determined on a basis of date and time contained in the content-storage-location information, a physical or a network-structural distance between the content playing device and the relaying device, a load status of the relaying device, a transmission log which is stored in a transmission log storage section 12, or the like.

[Client 4]

[0229] The client 4 of Embodiment 3, unlike that of Embodiment 2, when functioning as a content playing device, (i) receives a content storage location list which is transmitted from the server 2 and (ii) acquires a content that the client 4 requests, from one of relaying devices which exist at an address indicated by the address information contained in the content storage location list thus received.

[0230] In the client 4 illustrated in Fig. 20, a client control section 32 includes, in addition to a response/request executing section 35, a client status determining section 36 and a relaying device selecting section (relaying de-

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vice changing means) 37, both of which are not included in Embodiment 2.

[0231] The response/request executing section 35 receives, from the server 2, as a response message, (i) a content storage location list and (ii) an instruction to transmit a request message for requesting a content to one of the relaying devices which exist at the address indicated by the address information contained in the content storage location list.

[0232] When the response/request executing section 35 receives the content storage location list and the instruction, the relaying device selecting section 37 selects one of pieces of the address information contained in the content storage location list that the response/request executing section 35 receives. The relaying device selecting section 37 transmits, to the response/request executing section 35, an instruction to acquire a content from a relaying device of an address indicated by the address information thus selected.

[0233] In a case where priority is not added to the address information contained in the content storage location list (in a case where the server 2 does not instruct an order of selecting a relaying device from which a content is acquired), the relaying device selecting section 37 may select (i) a relaying device, at random, on a basis of the address information contained in the content storage location list, (ii) a relaying device on a basis of a predetermined rule (default), or (iii) a relaying device having a shortest physical or network-structural distance to the client 4.

[0234] Meanwhile, in a case where priority is added to the address information contained in the content storage location list, the relaying device selecting section 37 selects address information having a highest priority.

[0235] When the relaying device selecting section 37 receives, from the client status determining section 36, delay information indicating that an acquisition speed at which the response/request executing section 35 acquires a content (receiving speed required to acquire a content) is slower than a predetermined receiving speed, the relaying device selecting section 37 (i) changes the relaying device from which the content is acquired, from the relaying device that the relaying device selecting section 37 selects, to another relaying device which exists at the address indicated by the address information contained in the content storage location list and (ii) transmits, to the response/request executing section 35, an instruction to acquire a content from the another relaying device thus changed to.

[0236] Here, in a case where priority is not added to the address information contained in the content storage location list, the relaying device selecting section 37 may select (i) a relaying device, at random, on a basis of the address information contained in the content storage location list, (ii) a relaying device on a basis of a predetermined rule (default), or (iii) a relaying device having a second shortest physical or a network-structural distance to the client 4.

[0237] Meanwhile, in a case where priority is added to the address information contained in the content storage location list, the relaying device selecting section 37 selects address information having a second highest priority.

[0238] The client status determining section 36 detects an occurrence of a predetermined event. Specifically, the client status determining section 36 detects an event that a content is received with delay when the content playing device acquires, from the relaying device, the content that the content playing device requires. The event indicates (i) a network communication status between the content playing device and the relaying device and/or (ii) a size of a load of the relaying device. When detecting the event that the content is received with delay, the client status determining section 36 transmits, to the relaying device selecting section 37, delay information indicating the event thus detected.

[Format of content]

[0239] Next, in Embodiment 3, a format of a content which is stored in the content storage section 5 will be described with reference to (a) of Fig. 21. (a) of Fig. 21 is a view illustrating an example format of the content.

[0240] As illustrated in (a) of Fig. 21, a media file, which is data indicating the content, is fragmented by a predetermined unit. The unit is not particularly limited but the media file may be fragmented (i) by a time unit such as one minute or (ii) by a unit of GOP (group of picture) in an image coding.

[0241] In the following description, the fragment is referred to as a movie fragment, and an MP4 file is used as a specific example of a media file which is constituted by the movie fragment.

[0242] In a case where the MP4 file is used as a media file, a fragment which is constituted by "moof" storing header information which manages an image and a sound in the fragment and "mdat" storing data such as an image and a sound which are played by a client corresponds to the movie fragment.

[0243] Here, as to the MP4 file, in addition to "moof" and "mdat," information (e.g., image resolution, profile information, etc.) related to an entire media file, that is, information (play information) required for a formatting of a content playing section 34 in the client 4, is stored in "moov," which is different from the "moof" or the "mdat."

[0244] Accordingly, it is necessary to notify, before a play starts, the client 4 of the play information stored in "moov". The play information stored in "moov" may be notified in a procedure different from that for the movie fragment, and it is not always necessary to include "moov" in the movie fragment. However, the following description will discuss an example where a first movie fragment in each of media files includes "moov." That is, "information required for the formatting of the playing device" illustrated in (a) of Fig. 21 is "moov."

[0245] As illustrated in Fig. 21, consecutive reference

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numerals "movie fragment 1", "movie fragment 2" ... are assigned to a movie fragment in each of the media files in the order from the first movie fragment. Note that each of the movie fragments includes image data for one minute.

[Format for transmission of content]

[0246] Next, in the content distribution system 1b of the present invention, a transmission unit of the content will be described. In the content distribution system 1b, among the server 2, the proxy 3, and the client 4, the content is (i) divided by a unit which is referred to as media segment and (ii) transmitted with use of HTTP.

[0247] (b) of Fig. 21 is a view illustrating a concept of a media segment which is treated by the content distribution system 1b as a transmission unit of the content and showing an exemplary transmission unit of the content in the content distribution system 1b.

[0248] The media segment is constituted to include at least one movie fragment. In other words, a content is constituted by one or more media segments and each of the media segments is constituted by one or more movie fragments. Generally, each of the media segments, in a predetermined content, is configured to include two or more movie fragments each of which has consecutive playing time. However, the media segment may be constituted by (i) one movie fragment or (ii) two or more movie fragments each of which has no consecutive playing time.

[0249] Specifically, (b) of Fig. 21 shows an example where a plurality of movie fragments are combined so as to constitute one media segment. This makes it possible to reduce the number of messages which transmit a content as compared with a case where each of the plurality of movie fragments is transmitted separately. As such, it is possible to send a content efficiently.

[0250] In an example of (b) of Fig. 21, one media segment "media segment 1" is constituted by combining "movie fragments 1 through 60", and another media segment "media segment 2" is constituted by combining "movie fragments 61 through 120". Note that a media segment should include two or more movie fragments each of which has consecutive playing time in the predetermined content, and the number of movie fragments included in one media segment is not particularly limited. In Embodiment 3, as illustrated in (b) of Fig. 21, one media segment includes 60 movie fragments.

[Process carried out by each device]

[0251] Next, a process which is carried out by the server 2 and the client 4 functioning as a content playing device will be described with reference to Figs. 22 and 23. A process which is carried out by the proxy 3 of Embodiment 3 is identical to that of Embodiment 1, and a process which is carried out by the client 4 functioning as a relaying device of Embodiment 3 is identical to that of Embodiment 2. As such, those processes will not be discussed here.

[Process carried out by server 2]

[0252] First, a process which is carried out by the server 2 will be described with reference to Fig. 22. Fig. 22 is a flowchart showing an exemplary process which is carried out by the server 2.

[0253] The response executing section 15 is ready to receive a request message for requesting to transmit a content, and upon receipt of the request message for requesting to transmit the content, via the server communication section 11 (S601), the response executing section 15 determines whether or not the request message thus received is transmitted from a relaying device by referring to a header of the request message thus received (S602).

[0254] In a case where a subject which transmits the request message thus received is a content playing device (in a case -where an answer for S602 is No), the content playing device instructs the relaying device specifying section 16 to specify a plurality of relaying devices from which the content playing device acquires the content. The relaying device specifying section 16 reads out content-storage-location information from the content-storage-location information storage section 13 in response to the instruction of the response executing section 15 (S603). With reference to the content-storage-location information thus read out, the relaying device specifying section 16 (i) specifies a plurality of URIs of a relaying device associated with the content that the content playing device requests and (ii) creates a content storage location list containing the plurality of pieces of address information thus specified (S604). The relaying device specifying section 16 transmits the content storage location list thus created to the response executing section 15. The response executing section 15 transmits, to the content playing device, a response message instructing to acquire the content that the content playing device requests from one of the relaying devices which exist at an address indicated by the address information contained in the content storage location list which is created by the relaying device specifying section 16 (S605). The response executing section 15 (i) creates a transmission log on a basis of the response message which is sent to the content playing device and (ii) adds the transmission log thus created to the transmission log storage section 12 (S610).

[0255] Processes (S606 through S609) for a case where the sender of the received request message is the relaying device is identical to those (S506 through S509 in Fig. 14) for the server 2 of Embodiment 2. As such, those processes will not be discussed here.

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[Process carried out by client 4 functioning as content playing device]

[0256] Next, a process which is carried out by the client 4 functioning as a content playing device will be described with reference to Fig. 23. Fig. 23 is a flowchart showing an exemplary process which is carried out by the client 4 functioning as a content playing device.

[0257] The response/request executing section 35 transmits a request message for requesting to transmit a content to the server 2 (S621). In response to the request message, the response/request executing section 35 receives a response message containing (i) a content storage location list and (ii) an instruction to transmit, to one of relaying devices which is of an address indicated by address information contained in the content storage location list, a request message for requesting a content (S622).

[0258] When the response/request executing section 35 receives the response message, the relaying device selecting section 37 selects one of pieces of the address information contained in the content storage location list which the response/request executing section 35 receives (S623). The relaying device selecting section 37 instructs the response/request executing section 35 to acquire a content from the relaying device is of the address indicated by the address information thus selected.

[0259] The response/request executing section 35 which is instructed from the relaying device selecting section 37 transmits a request message to the relaying device that the relaying device selecting section 37 selects (S624). First, upon receipt of the request message, the relaying device sends, as a response message, a header in response to the request message thus received. As such, the response/request executing section 35 receives the header (S625) and notifies the client status determining section 36 of the receipt of the header.

[0260] Upon receipt of the notification, the client status determining section 36 initializes a timer and starts counting in order to evaluate receiving time for a movie fragment. Moreover, the client status determining section 36 initializes a variable (counter) ($N_1 = N_2 = 0$) which is used for the evaluation (S626). For example, an initial value for the timer may be a value calculated by subtracting a predetermined threshold T_{th} from a value of a time stamp of a movie fragment which is most recently sent.

[0261] The relaying device that received the request message transmits, after the header, as a response message in response to the request message received in S624, a body for which a plurality of movie fragments are multiparted. The response/request executing section 35 receives a movie fragment (S627) and notifies the client status determining section 36 of the receipt of the movie fragment.

[0262] Furthermore, the response/request executing section 35 (i) determines, on a basis of a value of "Content-Type" header contained in the header thus received, that the movie fragment is received in a MIME multipart format, (ii) notify the content playing section 34 of the receipt of the movie fragment, and also (iii) transmits the movie fragment thus received to the content playing section 34. Then, the content playing section 34 (a) specifies a time stamp of the movie fragment in reference to an "X-Timestamp" header of the movie fragment thus received and (ii) plays the movie fragment with reference to the time stamp.

[0263] Here, the client status determining section 36 evaluates receiving time (S628). Specifically, the client status determining section 36 compares time t indicated by the timer which starts counting in S626 and a time stamp T_{fr} (value of X-Timestamp) of the movie fragment which is received in S627.

[0264] In a case where the comparison shows that $t < T_{fr} - T_{th}$, the client status determining section 36 determines that it is sufficiently earlier than predetermined receiving time (an event indicating a good communication status is detected), and a process proceeds to S629. In contrast, in a case where $T_{fr} + T_{th} > t$, the client status determining section 36 determines that a delay occurs (an event indicating a poor communication status is detected), and the process proceeds to S630. Meanwhile, in a case where neither of the above cases applies ($|t-T_{fr}| \leq T_{th}$), the process proceeds to S631.

[0265] That is, after starting a receipt of a first movie fragment contained in the response message, the client status determining section 36 counts time t until starting a receipt of a next fragment. When (i) T_{fr} indicates a difference between a value of a time stamp associated with the first movie fragment and a value of a time stamp associated with the next movie fragment and (ii) T_{th} indicates zero or more predetermined threshold, (a) in a case where $T_{fr} + Tth > t$, the client status determining section 36 determines that the event indicating a poor communication status is detected, and (b) in a case where $t < T_{fr} - T_{th}$, the client status determining section 36 determines that the event indicating a good communication status is detected.

[0266] In S629, the client status determining section 36 increments N_1 which is a counter for the number of times that the movie fragment is received sufficiently earlier than the predetermined receiving time. Then, the process proceeds to S631.

[0267] In S630, the client status determining section 36 increments N_2 which is a counter for the number of times that the movie fragment is received with delay. Then, the process proceeds to S631.

[0268] In S631, the response/request executing section 35 confirms whether or not all of the movie fragments contained in the media segment specified by the request which is transmitted in S624, and in a case where an unreceived movie fragment is found (in a case where an answer for S631 is No), the process returns to S627.

[0269] Meanwhile, in a case where the response/request executing section 35 confirms that all of the movie fragments are already received (in a case where an answer for S631 is Yes), the response/request executing

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section 35 confirms whether or not all of the media segments of the content which is subject to be requested are received (S632), and in a case where it is confirmed that all of the media segments has been received (in a case where an answer for S632 is Yes), the process is completed. Meanwhile, in a case where an unreceived media segment is found (in a case where an answer for S632 is No), the client status determining section 36 determines, whether or not $N_2 - N_1 > 0$ with use of N_1 and N_2 which are calculated in S629 and S630 (S633).

[0270] In a case where $N_2 - N_1 > 0$ is not true, that is, in a case where $N_2 - N_1 \leq 0$, the relaying device is not changed, and a request message in which a media segment number is incremented is transmitted to the relaying device which is selected in S623 (S624). As a response message in response to the request message, the response/request executing section 35 receives a header (S625) and notifies the client status determining section 36 of the receipt of the header. Then, in order to evaluate receiving time for a movie fragment contained in a next media segment, the client status determining section 36 reinitializes the timer, so as to start counting of the time. Moreover, the client status determining section 36 also reinitializes the variable (counter) ($N_1 = N_2 = 0$) which is used for the evaluation. Then, the response/request executing section 35 receives the movie fragment contained in the next media segment (S627).

[0271] Meanwhile, in a case where $N_2 - N_1 > 0$, the client status determining section 36 transmits, to the relaying device selecting section 37, delay information indicating that an acquisition of the content is delayed. Upon a receipt of the delay information from the client status determining section 36, the relaying device selecting section 37 selects other address information which is (i) contained in the content storage location list and (ii) different from the address information which is currently selected (S634). The relaying device selecting section 37 instructs the response/request executing section 35 to acquire a content from a relaying device which exists at an address indicated by the address information thus selected.

[0272] Upon receipt of the instruction from the relaying device selecting section 37, the response/request executing section 35 retransmits, to the relaying device selected by the relaying device selecting section 37, a request message for which the media segment number is incremented (S624).

[0273] The description above describes an example where the relaying device from which the content is acquired is reselected per media segment (S634). Note, however, that the relaying device may be reselected per movie fragment. In that case, for example, in accordance with a result of the evaluation of the receiving time in S628, it is possible (i) to change the relaying device, (ii) to transmit a new request message to the relaying device thus changed, and (iii) to cancel a subsequent movie fragment which is transmitted on a basis of a request message which is sent first.

[0274] For example, the client status determining section 36 may count, in S629 and S630, (i) the number N_1 of movie fragments which are received sufficiently earlier than the predetermined time and (ii) the number N_2 of movie fragments which are transmitted with delay. After a transmission of one media segment is completed, in a case where $N_2 - N_1 > 0$, the client status determining section 36 may determine that there is an overall delay (an event indicating a poor communication status is detected) and notify the relaying device selecting section 37 of the determination.

[0275] Moreover, in the description above, in S633, the client status determining section 36 determines whether or not $N_2 - N_1 > 0$, so as to determine whether or not a delay occurs when the content is acquired. However, the process is not limited to this. For example, it is also possible (i) to predetermine an upper limit for N_2, which is a counter for the number of times that the movie fragment is received with delay, and (ii) to cancel a subsequent movie fragment when a value of N_2 exceeds the value thus predetermined, so as to switch the relaying device to another relaying device.

[Example 3]

[0276] The present embodiment is further described below with reference to Example 3 illustrated in Fig. 24. Example 3 shows an operation example of a content distribution system 1b that transmits, to a content playing device serving as a client 4e, an instruction to acquire a content from any one of address information contained in a content-storage-location list. Fig. 24 is a view illustrating an example operation sequence of the content distribution system 1b in Example 3.

[0277] Note that Example 3 is carried out on the following conditions. A content 1 in a format illustrated in Fig. 21 is already stored in the content storage section 5, and the client storage sections 6a, 6c, and 8f. Further, the server 2 generates a content-storage-location list by adding priorities to the plurality of pieces of address information. Furthermore, when the process shown in Fig. 25 is started in Example 3, the transmission logs 51 to 53 stores the transmission log storage section 12 and the content-storage-location information storage section 13, respectively. Still further, the response executing section 15 creates the transmission logs 54 to 56 of Fig. 25 every time when a response message is transmitted, and pieces of the content-storage-location information 64 to 67 generating section 17 generates the content-storage-location information of Fig. 26 every time when a content transmission log or a version notification log (transmission log whose "transmitted contents" is "200 OK" or "304 Not Modified") is added to the transmission log storage section 12.

[0278] Further, Example 3 is carried out on condition that a sequence starting from a time at which the content playing device transmits a request message and ending at a time at which the content playing device receives a response message in response to the request message

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is considered as a single session.

[0279] As shown in Fig. 24, in a session 310, the client 4e transmits, to the server 2, a request message to request to transmit the content 1 (request 311). In the server 2 which has received the request 311, the response executing section 15 transmits, to a plurality of relaying devices specifying section 16, an instruction to specify a relaying device to acquire the content 1. In response to the instruction, the relaying device specifying section 16 confirms whether or not the content-storage-location information is stored in the content-storage-location information storage section 13 (process 312). At this point, the content-storage-location information storage section 13 contains a proxy 3a, a proxy 3c, and a client 4f serving as a storage location associated with the content 1. Therefore, the relaying device specifying section 16 creates the content storage location list by (i) adding priorities 1 through 3 to the proxy 3a, the client 4f, and the proxy 3c, respectively, on a basis of date and time contained in the content-storage-location information so that the content storage location list added with priority contains the address information of the proxy 3, the client 4f, and the proxy 3c. The response executing section 15 transmits, to the client 4e, the response message to instruct to (i) select, in order of high priority, the address information contained in the content storage location list created by the relaying device specifying section 16 and (ii) acquire the content from a relaying device existing at an address indicated by the address information thus selected (response 313). In other words, the response executing section 15 transmits to the client 4e an instruction to acquire the content first from (i) the proxy 3a and, in a case where the content cannot be acquired from the proxy 3a or a speed to acquire the content is slow, secondarily from (ii) the client 4f, and lastly from (iii) the proxy 3c. Sequentially, the response executing section 15 creates the transmission log on the basis of the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 314).

[0280] In the client 4e which received the response 313, a relaying device selecting section 37 selects the proxy 3a having a highest priority, on the basis of the instruction from the server 2, as a relaying device in the address information of a device from which the content is acquired (process 320). Then, the relaying device selecting section 37 transmits to a response/request executing section 35 an instruction to acquire the content 1 from the proxy 3a.

[0281] Next, in a session 330, the response/request executing section 35 thus instructed by the relaying device selecting section 37, transmits to the proxy 3a the request message for requesting to transmit the content 1 (a request 331). In response to the response 331, the proxy 3a checks whether the content 1 is stored in the cash storage section 6a or not (process 332). Because the content 1 is already stored in the cash storage section 6a, in order to check with the server 2 if the contents 1 stored in the cash storage section 6a is the latest data, the proxy 3a transmits to the server 2 a conditional request that is the request message being associated with the request 331 added with "If_Modified-Since" according to the request 331. (a request 333). In the server 2 which received the request 333, because the request 333 is the conditional message containing a "Via" header, the response executing section 15 determines whether or not the content 1 kept by the proxy 3 is the latest data (process 334). The response executing section 15 determines that the content 1 kept by the proxy 3a is the latest data, and transmits the response message "304 NOT Modified" to the proxy 3a (a response 335). In response to the response 335, the proxy 3a retrieves the content 1 stored in the cash storage section 6a and, as a response to the request 331, transmits the content 1 thus retrieved to the client 4e (a response 336). The client 4e acquires "movie fragment1 to 60" one by one, in response to the response 336. After transmitting the response 335, the response executing section 15 creates the transmission log on the basis of the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 337). The content-storage-location information generation section 17 generates the content-storage-location information by associating the content 1 with the address information of the proxy 3a, and stores the content-storage-location information in the content-storage-location information storage section 13. In addition, the content-storage-location information generation section 17 generates the content-storage-location information by associating the content 1 and the address information of the client 4e, and stores the content-storage-location information in the content-storage-location information storage section 13 (process 338).

[0282] A client status determining section 36 evaluates receiving time at every receipt of movie fragments. If the receiving time is evaluated as $N_2 - N_1 > 0$ at the time of receipt of one media segment, at this point, the client status determining section 36 determines that a receiving speed required to acquire the content from the proxy 3a is slower than a predetermined receiving speed. Then the client status determining section 36 gives information of such delay to the relaying device selecting section 37 (process 340).

[0283] The relaying device selecting section 37, in response to the information of the delay from the client status determining section 36, changes the proxy 3a which is currently selected as the relaying device, from which the content is required, to the client 4f having a second priority to be selected as the relaying device (process 350). In other words, the relaying device selecting section 37 selects the client 4f as the device from which the content is acquired. Continuously, the relaying device selecting section 37 transmits to the response/request executing section 35 an instruction to acquire the content 1 from the client 4f.

[0284] Next, in a session 360, the "movie fragments 1

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to 60" has been received by the response/request executing section 35 according to the instruction from the relaying device selecting section 37. Thus, the response/request executing section 35 transmits to the client 4f the request message to request to transmit the content 1 from "movie fragment61" onward (request 361). In response to the request 361, the client 4f determines whether or not the content 1 is stored in the client storage section 8f (process 362). The content 1 is already stored in the client 8f. Thus, in order to check with the server 2 whether or not the content 1 stored in the client storage section 8f is the latest data, the client 4f transmits the conditional request, which is the request message associated with the request 361, added with "If_Modified-Since" (request 363). In the server 2 which received the request 363, because the request 363 is the conditional request message containing the "Via" header, the response executing section 15 determines that the content 1 kept by the client 4f is the latest data, and transmits the response message "304 NOT Modified" to the client 4f (response 365). Sequentially, the client 4f, in respond to the response 365, retrieves data of the content 1 "movie fragment61" or later stored in the client storage section 8f. Then the client 4f transmits the retrieved content 1 "movie fragment61" or later to the client 4e one by one (response 366). In response to the response 366, the client 4e acquires "movie fragment61" or later one by one. Further, after transmitting the response 365, the response executing section 15 creates the transmission log on the basis of the response message thus transmitted, and adds the transmission log to the transmission log storage section 12 (process 367). In addition, the content-storage-location information generating section 17 generates the content-storage-location information by associating the content 1 with the address information of the client 4e so as to store the content-storage-location information in the content-storage-location information storage section 13 (process 368).

[0285] As mentioned above, in the present embodiment, a content playing device receives from a server 2 a content storage location list containing address information of a plurality of relaying devices, and then acquires a content from any one of the relaying devices indicated by the address information contained in the content-storage-location list. In a case where a receiving speed required to acquire the content is slow, the relaying device, from which the content is acquired, is changed to another relaying device which is indicated by the address information contained in the content storage location list. This makes it possible to distribute a load of network (particularly, a network between the content playing device and the relaying device) efficiently timewise, thus realizing a control in more detail in the content distribution system 1b. Accordingly, it is possible to keep higher quality of service for a larger number of content playing devices.

[HTTP Messages in Example 3]

[0286] Next, the detail of the requests and the responses used in the operation sequence illustrated in Fig. 24 is illustrated in Fig. 27 and Fig. 28. Fig. 27 and Fig. 28 show examples of HTTP messages which are transmitted/received as a request or a response. Fig. 27 shows example HTTP messages in the session 310 and the session 330. Fig. 28 shows examples of HTTP messages in the session 360.

[0287] (a), (b), (c), (d), (e), and (f) of Fig. 27 show the HTTP messages of the request 311, the response 313, the request 331, the request 333, the response 335, and the response 336 of Fig. 24, respectively.

[0288] (a), (b), (c), and (d) of Fig. 28 show HTTP messages of the request 361, the response 363, the request 365, the request 363, the request 365, and the request 336 of Fig. 24, respectively.

[HTTP messages in sessions 310 and 330]

[0289] HTTP messages in the session 310 and the session 330 will be described with reference to Fig. 27. Since (c), (d), and (e) of Fig. 27 correspond to (c), (d), and (e) of Fig. 10, respectively. A content 2, a client 4a, and a proxy 3b of FIG. 10 are merely changed to a content 1 in MIME multipart format, a client 4e, and a proxy 3a of Fig. 27, respectively. Thus, the description of the HTTP messages of the request 331, the request 333, and the response 336 in the session 330 is not repeated here. In addition, (a), (b), (c), and (d) of Fig. 28 correspond to (c), (d), (e), and (f) of Fig. 27, respectively. Since "media segment1" of the content 1 and a proxy 3a of Fig. 27 are merely changed to a "media segment2" and a proxy 4f in Fig. 28, respectively. Therefore, the description of the HTTP message in the session 360 is not repeated here. Note also that, an element, which is more peculiar to the present invention, contained in an HTTP message is mainly described here. Thus, the description of well-known elements will be appropriately omitted.

(Request 311 Requesting for Content)

[0290] As shown in (a) of Fig. 27, a request line and a header are contained in an HTTP message which corresponds to the request 311 for requesting a "media segment1" of a content 1 from a serer 2 by a client 4e.

[0291] In the request line in (a) of Fig. 27, information for specifying the content to be acquired is described after a "GET" indicating a method for acquiring the content. Specifically, the information is described in a form of "/content name/media segment number". In other words, the HTTP message (a) of Fig. 27 is a request for the "0(zero)"th "media segment 1" (first portion) of the "content 1".

[0292] Further, a header of (a) of Fig. 27 contains an "Accept" header indicative of a processible data format for the client 4e. The "Accept" header has information

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"video/mp4" indicative of a moving image data of an MP4 format, and information "multipart/media-segment" indicative of a MIME multipart format. This enables the client 4e, which is a source that has transmitted the request, to inform the server 2, which is a receiver of the request, that the moving image data of the MP4 format is receivable in the MIME multipart format.

[0293] Furthermore, the header of (a) of Fig. 27 contains a "Host" header for specifying a server to which a request is transmitted. The "Host" header has a description "example.com" indicative of the address of the server 2.

(Response 313 for instructing on device from which content is acquired)

[0294] As shown in (b) of Fig. 27, a response line and a header are contained in an HTTP message corresponding to the response 313, in which the server 2 transmits to the client 4e an instruction on address information of a device from which the content 1 is acquired.

[0295] In the response line of (b) of Fig. 27, information for instructing to use the proxy is described in a form of "status number message".

[0296] Further, the header of (b) of Fig. 27 contains a "Location" header for specifying the relaying device to be used. That is, the HTTP message of (b) of Fig. 27 is the response instructing to request for the content 1 with use of the relaying device designated by the "Location" header mentioned below. In the example of (b) of Fig. 27, the "Location" header has the address information "http://example-proxy1.com" indicative of the address of the proxy 3a. This enables the client 4e to be informed of the address information of the relaying device (proxy 3a) from which the content 1 is requested.

[0297] Moreover, the header of (b) of Fig. 27 contains an "X-Alternative-Proxy-List" header indicative of the address information of other relaying devices which possesses the content 1. This "X-Alternative-Proxy-List" header describes address information "http://example-client2.com, http://example-proxy3.com" indicative of addresses of the other relaying devices (referring to the client 4f and the proxy 3c here). Thus, to the client 4e, which is a device received this response, the relaying devices (possibly) possessing the content 1 are presented, in addition to the relaying device specified by the "Location" header. Accordingly, the client 4e can select the relaying device, from which the content 1 is acquired, out of the relaying devices of the address information contained in the "Location" header or the "X-Alternative-Proxy-List" header. Note that an "X" in the description of the header indicates that the header was newly defined in the present embodiment.

(Response 336 for transmitting content from proxy 3a to client 4e)

[0298] As shown in (f) of Fig. 27, the HTTP message contains a response line, a header, and a body are contained in the HTTP message corresponding to the response 336 for transmitting the "media segment 1" of the content 1 to the client 4e from the proxy 3a.

[0299] The response line of (f) of Fig. 27 describes information that the request has been received, which means the content thus requested is to be transmitted. Specifically, the information is described in the form of "status number response message".

[0300] The header has information about a content to be transmitted. In the example shown in the figure, a "Content-Type" header indicative of a type of the content to be transmitted, a "Content-Location" header indicative of a storage location of the content to be transmitted (e.g. URI), a "Cache-Control" indicative of an instruction regarding a cache of the content to be transmitted, a "Via" header indicative of a transmission path via which the message is transferred, and an "X-Media-Segment-Index" header indicative of a location of an entire content of the media segment to be transmitted are contained.

[0301] In the example shown in the figure, the "Content-Type" header describes "multipart/ media-segment" indicative of the MIME multipart format. Thus, a device which received this header (the client 4e) can recognize the media segment which was transmitted in MIME multipart format is the next content to receive. In addition, the header contains information "boundary=THIS#STRING#SEPARATES" indicating that a break point of the multipart format is "THIS#STRING#SEPARATES".

[0302] The "Content-Location" header describes the URI "http://www.example.com/content1/0". As mentioned earlier, the final number "0" of this URI stands for the "media segment1" which is the initial portion of the content, followed by a URI of the "media segment2" which is "http://www.example.com/content1//1". Thus, a media segment indicated by a serial number enables a device received the response (client 4e) to determine that a URI having an incremented number is the URI of a next media segment to request for.

[0303] The "Cache-Control" header describes "must-revalidate", and the "Via" header describes "example-proxy 1.com".

[0304] Further, the example in the figure contains the "X-Media-Segment-Index" header. The "X-Media-Segment-Index" header indicates a playing location of the media segment for the entire content. In (f) of Fig. 27, the header contains "1/60". This "1/60" means a first media segment out of 60 media segments in the entire content. According to this information, a full length of the content and a current playing location can be tracked of. It is also possible to access arbitrarily to any media segment in the content with reference to this information.

[0305] In the body, a plurality of movie fragments consisting media segments described in the MIME multipart format. Here, one media segment contains 60 movie fragments from 1 through 60.

[0306] Moreover, each of parts (each of the movie frag-

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ments) can have a header. In the example shown in the figure, a "Content-Type" header indicating a type of the content of a movie fragment and an "X-Timestamp" header indicating a time stamp of the movie fragment are described. It is possible to specify a playing time (timing of starting a play) of the movie fragment without analyzing the movie fragment by referring to the time stamp indicated by the "X-Timestamp" header. Each of the parts contains a data entity (binary data) of the movie fragment of the respective parts.

[Case where client cannot process MIME multipart format data]

[0307] The Embodiment 3 has discussed the case where data in the MIME multipart format could have been processed by the client 4 serving as a content playing device, that is, the case where the "Accept" header of the request message has contained "multipart/media-segment". However, it is also conceivable that the content playing device cannot process the data in the MIME multipart format (that is, the "multipart/media-segment" is not contained in the "Accept" header of the request message).

[0308] In this case, it is advisable that a relaying device and a server 2 respond to a request not by the MIME multipart format but by one body which is a combination of all movie fragments in the media segment. This enables a content playing device which is not capable of processing data in the MIME multipart to play a content received.

<Embodiment 4>

[0309] Embodiment 4 of the present invention will discuss an example where (i) a single content is managed by a plurality of servers 2, (ii) a server 2 receives a request for the content, and designates, as a server from which the content thus requested is acquired, at least two servers 2 among the plurality of servers 2, and (iii) a content playing device selects one of the at least two servers 2 thus designated, so as to acquire the content. With the arrangement, it is possible to distribute, more widely, (a) a load of a network between the content playing device and a corresponding one of the plurality of servers 2, and (b) a process load of the corresponding one of the plurality of servers 2.

[0310] More specifically, in Embodiment 4, a client 4, which is the content playing device, (i) selects one of a plurality of servers 2 designated by a server 2 to which a request for a content has been transmitted, and (ii) acquires the content from the one of the plurality of servers 2 thus selected. In a case where acquisition of the content is delayed during a time period in which the client 4 acquires the content from the one of the plurality of servers 2 thus selected, the client 4 selects another one of the plurality of servers 2 designated by the server 2 to which the request for the content has been transmitted, and switches, to the another one of the plurality of servers 2, the server 2 from which the content is acquired.

[0311] The following description deals with Embodiment 4 with reference to Figs. 29 through 34. Embodiment 4 is identical to Embodiment 3 except that (i) a content distribution system of Embodiment 4 includes a plurality of servers 2, (ii) an arrangement of each of the plurality of servers 2 of Embodiment 4 is different from that of a server 2 of Embodiment 3, and (iii) an arrangement of the client 4 is different from that of a client 4 of Embodiment 3. For this reason, the following description mainly deals with such differences between Embodiment 4 and Embodiment 3.

Outline of content distribution system 1]

[0312] First, the following description explains an outline of a content distribution system 1c of Embodiment 4 with reference to Fig. 29. Fig. 29 is a view illustrating the outline of the content distribution system 1c of Embodiment 4 and an arrangement of a main part of each of devices constituting the content distribution system 1c.

[0313] The content distribution system 1c includes servers 2a, 2b, and 2c, proxies 3a, 3b, and 3c, and clients 4g and 4h (see Fig. 29). Further, the content distribution system 1c includes (i) content storage sections 5a, 5b, and 5c, which are connected to the servers 2a, 2b, and 2c, respectively, (ii) cache storage sections 6a, 6b, and 6c, which are connected to the proxies 3a, 3b, and 3c, respectively, and (iii) client storage sections 8g and 8h, which are connected to the clients 4g and 4h, respectively.

[0314] The proxies 3a, 3b, and 3c of Embodiment 4 are identical to proxies 3a, 3b, and 3c of Embodiment 3 in arrangement and operational process. For this reason, details of the proxies 3a, 3b, and 3c are omitted here for the sake of simple explanation.

As to server 2]

[0315] Each of the servers 2a, 2b, and 2c of Embodiment 4 is different from the server 2 of Embodiment 3 in that each of the servers 2a, 2b, and 2c includes an acquisition location specifying section 18 in place of a relaying device specifying section 16. Further, a content-storage-location information storage section 13 of each of the servers 2a, 2b, and 2c stores not only content-storage-location information including address information of a replying device which possesses a content but also content-storage-location information including address information of a server 2 which possesses a content. Other than these points described above, each of the servers 2a, 2b, and 2c of Embodiment 4 has the same arrangement as that of the server 2 of Embodiment 3.

[0316] In order to cause the content playing device to select a sever 2 from which the content playing device acquires a content, each of the server 2a, 2b, and 2c of Embodiment 4 (i) identifies a plurality of servers 2, each

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of which (possibly) possesses the content requested by the content playing device, (ii) presents, to the content playing device, a content storage server list including address information of each of the plurality of servers 2 thus identified, and (iii) instructs the content playing device to acquire the content from one of the plurality of servers 2 each of which is located at an address indicated by a corresponding piece of the address information included in the content storage server list thus presented.

[0317] Specifically, in a case where a response executing section 15 directly receives, from the content playing device, a request message which requests a content, the response executing section 15 instructs an acquisition location specifying section 18 to specify address information (e.g., an URI of a server 2) of servers 2, each of which (possibly) possesses the content requested by the content playing device. Then, in a case where the response executing section 15 receives, from the acquisition location specifying section 18, a content storage server list including the address information of the servers 2, each of which possesses the content requested by the content playing device, the response executing section 15 transmits, as a response to the request message received from the content playing device, to the content playing device, a response message which is an instruction to acquire such a requested content from one of the servers 2 each of which is located at an address indicated by a corresponding piece of the address information included in the content storage server list created by the acquisition location specifying section 18.

[0318] Further, in a case where the response executing section 15 receives, from a response executing section 15 of another server 2, an inquiry as to whether the server 2 possesses a certain content, the response executing section 15 checks whether or not the content is stored in a corresponding content storage section 5 connected to the server 2. Then, the response executing section 15 transmits, to the another server 2, a response indicating whether the server 2 possesses the certain content. For example, in a case where a response executing section 15 of the server 2a receives, from a response executing section 15 of the server 2b, an inquiry as to whether the server 2 possesses a certain content, the response executing section 15 of the server 2a (i) checks contents stored in the content storage section 5a, and (ii) transmits, to the server 2b, a response indicating whether the server 2 possesses the certain content.

[0319] Processes of the response executing section 15, other than the aforementioned process, are identical to those of a response executing section 15 of Embodiment 3, and therefore explanations of such processes are omitted here for the sake of simple explanation.

[0320] In accordance with the instruction received from the response executing section 15, the acquisition location specifying section 18 (i) identifies a plurality of servers 2, each of which (possibly) possesses the content requested by the content playing device, and (ii) creates a content storage server list including address information of the plurality of servers 2 thus identified.

[0321] Specifically, on receipt of the instruction from the response executing section 15, the acquisition location specifying section 18 reads out content-storage-location information from a content-storage-location information storage section 13. The acquisition location specifying section 18 (i) refers to the content-storage-location information thus read out, (ii) identifies a plurality of pieces of address information, which are associated with the content requested by the content playing device, and (iii) creates the content storage server list including the plurality of pieces of address information thus identified. The acquisition location specifying section 18 transmits the content storage server list thus created to the response executing section 15.

[0322] There is a case where the acquisition location specifying section 18 checks the content-storage-location information storage section 13 for the content-storage-location information including the address information of the servers 2 but such content-storage-location information is not stored in the content-storage-location information storage section 13, for example. Further, there is also a case where the content-storage-location information stored in the content-storage-location information storage section 13 is old information (a time and date included in the content-storage-location information has been obtained before a predetermined time), In such cases, the acquisition location specifying section 18 updates the content-storage-location information which includes the address information of the servers 2, and is stored in the content-storage-location information storage section 13.

[0323] In a case where the acquisition location specifying section 18 determines that it is necessary to update the content-storage-location information, the acquisition location specifying section 18 transmits, to each of other servers 2 via the response executing section 15, an inquiry as to whether or not each of other servers 2 has the content thus requested. On the basis of a response received from each of other servers 2, the acquisition location specifying section 18 (i) identifies address information of a server 2 which made such a response that the server 2 has the content thus requested, (ii) creates a content storage server list including the address information thus identified, and (iii) notifies the response executing section 15 of the content storage server list. Further, on the basis of a response received from each of other servers 2, the acquisition location specifying section 18 creates such content-storage-location information that (i) the content thus requested, (ii) address information of a server 2 which made such a response that the server 2 has the content, and (iii) a time and date at which the response is received, are associated with each other. Then, the acquisition location specifying section 18 stores the content-storage-location information thus created in the content-storage-location information storage section 13.

[0324] Note that the acquisition location specifying

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section 18 can update the content-storage-location information at predetermined intervals.

[0325] Furthermore, it is possible that the acquisition location specifying section 18 updates the content-storage-location information in such a manner that the acquisition location specifying section 18 (i) transmits, to each of other servers 2, an inquiry as to whether or not each of other servers 2 has the content, (ii) measures a time period from a time that the inquiry is transmitted to a time that the acquisition location specifying section 18 receives a response, and (iii) ranks other servers 2 on the basis of such time periods. That is, it is possible that the acquisition location specifying section 18 (i) sets a low rank to a server 2 with which the aforementioned time period is long (the server 2 which took a long time to make a response), and (ii) sets a high rank to a server 2 with which the aforementioned time period is short. The acquisition location specifying section 18 can cause address information of a server 2 included in the content storage server list thus created and a rank thus set to be associated with each other.

[0326] Moreover, in the same manner as Embodiment 3, it is possible to set a priority of a server 2 on the basis of a physical distance between the content playing device and the server 2, a network-structural distance between the content playing device and the server 2, a load status of the server 2, or the like.

[0327] Further, the acquisition location specifying section 18 can create not only the content storage server list which includes the address information of the servers 2 each having the content but also a content storage location list which includes address information of a relaying device which (possibly) possesses the content, in the same manner as Embodiment 3.

[0328] The content-storage-location information storage section 13 stores, in addition to the content-storage-location information including the address information of the relaying device, such content-storage-location information that (i) a content, (ii) address information of a server 2 possessing the content, and (iii) a time and date at which a response indicating that updating is executed is received from the server 2, are associated with each other. The content-storage-location information stored in the content-storage-location information storage section 13 can be data shown in Fig. 30, for example. Fig. 30 is a view showing an example of the content-storage-location information stored in the content-storage-location information storage section 13.

[0329] As shown in Fig. 30, the content-storage-location information is such that the following (i) through (iii) are associated with each other: (i) "Date" which indicates a time and date at which a content is acquired by a proxy 3 or a client 4, (ii) "Content ID" which indicates the content, and (iii) "Storage Location Address" which indicates address information of the proxy 3 possessing the content, address information of the client 4 possessing the content, or address information of the server 2 possessing the content.

[0330] Specifically, Fig. 30 shows, as an example, content-storage-location whether the server 2 possesses information 75 which indicates that a server 2, whose address is "http://srv2.exmaple.com", possesses a content "content 1".

[0331] As described above, in short, according to the server 2 of Embodiment 4, the response executing section 15 determines whether or not the source of the request is (i) a relaying device which possesses the content thus requested, and transfers the content thus requested to a content playing device, or (ii) a content playing device which plays the content thus requested. Next, in a case where the response executing section 15 determines that the source of the request is the content playing device, the acquisition location specifying section (content-storage-location information acquisition means) 18 acquires, in response to the request, an address of a server 2 having the content thus request, among predetermined other servers 2. Then, the response executing section (content acquiring location designating means) 15 instructs the content playing device, which is the source of the request, to acquire the content from the server 2 indicated by the address acquired by the acquisition location specifying section.

[0332] Here, the predetermined other servers 2 described above are servers 2 which are connected to, via a network 7, a server 2 which has received the request, and are in a range determined in advance in accordance with a predetermined rule. For example, in a case where the server 2 which has received the request is the server 2a, the predetermined other servers 2 can be (i) a server 2b and a server 2c, (ii) a server 2b only, or (iii), in addition to the server 2b and the server 2c, all servers 2 with which the server 2a can communicate via a network.

[0333] Further, the acquisition location specifying section 18 (i) transmits, to each of the predetermined other servers 2 described above, an inquiry as to whether or not each of the predetermined other servers 2 has the content thus requested, and then (ii) acquires an address(es) of a server(s) 2 each of which makes such a response that the server 2 has the content thus requested, among the predetermined other servers 2.

[0334] Furthermore, the acquisition location specifying section 18 (i) creates such content-storage-location information that such acquired address(es) of the server (s) 2 each having the content, and content identification information indicating the content are associated with each other, and (ii) stores the content-storage-location information in the content-storage-location information storage section (storage section) 13.

[0335] Moreover, the acquisition location specifying section 18 reads out the content-storage-location information from the content-storage-location information storage section 13. In a case where the content-storage-location information thus read out includes the content identification information indicating the content thus requested, the acquisition location specifying section 18 acquires, from the content-storage-location information,

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an address(es) associated with the content identification information. On the other hand, in a case where the content-storage-location information thus read out does not include the content identification information indicating the content thus requested, the acquisition location specifying section 18 transmits the inquiry described above, and acquires the address(es) of the server(s) 2 each having the content thus requested, among the predetermined other servers 2.

[0336] Further, the acquisition location specifying section 18 (i) acquires an address of each of a plurality of servers 2 each having the content thus requested, and (ii) creates a content storage server list including the address of each of the plurality of servers 2, and the content identification information indicating the content. Then, the response executing section 15 instructs the content playing device, which is the source of the request, to acquire the content from a server 2 indicated by an address included in the content storage server list created by the acquisition location specifying section 18.

[0337] Furthermore, the client 4 serving as a content playing device of Embodiment 4 (i) transmits a request for a content to a server 2, (ii) receives a content storage server list as a response to the request, and (iii) acquires the content thus requested from another server 2 indicated by an address included in the content storage server list thus received.

[0338] Specifically, the client 4 includes an acquisition location selecting section (acquisition location changing means) 38. The acquisition location selection section 38 switches the another server 2 (for example, the server 2b) from which the content is acquired to further another server 2 (for example, the server 2c) indicated by an address which is (i) included in the content storage server list and (ii) is different from the address of the another server 2, in a case where a receiving speed at which the content is acquired is slower than a predetermined receiving speed.

[Client 4]

[0339] In a case where the client 4 of Embodiment 4 serves as the content playing device, the client 4 receives a content storage server list from a server 2, and acquires a content thus requested from another server 2 which is located at an address indicated by address information included in the content storage server list thus received.

[0340] Each of the clients 4g and 4h, illustrated in Fig. 29, includes an acquisition location selecting section 38 in place of a relaying device selecting section 37 included in the client 4 of Embodiment 3. The acquisition location selecting section 38 has a function of the relaying device selecting section 37 in addition to a function of selecting a server 2 (described later in the present embodiment).

[0341] A response/request executing section 35 receives, from the server 2, as a response message, (i) the content storage server list and (ii) an instruction to transmit, to a server 2 located at an address indicated by address information included in the content storage server list, a request message requesting the content.

[0342] In a case where the response/request executing section 35 receives the content storage server list and the instruction, the acquisition location selecting section 38 selects one of pieces of the address information included in the content storage server list received by the response/request executing section 35. The acquisition location selecting section 38 instructs the response/request executing section 35 to acquire the content from the server 2 located at the address indicated by the one of pieces of the address information thus selected.

[0343] Here, in a case where no priority is added to the pieces of the address information included in the content storage server list (in a case where there the acquisition location selecting section 38 has not received, from the server 2 to which the request for the content has been transmitted, an instruction as to an order in which the server 2 from which the content is acquired is selected from among the servers 2), the acquisition location selecting section 38 can (i) select a server 2 randomly from among the servers 2 indicated by the respective pieces of the address information included in the content storage server list, (ii) select a server 2 in accordance with a predetermined rule (default) from among the servers 2 indicated by the respective pieces of the address information, or (iii) select, from among the servers 2 indicated by the respective pieces of the address information, a server 2 which is closest to the client 4g or 4h in physical distance or network-structural distance.

[0344] Meanwhile, in a case where priorities are added to the pieces of the address information included in the content storage server list, the acquisition location selecting section 38 selects one of the pieces of the address information, which one of the pieces of the address information has the highest priority.

[0345] Further, in a case where the acquisition location selecting section 38 receives, from the a client status determining section 36, delay information indicating that a speed (receiving speed of the content) at which the response/request executing section 35 acquires the content from the server 2 selected by the acquisition location selecting section 38 is slower than a predetermined receiving speed, the acquisition location selecting section 38 (i) switches the server 2 from which the content is acquired to another server 2 located at an address indicated by another one of the pieces of the address information included in the content storage server list, and (ii) instructs the response/request executing section 35 to acquire the content from the another server 2.

[0346] Here, in a case where no priority is added to the address information included in the content storage server list (in a case where the acquisition location selecting section 38 has not received, from the server 2 to which the request for the content has been transmitted, an instruction as to an order in which the server 2 from which the content is acquired is selected from among the servers 2), the acquisition location selecting section 38 can

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(i) select the another server 2 randomly from among the servers 2 indicated by the respective pieces of the address information included in the content storage server list, (ii) select the another server 2 in accordance with a predetermined rule (default) from among the servers 2 indicated by the respective pieces of the address information, or (iii) select, from among the servers 2 indicated by the respective pieces of the address information, the another server 2 which is second-closest to the client 4g or 4h in physical distance or in network structural distance.

[0347] Meanwhile, in a case where priorities are added to the respective pieces of the address information included in the content storage server list, the acquisition location selecting section 38 selects one of the pieces of the address information, which one of the pieces of the address information has the second highest priority.

[0348] The client status determining section 36 detects an occurrence of an event described below, in addition to operations described in Embodiment 3. Specifically, in a case where acquisition of the content from a server 2, executed by the content playing device, is delayed, the client status determining section 36 detects such an event that the content has been received behind schedule. This event is regarded as an event indicating (i) how good (or bad) a communication condition of a network between the content playing device and the server 2 is, and/or (ii) how large a load of the server 2 is. In a case where the client status determining section 36 detects an event that the content has been received behind schedule, the client status determining section 36 transmits, to the acquisition location selecting section 38, delay information indicating the event thus detected.

[0349] The example described above deals with the case where a response message includes a content storage section sever list for selecting another server 2 having the content thus requested. However, the present invention is not limited to this. It is possible that a response message received from the server 2 includes, in addition to a content storage server list, a content storage location list for selecting a relaying device. In a case where the response message received from the server 2 includes both the content storage server list and the content storage location list, the acquisition location selecting section 38 (i) selects whether the content is acquired via a relaying device or the content is acquired from another server 2, and (ii) selects one of pieces of address information, included in one of the content storage server list and the content storage location list, thus selected.

[0350] Here, in a case where no priority is added to the pieces of address information included in one of the content storage location list and the content storage server list, thus selected (in a case where the acquisition location selecting section 38 has not received, from the server 2, an instruction as to an order in which the server 2 from which the content is acquired is selected from among the servers 2), the acquisition location selecting section 38 can (i) select a server 2 randomly from among the servers 2 indicated by the respective pieces of the address information included in the one of the content storage location list and the content storage server list, (ii) select a server 2 in accordance with a predetermined rule (default) from among the servers 2 indicated by the respective pieces of the address information, or (iii) select, from among the servers indicated by the respective pieces of the address information, a server 2 which is closest to the client in physical distance or in network-structural distance.

[0351] Meanwhile, in a case where priorities are added to the respective pieces of the address information, the acquisition location selecting section 38 selects one of the pieces of the address information, which one of the pieces of the address information has the highest priority.

[0352] Further, in a case where the acquisition location selecting section 38 receives, from the client status determining section 36, delay information indicating that a receiving speed (content receiving speed) at which the response/request executing section 35 acquires the content from the device (a relaying device or a server 2) selected by the acquisition location selecting section 38 is slower than a predetermined receiving speed, the acquisition location selecting section 38 (i) switches the device from which the content is acquired to another relaying device or another server 2, located at an address indicated by one of the pieces of the address information included in the content storage location list or in the content storage server list, and (ii) instructs the response/request executing section 35 to acquire the content from the another relaying device or the another server 2.

Process carried out by each device]

[0353] Next, the following description deals with a process carried out by the server 2 and a process carried out by the client 4 serving as the content playing device, with reference to Figs. 31 and 32. Since a process carried out by the proxy 3 of Embodiment 4 is identical to a process of Embodiment 3, and a process carried out by the client 4 serving as a relaying device of Embodiment 4 is identical to a process of Embodiment 4, explanations of these are omitted here for the sake of simple explanation. Further, Embodiment 4 deals with an example in which one of the server 2 and the relaying device is selected, and a content is acquired from the one of the server 2 and the relaying device.

Process carried out by server 2]

[0354] First, the following description deals with the process carried out by the server 2 with reference to Fig. 31. Fig. 31 is a flowchart showing an example of the process carried out by the server 2. Note that a process identical to a process of Embodiment 3 has the same number as that of the process of Embodiment 3, and details of an explanation of the process are omitted here.

[0355] The response executing section 15 is ready to

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receive a request message which requests transmission of a content. In a case where the request message which requests transmission of the content is received via a server communication section 11 (S601), the response executing section 15 checks a header of the request message thus received, so as to determine whether or not the request message thus received has been transmitted from a relaying device (S602).

[0356] In a case where the request message thus received has been transmitted from a content playing device (NO in S602), the response executing section 15 instructs the acquisition location specifying section 18 to specify a plurality of devices as a device from which the content thus requested is to be acquired by the content playing device.

[0357] On receipt of the instruction from the response executing section 15, the acquisition location specifying section 18 reads out content-storage-location information from the content-storage-location information storage section 13 (S603). The acquisition location specifying section 18 creates a content storage server list on the basis of the content-storage-location information (S701).

[0358] The acquisition location specifying section 18 determines whether or not the content storage server list has been created (S702). In a case where (i) the content-storage-location information could not be read out or the content-storage-location information stored in the content-storage-location information storage section 13 has been determined as being old information, and, as a result, (ii) the content storage server list has not been created (NO in S702), the acquisition location specifying section 18 instructs the response executing section 15 to update the content-storage-location information. The response executing section 15 thus instructed transmits, to each of other servers 2 connected to a network, an inquiry as to whether or not each of the other servers 2 has the content thus requested (S703).

[0359] The response executing section 15 notifies the acquisition location specifying section 18 of a result of a response received from each of the other servers 2. On the basis of the result of the response, the acquisition location specifying section 18 requests the content-storage-location information storage section 13 to update the content-storage-location information, so as to update the content-storage-location information (S704). Then, the acquisition location specifying section 13 creates a content storage server list again (S705).

[0360] The acquisition location specifying section 18 (i) refers to the content-storage-location information thus read out, (ii) identifies a plurality of URIs of devices (each being a relaying device or a server (a relaying device), from which the content is acquired) being associated with the content requested by the content playing device, and then, (iii) creates a content storage location list including a plurality of pieces of address information thus identified (S604).

[0361] The acquisition location specifying section 18 transmits the content storage location list thus created to the response executing section 15. The response executing section 15 transmits, to the content playing device, a response message which instructs the content playing device to acquire the content thus requested from a relaying device or a server 2, located at an address of one of pieces of address information included in the content storage location list and/or in the content storage server list, created by the acquisition location specifying section 18 (S706).

[0362] The response executing section 15 creates a transmission log on the basis of the response message transmitted to the content playing device, and adds the transmission log thus created to a transmission log storage section 12 (S610).

[0363] Since a process (S606 through S609) carried out under a condition that the request message thus received is transmitted from a relaying device is identical to a process (S506 through S509 in Fig. 14) of a server 2 of Embodiment 2, explanations of the process are omitted here for the sake of simple explanation.

Process carried out by client 4 serving as content playing device]

[0364] Next, the following description deals with a process carried out by the client 4 serving as the content playing device, with reference to Fig. 32. Fig. 32 is a flowchart showing an example of the process carried out by the client 4 serving as the content playing device. Note that a process identical to a process of Embodiment 3 has the same number as that of the process of Embodiment 3, and details of an explanation of the process are omitted here for the sake of simple explanation. Further, a process for receiving a content is identical to a process (S625 through S631 in Fig. 23) of Embodiment 3, and therefore is shown as "S724" in Fig. 32.

[0365] The response/request executing section 35 transmits, to a server 2, a request message which requests transmission of a content (S621). The response/request executing section 35 receives, as a response to the request message, a response message which includes (i) a content storage location list and/or a content storage server list, and (ii) an instruction to transmit the request message, which requests the transmission of the content, to a device (a relaying device or a server 2) located at an address indicated by one of pieces of address information included in the content storage location list and/or the content storage server list (S3721).

[0366] In a case where response/request executing section 35 receives the response message, the acquisition location selecting section 38 selects one of the pieces of the address information included in the content storage location list and/or the content storage server list, received by the response/request executing section 35 (S722). The acquisition location selecting section 38 instructs the response/request executing section 35 to ac-

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quire the content from the device located at an address indicated by the one of the pieces of the address information thus selected.

[0367] On receipt of the instruction from the acquisition location selecting section 38, the response/request executing section 35 transmits the request message to the device selected by the acquisition location selecting section 38 (S723).

[0368] The device receives the request message and carries out a process of acquiring the content, which process is explained in Embodiment 3. Then, the response/request executing section 35 and the client status determining section 36 carry out a process of acquiring/playing media segments (S724).

[0369] Here, in a case where the response/request executing section 35 receives all movie fragments, the response/request executing section 35 checks whether or not all media segments of the content thus requested are received (S632). In a case where the response/request executing section 35 determines that all the media segments of the content are received (YES in S632), the response/request executing section 35 finishes the process. On the other hand, in a case where the response/request executing section 35 determines that there is any media segment which has not been received (NO in S632), the client status determining section 36 determines whether or not the device from which the content is acquired should be switched to another device, in the same manner as Embodiment 3 (S725).

[0370] In a case where it is determined that switching of the device to another device is not to be executed (NO in S725), the device from which the content is acquired is not switched to another device, and the response/request executing section 35 transmits, to the device selected in S722, a request message to which media segment numbers are incremented (S723).

[0371] In a case where it is determined that the switching of the device to another device is to be executed (YES in S725), the client status determining section 36 transmits, to the acquisition location selecting section 38, delay information indicating that acquisition of the content is delayed. On receipt of the delay information from the client status determining section 36, the acquisition location selecting section 38 selects another one (which is different from the one of the pieces of the address information selected above) of the pieces of the address information included in the content storage location list or the content storage server list (S726). The acquisition location selecting section 38 instructs the response/request executing section 35 to acquire the content from another device located at an address indicated by the another one of the pieces of the address information thus selected.

[0372] On receipt of the instruction from the acquisition location selecting section 38, the response/request executing section 35 transmits again, to the another device selected by the acquisition location selecting section 38, the request message to which the media segment numbers are incremented (S723).

[0373] Note that, it is possible to execute, in Embodiment 4, switching with use of not a media segment unit but a movie fragment unit, in the same manner as Embodiment 3. In addition, in this case, it is possible to carry out a switching process in the same manner as Embodiment 3.

Example 4]

[0374] The following description further deals details of Embodiment 4 more specifically with use of Example 4 shown in Fig. 33. Example 4 shows an example of an operation of the content distribution system 1c which instructs a content playing device serving, which is the client 4g, to acquire a content from one of pieces of address information included in a content storage location list or a content storage server list. Fig. 33 is a view showing an example of an operation sequence of the content distribution system 1c of Example 4. Note that a process identical to a process of Embodiment 3 has the same number as that of the process shown in Fig. 24.

[0375] Example 4 is made on a premise that a content 1 having a format shown in Fig. 21 is stored in each of content storage sections 5a, 5b, and 5c, and the content storage sections 52, 5b, and 5c are identical to each other in how to divide the content 1 into media segments. Further, the content 1 has been already cached in (i) a cache storage section 6a, (ii) a cache storage section 6c, and (iii) a client storage section 8h.

[0376] Further, a server 2a creates a content storage location list in such a manner that priorities are added to a plurality of pieces of address information, on the basis of times and dates, included in content-storage-location information. Furthermore, in Example 4, when a process shown in Fig. 32 is started, (i) transmission logs 51 through 53 shown in Fig. 25 have been already stored in a transmission log storage section 12, and (ii) pieces (61 through 63) of content-storage-location information shown in Fig. 26 have been already stored in a content-storage-location information storage section 13.

[0377] Moreover, one session is defined as a sequence starting from a time at which the content playing device transmits a request message and ending a time at which the content playing device receives a response message in response to the request message thus transmitted.

[0378] As shown in Fig. 33, in session 810, the client 4g transmits, to the server 2a, a request message which requests transmission of the content 1 (request 811). The server 2a receives the request 811, and the response executing section 15 instructs the acquisition location specifying section 18 to specify a plurality of devices as a device from which the content 1 is acquired. On receipt of the instruction, the acquisition location specifying section 18 checks content-storage-location information stored in the content-storage-location information storage section 13 (process 812). The acquisition location

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specifying section 18 checks whether or not there is a content storage server list on the basis of the content-storage-location information. In a case where there is no content storage server list, the acquisition location specifying section 18 checks (i) whether or not a server 2b has the content 1 and (ii) whether or not a server 2c has the content 1 (process 813). Here, the acquisition location specifying section 18 can execute such checking by (i) transmitting a request for a header of the content 1 to each of the servers 2, and (ii) checking a response received from each of the servers 2, for example (a request 814 transmitted to the server 2c and a response 816 received from the server 2c, in Fig. 33 and a request 815 transmitted to the server 2c and a response 817 received from the server 2c in Fig. 33).

[0379] Here, the content-storage-location information storage section 13 indicates that a proxy 3a, a proxy 3c, and a client 4f are associated with the content 1, i.e., the content 1 is stored in the proxy 3a, the prosy 3c, and the client 4f. Accordingly, on the basis of the times and dates, included in the content-storage-location information, the acquisition location specifying section 18 adds a first priority, a second priority, and a third priority to the proxy 3a, the client 4f, and the proxy 3c, respectively, so as to create a content storage location list which includes address information of the proxy 3a, the client 4f, and the proxy 3c, and to which the priorities are added.

[0380] In addition, on the basis of responses in process 813 (the responses 815 and 817), the acquisition location specifying section 18 creates a content storage server list. According to the present example, a response from the server 2b has been received earlier than a response from the server 2c, so that the server 2b has a first priority and the server 2c has a second priority. The acquisition location specifying section 18 creates the content storage server list which includes address information of the servers 2b and 2c, and also address information of the server 2a itself, and to which the priorities are added (process 818).

[0381] Here, how to set a priority of the server 2a can be determined arbitrarily. For example, it is possible to cause the server 2a to have the highest priority for all cases (a higher priority than those of the other servers 2). Further, it is possible to have such a setting that (i) in a case where a response speed of the server 2b or a response speed of the server 2c is faster than a certain threshold, the server 2a has a lower priority than that of the server 2b or 2c, and (ii) the response speed of the server 2b or the response speed of the server 2c is slower than the certain threshold, the server 2a has a higher priority than that of the server 2b or 2c. Furthermore, it is possible to have such a setting that, in a case where a process load of the server 2a is larger than a predetermined threshold, the server 2a has a lower priority than those of the other servers 2.

[0382] The response executing section 15 selects one (having the highest priority) of the pieces of the address information included in the content storage location list or the content storage server list, created by the acquisition location specifying section 18, in accordance with the priorities thus set. Then, the response executing section 15 transmits, to the client 4g, a response message for acquiring the content thus requested from a relaying device or a server 2 located at an address indicated by the one of the pieces of the address information thus selected (response 819).

[0383] Here, the response executing section 15 determines which one of the content storage location list and the content storage server list is preferentially used to selecting one of the pieces of the address information. That is, the response executing section 15 determines whether the client 4g acquires the content from a relaying device or from a server 2.

[0384] How to select preferentially one of the content storage location list and the content storage server list can be arbitrarily determined. For example, the response executing section 15 can select the content storage location list (or the content storage server list) preferentially on the basis of a setting of a default. Then, in a case where the content storage location list (or the content storage server list) thus selected cannot be used, the response executing section 15 selects the content storage server list (or the content storage location list), for example.

[0385] Further, the response executing section 15 can execute the selection in such a manner that (i) in a case where a time and date of the content-storage-location information including one (having the highest priority) of the pieces of the address information, included in the content storage location list, is a recent time and date (within a predetermined time period), the content storage location list is selected preferentially, and (ii) in a case where the time and date is an old time and date (before the predetermined time period), the content storage server list is selected preferentially. Furthermore, the response executing section 15 can execute the selection in such a manner that, in a case where, under a condition that there is no content-storage-location information, one of the pieces of the address information included in the content storage location list is determined (i) in accordance with a default or (ii) randomly, the content storage server list is selected preferentially.

[0386] In the present example, in a case where there is the content storage location list, the response executing section 15 selects the content storage location list preferentially.

[0387] Note that, in the present example, acquisition of the content from the server 2a is basically the same as acquisition of the content with use of a relaying device (that is, if the content is acquired with use of the relaying device the content, an address of the device from which the content is acquired is identical to an address of the server 2a). In other words, substantially the same process (the same process as a process of Embodiment 3) is carried out for both (i) a case where the response executing section 15 selects the content storage location

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list, and (ii) a case where the response executing section 15 selects the content storage server list, and then selects the server 2a from the content storage server list. Moreover, in a case where (i) the response executing section 15 selects the content storage server list, and then selects the server 2b or the server c from the content storage server list, and (ii) the server b or the server c thus selected receives the request for the content from the client 4g, the server b or the server c identifies a predetermined relaying device and instructs the client 4g to acquire the content from the relaying device thus identified, in the same manner as Embodiment 3.

[0388] That is, in a case where the relaying device is used ((i) in a case where the content storage location list is selected, and (ii) in a case where the content storage server list is selected and then the server 2a is selected from the content storage server list), the response executing section 15 first instructs the client 4g to acquire the content from the proxy 3a. If it is impossible to acquire the content from the proxy 3a, or a speed at which the content is acquired from the proxy 3a speed is slow, then, the response executing section 15 instructs the client 4g to execute acquisition of the content from the client 4f (if impossible, then acquisition of the content from the proxy 3c). On the other hand, in a case where another server 2 is used, the response executing section 15 instructs the client 4g to execute the acquisition of the content from the server 2b (if impossible, then acquisition of the content from the server 2c).

[0389] Then, the response executing section 15 creates a transmission log on the basis of the response message thus transmitted, and adds the transmission log thus created to the transmission log storage section 12 (process 820).

[0390] On receipt of the response 819, the acquisition location selecting section 38 of the client 4g selects the proxy 3a having the highest priority, as a candidate for the device from which the content is acquired, on the basis of the instruction received from the server 2a (process 830). Then, the acquisition location selecting section 38 instructs the response/request executing section 35 to acquire the content 1 from the proxy 3a.

[0391] In a case where the proxy 3a or another client (client 4f) is selected as the device from which the content is acquired, a process (session 840, process 850, process 860, and session 870) is the same as a process (session 330, process 340, process 350, and session 360 shown in Fig. 24) of Embodiment 3, and therefore explanations of these are omitted here for the sake of simple explanation.

[0392] Note that, in a case where a server 2 is selected, the content is acquired from the server 2 in the same manner as a general acquisition process with use of HTTP.

[0393] Further, in Example 3, the client status determining section 36 notifies the relaying device specifying section 16 of the delay information per movie fragment, whereas, in Example 4, the client status determining section 36 notifies the acquisition location specifying section 18 of the delay information. On receipt of such a notification, the acquisition location specifying section 18 executes again selection of the device from which the content is acquired, in the same manner as the relaying device specifying section 16.

[0394] As described above, in Embodiment 4, a content playing device receives, from a server 2, (i) a content storage location list including address information of a plurality of relaying devices and (ii) a content storage server list including address information of a plurality of servers. Then, the content playing device acquires a content from (i) a relaying device located at an address indicated by one of pieces of the address information included in the content storage location list or (ii) a server 2 located at an address indicated by one of pieces of the address information included in the content storage server list. Then, in a case where there is a delay in acquisition of the content, the content playing device switches the device from which the content is acquired to (i) another relaying device located at an address indicated by another one of the pieces of the address information included in the content storage location list or (ii) another server 2 located at an address indicated by another one of the pieces of the address information included in the content storage server list. Accordingly, it becomes possible to distribute a load of a network (particularly, a network between the content playing device and a relaying device, and a network between the content playing device and a server 2) efficiently even in terms of time. It becomes therefore possible for the content distribution system 1c to execute control more finely. As a result, it becomes possible to maintain higher service quality for a larger number of content playing devices.

[0395] Further, Embodiment 4 shows the example in which the content playing device receives, from the server 2a, (i) the content storage location list including the address information of the plurality of relaying devices and (ii) the content storage server list including the address information of the plurality of servers. Note, however, that the content playing device can receive, from the server 2a, only the content storage server list including the address information of the plurality of servers. Similarly, the server 2a can notify the content playing device of only the content storage server list including address information of other servers 2 each having the content thus requested.

HTTP message in Example 4]

[0396] Next, the following description deals with details of the response 819 used in the operation sequence shown in Fig. 33. Note that request 811 and other requests, and responses are the same as those in Example 3, and therefore explanations of these are omitted here for the sake of simple explanation.

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HTTP message in response 819]

[0397] The following description deals with an HTTP message in response 819 with reference to Fig. 34.

(Response R3210 instructing which one of devices content is acquired from)

[0398] (a) of Fig. 34 shows an HTTP message corresponding to the response 819, which (i) is transmitted from the server 2a to the client 4g and (ii) instructs the client 4g which one of the devices the client 4g acquires the content from. As shown in (a) of Fig. 34, the HTTP message includes a response line and a header.

[0399] The response line shown in (a) of Fig. 34 is such that information instructing the use of a relaying device is described in a format of "a status number and a message".

[0400] Further, the header shown in (a) of Fig. 34 includes a "Location" header which designates the relaying device to be used. In other words, the HTTP message shown in Fig. 34 is a response which instructs to request the content 1 with use of the relaying device designated by the following "Location" header. In the example shown in Fig. 34, address information "http://example-proxy1.com", indicating an address of the proxy 3a, is described in the "Location" header. With the arrangement, the client 4g, which has received the response, can obtain the address information of the relaying device (proxy 3a) to which the client 4g transmits the request for the content 1.

[0401] Further, the header shown in (a) of Fig. 34 includes an "X-Alternative-Proxy-List" header indicating address information of other relaying devices, each of which possesses the content 1. In the "X-Alternative-Proxy-List" header, the address information "http://example-client2.com, http://example-proxy3.com", indicating addresses of other relaying devices (here, a client 4h and a proxy 3c), are described. With the arrangement, the relaying devices each (possibly) possessing the content 1, other than the relaying device designated by the "Location" header, are presented to the client 4g. As a result, the client 4g can select, as the relaying device from which the content 1 is acquired, one of the relaying devices located at the addresses indicated by (i) the address information included in the "Location" header and (ii) the address information included in the "X-Alternative-Proxy-List" header. Note that, "X" in a title of the header indicates that the header is newly defined in Embodiment 4.

[0402] Further, the header shown in (a) of Fig. 34 includes an "X-Alternative-Server-List" header indicating address information of other servers, each of which possesses the content 1. In the "X-Alternative-Server-List" header, address information "http://svr2.example.com, http://srv3.example.com" indicating addresses of other servers (here, the server 2b and the server 2c), each of which (possibly) possesses the content 1, is described. With the arrangement, the client 4g, which has received the response, can not only execute such selection that the content is acquired via the relaying device included in the "Location" header or in the "X-Alternative-Proxy-List" header but also execute such selection that the content 1 is acquired from the server 2 described in the "X-Alternative-Server-List".

[0403] Note that, "X" in a title of the header shows that the header is newly defined in Embodiment 4.

[0404] The HTTP message shown in (a) of Fig. 34 is such an HTTP message that the server 2a requests the client 4g to access the content with use of the relaying device. Meanwhile, (b) of Fig. 34 shows an example of a message instructing the client 4g to access another server 2 without using any relaying device.

[0405] In (b) of Fig. 34, information which instructs the client 4g to make an access with use of another URI is described in a format of "status number (space) message".

[0406] Further, the header includes a "Location" header indicating another URI. The message shown in (b) of Fig. 34 instructs the client 4g to request the content 1 with use of the URI.

[0407] Furthermore, in the same manner as (a) of Fig. 34, the header includes an "X-Alternative-Server-List" header, in which other servers 2 which can be used are described.

<Embodiment 5>

[0408] Embodiment 4 deals with the example in which the content playing device is notified of, with use of the HTTP message, information on each of the servers 2, from which the content can be acquired.

[0409] Embodiment 5 of the present invention deals with an example in which information on servers 2, each of which can supply a content, is notified with use of meta data related to the content.

[0410] In Embodiment 5, the meta data of the content is described with use of a markup language MPD (Media Presentation Description) proposed in DASH (Dynamic Adaptive Streaming over HTTP) with which standardization has been currently executed. The MPD is meta data related to a moving image content, and is such that information, such as an address of a media segment and a video bit rate of a media segment, is defined for each of predetermined time periods. In Embodiment 5, meta data of a content is referred to as "MPD data".

[0411] An arrangement of Embodiment 5 is identical to that of Embodiment 4 illustrated in Fig. 29, and therefore is explained below with reference to Fig. 29. More specifically, a server 2a illustrated in Fig. 29 prepares MPD data which is meta data of the content. In the MPD data, not only information related to a moving image content, such as an encoding method and a bit rate, but also address information of the servers 2, each of which can supply the content, and address information used to acquire a media segment are described. Before playing the content, a client 4g acquires and analyzes the MPD data,

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so as to select one of a plurality of servers 2 described in the MPD data.

[0412] In addition, the MPD data, which is the meta data of the content, employs a format with which an external resource can be referred to. By taking advantage of the format, even if a condition of a network or a condition of a server changes during a time period from a time that the MPD data is created to a time that the content is actually played with use of the MPD data, it is possible to (i) reflect such a change and therefore (ii) distribute a load. Further, by setting timing at which the external resource is referred to so that the external resource is referred to at short intervals, it becomes possible to (i) reflect changes in condition more finely and therefore to (ii) execute control more finely.

Outline of content distribution system 1c]

[0413] The arrangement of Embodiment 5 is identical to the arrangement of Embodiment 4 of the subject application, illustrated in Fig. 29. Functionally, (i) the server 2a of Embodiment 5 is different from the server 2a of Embodiment 4 in that the server 2a of Embodiment 5 prepares MPD data which is meta data of the content supplied from the server 2a, and (ii) the client 4g of Embodiment 5 is different from the client 4g of Embodiment 4 in that the client 4g of Embodiment 5 acquires, from the MPD data, information of a server to which the client 4g make an access, to play the content.

[0414] Specifically, a response executing section (managing means) 15 manages (i) a content and (ii) meta data (MPD data which is meta data of the content) including (a) content-storage-location information in which content identification information for specifying the content and addresses of other content distributing devices, each having the content, are associated with each other, or (b) a storage location address (external resource) indicating a location of the content-storage-location information.

[0415] In a case where the content is stored in a content storage section 5, the response executing section 15 basically creates MPD data of the content, and, if necessary, updates the MPD data thus created. Further, the response executing section 15 creates an external resource on receipt of a request for creation of the external resource.

[0416] Moreover, the response executing section (request determining means) 15 determines whether the request described above is a request for the content or a request for the meta data.

[0417] Further, in a case where the response executing section 15 determines that the request is the request for the content, the response executing section 15 transmits the content thus requested to a device which is a source of the request. On the other hand, in a case where the response executing section 15 determines that the request is the request for the meta data, the response executing section 15 transmits the meta data thus requested to the device which is the source of the request.

[0418] The response executing section 15 can determine which one of the request for the content, the request for the meta data, and a request for the content-storage-location information with use of a storage location address, the request described above is.

[0419] In a case where the response executing section 15 determines that the request is the request for the content-storage-location information with use of the storage location address (external resource), the response executing section 15 transmits, to the device which is the source of the request, the content-storage-location information whose location is indicated by the storage location address.

[0420] Further, the acquisition location specifying section 18 (i) transmits, to each of the predetermined other content distributing devices, an inquiry as to whether or not each of the predetermined other content distributing devices has a predetermined content, and (ii) acquires addresses of other content distributing devices, each making, in response to the inquiry, a response that the content distributing device has the predetermined content, among the predetermined other content distributing devices.

[0421] Furthermore, the acquisition location specifying section 18 (i) creates content-storage-location information by causing the addresses of other content distributing devices each having the predetermined content and content identification information for specifying the predetermined content to be associated with each other, and (ii) stores the content-storage-location information thus created in a content-storage-location information storage section (storage section) 13.

[0422] Moreover, the acquisition location specifying section (update determining means) 18 determines whether to update the content-storage-location information stored in the content-storage-location information storage section 13.

[0423] Further, in a case where (i) the response executing section 15 determines that the request is the request for the content-storage-location information with use of the storage location address, and (ii) the acquisition location specifying section 18 determines that it is necessary to update the content-storage-location information whose location is indicated by the storage location address, the acquisition location specifying section 18 (i) makes the inquiry described above, (ii) acquires the addresses described above, and (iii) creates the content-storage-location information on the basis of the addresses thus acquired. Then, the response executing section 15 transmits the content-storage-location information to the device which is the source of the request.

[0424] Furthermore, in a case where (i) the response executing section 15 determines that the request is the request for the content-storage-location information with use of the storage location address, and (ii) the acquisition location specifying section 18 determines that it is unnecessary to update the content-storage-location in-

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formation whose location is indicated by the storage location address, the response executing section 15 transmits, to the device which is the source of the request, the content-storage-location information whose location is indicated by the storage location address.

[0425] Moreover, the meta data can include a plurality of storage location addresses each indicative of a location of content-storage-location information which is set for each of units into which the content is divided at predetermined time intervals.

[0426] Further, the content can include a plurality of media segments, and each of the units of the content, into which the content is divided at the predetermined time intervals, can include at least one media segment.

[0427] Furthermore, the meta data can include (i) a content storage server list including a plurality of pieces of the content-storage-location information or (ii) a storage location address indicating a location of the content storage server list.

[0428] Moreover, the client 4 serving as the content playing device (i) transmits the request for the meta data to the server 2, (ii) receives the meta data as a response to the request for the meta data, and (iii) acquires the content in accordance with the meta data thus received.

[0429] Further, in a case where (i) a response/request executing section (content acquiring means) 35 receives the content storage server list included in the meta data thus received, or (ii) the response/request executing section (content acquiring means) 35 transmits the request for the content-storage-location information with use of the storage location address which is included in the meta data thus received, and, as a response to the request, receives the content storage server list, the response/request executing section 35 acquires the content from another content distributing device located at an address indicated by one of the pieces of the content-storage-location information included in the content storage server list thus received.

[0430] Moreover, in a case where a receiving speed at which the response/request executing section 35 receives the content is slower than a predetermined receiving speed, the acquisition location selecting section (acquisition location changing means) 38 switches the server 2 (e.g., the server 2b) from which the content is acquired to another server 2 (e.g., the server 2c) located at another address included in the content storage server list.

Content meta data: MPD data]

[0431] Each of Figs. 35, 36, and 38 shows an example of how the MPD data, which is the meta data of the content used in Embodiment 5, is described. Fig. 35 is an example in which an external resource is not referred to. The content is fragmented by a predetermined unit, and is, for transmission, media-segmented, in the same manner as Embodiment 3. In (a) of Fig. 35, "content1/0.mp4", "content1/1.mp4", and the like indicate media segments of the content 1, for example. In the example shown in (a) of Fig. 35, the content 1 is divided into 12 media segments.

[0432] The MPD data is data of a markup language format, and employs "MPD" as a route element. A value of an attribute "minBufferTime" of an MPD start tag indicates an initial buffering time period which is necessary to play a video smoothly. A value of an attribute "type" indicates a default value of an attribute "type" of a "Representation" tag (described later). That is, a value of the attribute "type" indicates whether a representation whose attribute "type" is not designated in the "Representation" tag is on-demand streaming delivery or live streaming delivery. Further, an attribute "mediaPresentationDuration" indicates a playing time period of the content. In the present example, the playing time period of the content is described as being 120 seconds.

[0433] "Period", which is a sub-element of "MPD", indicates that information related to a video to be played within a certain time period (period) is described in a range between a corresponding Period start tag and a corresponding Period end tag. An attribute "id" of the Period start tag is information for specifying each Period included in the content provided with use of the MPD, and a unique value is set to each Period.

[0434] "Group", which is a sub-element of "Period", indicates that at least one sub-element "Representation" described in the range between a Group start tag and a Group end tag belongs to the same representation group.

[0435] That is, "Group" indicates that only one representation is selected, and media segments (target data to be played) of the only one representation are played in a corresponding time period. Note that, representations belonging to the same group might be different from each other in play quality such as an image size, a frame rate, and a bit rate, but are identical to each other in the content to be played. For example, in the example shown in (b) of Fig. 35, two representations (the content 1 and the content 2) are described. In this case, it is possible to play the content by selecting either one of the two representations.

[0436] Further, in (a) of Fig. 35, an attribute "mimeType" of the Group start tag indicates, for example, a sort of codec used in media segments constituting the representation. Furthermore, an attribute "lang" indicates a language of the representation belonging to the Group.

[0437] Moreover, in the range between the Group start tag and the Group end tag, a sub-element "SegmentInfoDefault" is described. The "SegmentInfoDefault" is such that common information, which is shared by all the representations in the range between the Group start tag and the Group end tag, is described. In the present example, the "SegmentInfoDefault" element further includes, as a sub-element, a "BaseURL" element. In a range between a Base URL start tag and a Base URL end tag, a common URL is described. With use of such a URL and the following URL information of the representations, it is possible to determine a device to be re-

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ferred. As shown in (a) of Fig. 35, it is possible to describe a plurality of Base URLs.

[0438] The representations constituting the Group are described with use of "Representation" tag. An attribute "bandwidth" of a Representation start tag, shown in (a) of Fig. 35, indicates a bit rate of the representation.

[0439] In a range between a Representation start tag and a Representation end tag, a sub-element "Segment" is used to indicate that there is media segment information. An URL from which a media segment belonging to the representation is acquired is described with use of an attribute "sourceURL" of a start tag of a sub-element "Url" of the Segment tag. These Urls are described for corresponding media segments. Note that, in a case where there is a common part between these Urls, it is possible to describe the Urls with use of the BaseURL tag described above.

[0440] In the example shown in Fig. 35, the BaseURL tag is used, and a Url of each media segment has no description indicating a host. Accordingly, a Url of a media segment is created by using information indicated by the BaseURL tag. That is, an access to a first media segment is made with use of a Url created as "http://srv2.example.com/content1/0.mp4" which is obtained with use of (i) the BaseURL tag "http://srv2.example.com/" and (ii) the Ur1 tag "content1/0.mp4".

[0441] As described above, in a case where a client acquires each media segment, a Url of each media segment is created and acquired, on the basis of an analysis result of MPD data.

[0442] Next, the following description deals with how to refer to an external resource with use of the MPD data, with reference to Figs. 36 through 38.

[0443] Details of the present example are explained with use of the example shown in (a) of Fig. 35, which example employs one representation.

[0444] As described above, in the MPD data shown in (a) of Fig. 35, address information of a server in which a corresponding media segment is stored is described with use of the BaseURL tag. Here, there are a plurality of BasURL tags. That is, the client can select one of the plurality of Base URL tags depending on a condition, so as to acquire the media segment under an optimum condition.

[0445] However, generally, the MPD data is created when the content is stored in the server 2. For this reason, even if information on an optimum server is collected and described at a time that the MPD data is created, it is highly possible that a network status or information on such an optimum server might have been changed at a time that the content is actually accessed with use of the MPD data. Further, even if, for example, a server which works at a higher speed than the above server is added to deliver the content after the MPD data is created, it is impossible to use such a high-speed server unless the MPD data thus created is recreated.

[0446] In view of this, a function of a link to an external resource of the MPD is used. Fig. 36 shows an example of such an MPD data. In Fig. 36, a description of "xlink" is used as the attribute of the Group start tag, in place of the server information (information described with use of the BaseURL tag) described with use of the Group tag in (a) of Fig. 35, the description of each representation, the description of each of the media segments (information described with use of the Representation tag) constituting the representation, and the like. The xlink is a function of referring to an external resource. In a case where data including the description of the xlink is analyzed, it is possible to execute the analysis by acquiring and taking in the external resource linked by the xlink. As shown in Fig. 36, a URL of an external resource linked by an attribute "xlink:href" is described. The attribute "xlink:actuate" is such that at what stage the external resource indicated by "xlink:href" is acquired is described. The "xlink:actuate" is classified into "onRequest", with which the external resource is acquired if necessary, and "onLoad" with which the external resource is acquired at the same time as acquisition of the MPD data. In the present example, the "onRequest", with which the external resource is acquired if necessary, is used.

[0447] Fig. 37 is a view showing an example of data of an external resource (http://example.com/content1/resource 1.xml). The MPD data shown in Fig. 36 takes in the external resource shown in Fig. 37 with use of the xlink, and becomes MPD data which is identical to the MPD data shown in (a) of Fig. 35.

[0448] Further, in the present example, in order to execute control more finely, the MPD data is divided into short Periods with use of the Period tag described above, and each of the Periods takes in the external resource with use of the xlink. The MPD data shown in (a) of Fig. 35 and the external resource shown in Fig. 37 are such that the content is described with use of one Period. Accordingly, even if the external resource is taken in, it is merely possible to reflect a condition obtained at a time that the content is started to be played. That is, in a case where the content is a long-time content, there might be a case where, even if a certain server is selected as the optimum server at the time that the content is started to be played, the certain server thus selected might not be the optimum server anymore during a time period in which the content is played, due to a change in a condition of the network or a change in a condition of the certain server or conditions of other servers. Moreover, in a case where a server which is the most appropriate server at a final phase of acquisition of the content (i) has not been selected at a time that the content is started to be played and (ii) has not been described as the external resource, it is impossible to select the server.

[0449] In view of this, (a) of Fig. 38 shows an example in which the MPD data is divided into a plurality of Periods, and an external resource is taken in with use of the xlink in each of the plurality of Periods. (b) through (d) of Fig. 38 show examples of the external resource thus taken in.

[0450] Each of the external resources shown in (b)

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through (d) of Fig. 38 has four media segments. In the present example, one media segment equals 10 seconds. That is, one Period in the MPD data shown in (a) of Fig. 38 equals 40 seconds, and an external resource is taken in per acquisition of 40-second data.

[0451] With the arrangement in which the server information included in the MPD data is provided as an external resource, it is possible to create and provide an external resource in response to a request received from the client, which external resource (i) has not been created in advance and (ii) reflects a condition of a distribution system or a network at a time that the client makes a request.

[0452] Further, in the present example, by setting a Period to be short, it becomes possible to reflect the condition of the network or the conditions of the servers finely. With the arrangement, it is possible to provide information in accordance with a condition at a time that MPD data is used, even if timing that the MPD data, which is meta data of a content, is created, and timing that the MPD data is used, are different from each other.

Process carried out by each device]

[0453] Next, the following description deals with processes carried out by the server 2 and the client 4, with reference to Figs. 39 and 40. A process carried out by proxies 3a, 3b, and 3c of Embodiment 5 is identical to a process of Embodiment 3, and therefore an explanation of the process is omitted here for the sake of simple explanation.

Process carried out by server 2]

[0454] First, the following description deals with a process carried out by the server 2a in accordance with Embodiment 5, with reference to Fig. 39. Fig. 39 is a flowchart showing an example of the process carried out by the server 2a. A process which is identical to a process of Embodiment 4 of the present invention has the same sign as that of the process of Embodiment 4.

[0455] The response executing section 15 is ready to receive a request message from the client 4. The response executing section 15 receives the request message from the client 4 via the server communication section 11 (S901).

[0456] On receipt of the request message, the server 2 determines which one of a request for a content, a request for xlink data, and a request for MPD data (which is meta data of the content) the request message thus received is (S902, S903, S904). In a case where it is determined that the request message is the request for the meta data of the content (YES in S904), the server 2 reads out designated MPD data from the content storage section 5 (S905), and transmits the MPD data to a device which is a source of the request (S906).

[0457] In a case where it is determined that the request message is the request for acquisition of external resource data with use of the xlink (YES in S903), the response executing section 15 instructs the acquisition location specifying section 18 to specify a plurality of servers as a server from which the content is acquired by the content playing device. On receipt of such an instruction from the response executing section 15, the acquisition location specifying section 18 reads out content-storage-location information from the content-storage-location information storage section 13 (S603).

[0458] The acquisition location specifying section 18 creates a content storage server list on the basis of the content-storage-location information (S701). The acquisition location specifying section 18 determines whether or not the content storage server list could be created (S702). In a case where (i) the content-storage-location information could not be read out or it was determined that the content-storage-location information stored in the content-storage-location information storage section 13 was old information, for example, and, as a result, (ii) the content storage server list could not be created, the acquisition location specifying section 18 instructs the response executing section 15 to update the content-storage-location information. On receipt of the instruction to update the content-storage-location information, the response executing section 15 transmits, to each of other servers 2 connected to the network, an inquiry as to whether or not each of the other servers 2 has the content thus requested (S703).

[0459] The response executing section 15 notifies the acquisition location specifying section 18 of a result of a response received from each of the other servers 2. On the basis of the result of the response thus notified, the acquisition location specifying section 18 requests the content-storage-location information storage section 13 to update the content-storage-location information, so that the content-storage-location information storage section 13 updates the content-storage-location information (S704). Then, the acquisition location specifying section 18 creates the content storage server list again (S705).

[0460] The response executing section 15 creates external resource data which instructs the client 4 to acquire the content thus requested from one of the servers 2 each being located at an address indicated by a corresponding one of pieces of address information included in the content storage server list created by the acquisition location specifying section 18 (S907). Then, the response executing section 15 transmits the external resource data to the content playing device (S908).

[0461] Meanwhile, in a case where it is determined that the request is the request for the content (YES in S902), the server 2 transmits the content to the source of the request. A process carried out here is identical to a process of a server 2 in accordance with Embodiment 3 (S606 through S610 shown in Fig. 22), and therefore an explanation of the process is omitted here for the sake of simple explanation.

[0462] In a case where the request is not the request

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for the content, the request for the xlink data, or the request for the MPD data (NO in S904), the server 2 carries out a process corresponding to the request thus received. For example, in a case where the server 2 receives a GET request for data of a web page including a link to the content, or a HEAD request for a file size of the content, a time stamp of a file, or the like, the server 2 carries out a process corresponding to such a request.

Process carried out by client 4 serving as content playing device]

[0463] Next, the following description deals with a process carried out by the client 4 serving as the content playing device, with reference to Fig. 40. Fig. 40 is a flowchart showing an example of the process carried out by the client 4 serving as the content playing device.

[0464] The response/request executing section 35 transmits, to the server 2, a request message which requests transmission of MPD data corresponding to a content (S921). The response/request executing section 35 receives, as a response to the request message, a response message including the MPD data (S922). The meta data thus received is analyzed by the response/request executing section 35 so that a content to be played is determined (S923).

[0465] Next, the response/request executing section 35 acquires an address of the content (media segment) to be played, on the basis of a result of the analysis of the MPD data. Here, In order to acquire the address from the MPD meta data, the response/request executing section 35 determines whether or not data of an external resource indicated by an xlink of the MPD data is necessary (S924). In a case where it is determined that the data of the external resource is unnecessary to acquire the address (NO in S924), the response/request executing section 35 analyzes the MPD data, and extracts a content storage server list. On the basis of the content storage location list thus extracted, the acquisition location selecting section 38 selects one of pieces of address information of servers, in the same manner as a process of a client 4 in accordance with Embodiment 4 (S623 through S634 in Fig. 23) (S928). On the other hand, in a case where it is determined that the data of the external resource is necessary to acquire the address (YES in S924), the response/request executing section 35 requests the external resource data with use of the address of the external resource indicated by the xlink (S925).

[0466] On receipt of the external resource data thus requested from a server 2 indicated by the xlink (S926), the response/request executing section 35 replaces, with the external resource data thus received, a part of the MPD data thus received, which part is indicated by the xlink with which the external resource is acquired (S927). That is, the response/request executing section 35 updates the MPD data. Then, the response/request executing section 35 analyzes the MPD data, so as to extract the content storage server list. On the basis of the content storage location list thus extracted, the acquisition location selecting section 38 selects one of the pieces of the address information of the servers, in the same manner as the process of the client 4 in accordance with Embodiment 4 (S623 through S634 in Fig. 23) (S928). The response/request executing section 35 creates a request for a media segment on the basis of (i) address information of the server thus selected and (ii) address information of a media segment to be acquired. Then, the response/request executing section 35 transmits the request thus created to the server thus selected (S929). Then, the response/request executing section 35 receives media segments sequentially, in the same manner as Embodiment 4 (S724). Note that, a process for receiving media segments is identical to a process of Embodiment 4, and therefore is shown as "S724" in Fig. 40.

[0467] Here, in a case where the response/request executing section 35 receives all movie fragments, the response/request executing section 35 checks whether or not all the movie fragments of the content thus requested have been received (S632). In a case where the response/request executing section 35 confirms that all the movie fragments have been received (YES in S632), the process is finished.

[0468] On the other hand, in a case where the response/request executing section 35 determines that there is any movie fragment which has not been received (NO in S632), the response/request executing section 35 determines whether or not a next media segment can be acquired, by determining whether or not all media segments included in a corresponding Period, which is a target to be played in the MPD data, have been received (S930). In a case where all the media segments in the corresponding Period have been received (YES in S930), the response/request executing section 35 acquires a next Period (S931).

[0469] In a case where, in the corresponding Period, there is a media segment which can be received, the response/request executing section 35 starts to carry out a process of receiving such a media segment. Then, the client status determining section 36 determines whether or not a device from which such a media segment is received should be changed, in the same manner as Embodiment 3 (S725). A determination method here is identical to a determination method of Embodiment 4. Then, acquisition of media segments is continued.

Example 5]

[0470] The following description deals with details of Embodiment 5 more specifically, with use of Example 5 shown in Fig. 41. Example 5 is a view showing an example operation sequence of a content distribution system 1 which instructs a client 4, which serves as a content playing device, to acquire a content from one of pieces of address information included in a content storage server list.

[0471] Note that, in Example 5, as a premise, a content

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1 having a format shown in Fig. 21, MPD data which (i) is meta data of the content 1 and (ii) has a structure shown in Fig. 38, and external resource data are stored in a content storage section 5 of each of servers 2a, 2b, and 2c. Further, a media segment of the content 1, stored in each of the servers 2a, 2b, and 2c, has been similarly divided into a plurality of media segments.

[0472] Furthermore, as in Example 4, one session is defined as a process from a time that the content playing device transmits a request message to a time that the content playing device receives a response message in response to the request message.

[0473] As shown in Fig. 41, in a session 1010, a client 4g transmits, to the server 2a, a request message which requests transmission of MPD data of the content 1 (request 1011). In a case where the server 2a receives the request 1011, a response executing section 15 reads out the MPD data thus requested from the content storage section 5a (process 1012), and transmits a response message to the client 4g (response 1013).

[0474] In a case where the client 4g receives the response 1013, a response/request executing section 35 analyzes the MPD data thus received, so as to acquire a media segment (process 1020). Then, in a case where it is determined that the MPD data includes an instruction to refer to an external resource which is necessary to acquire, for example, location information of the media segment, the response/request executing section 35 acquires the external resource from the server 2.

[0475] Next, in a session 1030, the client 4g transmits a request message which requests external resource data (request 1031).

[0476] In a case where the server 2a receives the request 1031, a response executing section 15 instructs an acquisition location specifying section 18 to specify a plurality of servers 2. On receipt of such an instruction, the acquisition location specifying section 18 creates a storage location server list on the basis of content-storage-location information stored in a content-storage-location information storage section 13 (process 812). Here, in the content-storage-location information storage section 13, there is no server information related to a content 1 (process 813). Accordingly, in order to create the content storage server list, the acquisition location specifying section 18 transmits, to the servers 2b and 2c via the response executing section 15, an inquiry as to storage information of the content 1 (requests 814 and 815). Then, the acquisition location specifying section 18 obtains (i) responses (responses 816 and 817) to the inquiry and (ii) response times of such responses. Then, the acquisition location specifying section 18 creates the content storage server list on the basis of such results of the responses (process 818). Next, the response executing section 15 (i) acquires external resource data thus requested from a content storage section 5a, (ii) updates the external resource data with use of information of the content storage location list thus created, and (iii) creates external resource data thus requested (process 1032). Then, the response executing section 15 transmits, to the client 4g via a server communication section 11, a response message including the external resource data thus created (response 1033).

[0477] In a case where the client 4g receives the response 1033, the client 4g updates, with use of the external resource data, the MPD data which has been already received. The acquisition location selecting section 38 selects, with use of the MPD data thus updated, a server 2 as a device from which the content is acquired (process 1040). A selection method here can be such that a server 2 described at a top of the list is selected, or, if information (such as priorities) is added, a server 2 is selected on the basis of such information. Further, in a case where delay information is received from a client status determining section 36, it is possible to select, in consideration of such delay information, a server 2 as the device from which the content is acquired.

[0478] In a case where the server 2 (here, the server 2b) is selected, the response/request executing section 35 creates, on the basis of the MPD, a Url to acquire a media segment, and start acquiring media segments sequentially (session 1050). Details of a process of acquiring media segments are identical to those of a process of Example 3 (Example 4), and therefore are omitted here for the sake of simple explanation.

[0479] In a case where acquisition of all media segments in a Period of the MPD data is completed, the client 4g start acquiring media segments included in a next Period. In a case where acquisition of external resource data with use of an xlink is necessary to acquire media segment information, the client 4g transmits a request for an external resource to an address described in a corresponding xlink, in the same manner as the session 1030.

[0480] Then, both the client 4 and the server 2 repeat operations of sessions 1010 through 1050, so as to acquire all the media segments. Playing is thus completed.

[Solution to Problem]

[0481] In order to achieve aforementioned object, a content distributing device for transmitting, in response to a request, a content to a source which has transmitted the request, in accordance with the present invention, includes: determining means for determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; content transmitting means for transmitting, in response to the request, the content thus requested to the relaying device in a case where the determining means determines that the source is the relaying device; content-storage-location information generating means for generating content-storage-location information by associating (A) the content transmitted by the content transmitting means with (B) an address of the relaying device, which is a

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destination to which the content is transmitted, or an address of the content playing device, to which the content is transferred from the relaying device; and content-acquiring-location instructing means for transmitting, in response to the request, an instruction to the content playing device which is the source in a case where the determining means determines that the source is the content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address associated, in the content-storage-location information, with the content thus requested or (ii) a content playing device indicated by an address associated, in the content-storage-location information, with the content thus requested.

[0482] In order to achieve aforementioned object, a method for controlling content distributing device for transmitting, in response to a request, a content to a source which has transmitted the request, the method in accordance with the present invention includes: a determining step of determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; a content transmitting step of transmitting, in response to the request, the content thus requested to the relaying device in a case where it is determined that, in the determining step, the source is the relaying device; a content-storage-location information generating step of generating content-storage-location information by associating (A) the content transmitted in the content transmitting step with (B) an address of the relaying device, which is a destination to which the content is transmitted, or an address of the content playing device, to which the content is transferred from the relaying device; and a content-acquiring-location instructing step of transmitting, in response to the request, an instruction to the content playing device which is the source in a case where it is determined that, in the content-storage-location information generating step, the source is the content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address associated, in the content-storage-location information, with the content thus requested or (ii) a content playing device indicated by an address associated, in the content-storage-location information, with the content thus requested.

[0483] According to the arrangement, upon receipt of the request from the relaying device, the content transmitting means transmits the content thus requested to the relaying device which is the source, and the content-storage-location information generating means generates the content-storage-location information by associating (A) the content transmitted from the content transmitting means with (B) the address of the relaying device, which is the destination of the content, or the address of the content playing device, to which the content is transferred from the relaying device. Further, upon receipt of the request from the content playing device, the content-acquiring-location instructing means transmits, to the content playing device which is the source, the instruction to acquire the content from (I) the relaying device indicated by an address associated, in the content-storage-location information, with the content thus requested or (II) the content playing device indicated by an address associated, in the content-storage-location information, with the content thus requested. Here, the relaying device and the content playing device possesses the content thus acquired, and the content-storage-location information is information indicative of which relaying device or content playing device possesses a content.

[0484] That is, the content distributing device associates (A) a content which has been transmitted before with (B) a relaying device or a content playing device which possesses the content, and, upon receipt of a request from a certain content playing device, the content distributing device does not directly transmit the content to the content playing device which is the source, but transmits, to the content playing device which is the source, an instruction to acquire the content from a relaying device or a content playing device which possesses the content thus requested. The content playing device, which is the source, acquires the content thus requested from a designated relaying device or a designated content playing device. Therefore, if the designated relaying device or the designated content playing device possesses the content, it is possible to complete transmission and reception of the content with use of only (A) the content playing device which is the source and (B) the designated relaying device or the designated content playing device. That is, the content playing device, which is the source, can acquire content, without carrying out a process for transmitting the content.

[0485] This makes it possible to reduce (A) a load of a network, which is used to transmit data from the content distributing device, and (B) a load of the content distributing device. Among processes carried out by the content distributing device, the relaying device, and the content playing device, a process for transmitting and receiving the content is a process which applies the heaviest load, and the process applies the heaviest load of the network among the content distributing device, the relaying device, and the content playing device. However, even if, for example, the number of content playing devices is increased and the number of requests to the content distributing devices is therefore increased, it is possible to reduce (A) an increase in load of the network which is used to transmit data from the content distributing device and (B) an increase in load of the content distributing device. Therefore, a large number of content playing devices can acquire contents, without increasing throughput of the content distributing device or capacity of the network.

[0486] It is preferable that the content distributing device in accordance with the present invention determine that, in a case where the request contains transmission path information indicative of a transmission path via

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which the request is transferred, the source is a relaying device and, in a case where the request does not contain the transmission path information, the source is a content playing device.

[0487] According to the arrangement, the determining means determines that, in a case where the request contains transmission path information indicative of a transmission path via which the request is transferred, the source is a relaying device and, in a case where the request does not contain the transmission path information, the source is a content playing device. That is, the determining means determines that the source is the content playing device in a case where the request is directly transmitted from the content playing device, whereas the content acquiring device is the relaying device in a case where the request is transmitted from a device other than the content playing device.

[0488] As described above, a content distributing device transmits a requested content to a relaying device in a case where the relaying device is a source which has transmitted a request, whereas, in a case where a content playing device is the source, the content distributing device transmits, to the content playing device, an instruction to acquire the requested content from a relaying device or a content playing device which possesses the requested content. The content distributing device can, therefore, always transmit the content to the content playing device via a designated relaying device or a designated content playing device. Accordingly, in a case where the designated relaying device or the designated content playing device possesses the content requested by the content playing device which is the source, the content distributing device does not need to transmit the content to the content playing device. This makes it possible to reduce (A) the load of the network which is used to transmit data from the content distributing device and (B) the load of the content distributing device.

[0489] Further, it is preferable that, in the content distributing device in accordance with the present invention, in a case where there are a plurality of pieces of the content-storage-location information which contain a plurality of addresses, respectively, each of the plurality of addresses being associated with the content thus requested, the content-acquiring-location instructing means (A) create a content-storage-location list containing the plurality of addresses included in the plurality of pieces of content-storage-location information and (B) transmit, to the content playing device which is the source, an instruction to acquire the content from (I) a relaying device indicated by an address contained in the content-storage-location list thus created or (II) a content playing device indicated by an address contained in the content-storage-location list thus created.

[0490] According to the arrangement, in a case where there are a plurality of pieces of the content-storage-location information which includes a plurality of addresses, respectively, each of the plurality of addresses being associated with the content thus requested, the content-acquiring-location instructing means (A) creates a content-storage-location list including the plurality of addresses included in the plurality of pieces of content-storage-location information and (B) transmit, to the content playing device which is the source, an instruction to acquire the content from (I) a relaying device indicated by an address included in the content-storage-location list thus created or (II) a content playing device indicated by an address included in the content-storage-location list thus created.

[0491] Accordingly, the content playing device, which is the source, selects (A) the relaying device indicated by the address included in the content-storage-location list or (B) the content playing device indicated by the address included in the content-storage-location list, and acquires the content from the relaying device or the content playing device thus selected. The content playing device, which is the source, can therefore acquire the content from an optimum device depending on a status of the content playing device and a status of the relaying device or the content playing device which possesses the content.

[0492] Further, it is preferable that, the content distributing device in the present invention, the content-storage-location information generating means generate the content-storage-location information by associating (A) the content which has been transmitted by the content transmitting means with (B) date and time when the content transmitting means has transmitted the content; and the content-acquiring-location instructing means create the content-storage-location list by (I) arranging the plurality of addresses, which are contained in the plurality of pieces of content-storage-location information, on the basis of the date and time associated with the content and (II) adding priorities to the plurality of addresses so that an address having later date and time gets a higher priority.

[0493] According to the arrangement, in the content-storage-location information, (A) a content, (B) a relaying device or a content playing device which possess the content, and (C) date and time when the content has been transmitted to the relaying device or the content playing device, i.e., date and time when the relaying device or the content playing device has held the content are associated with one another. Then the content-acquiring-location instructing means creates the content-storage-location list by (I) arranging the plurality of addresses, which are contained in the plurality of pieces of content-storage-location information, on the basis of date and time associated with the content identification information and (II) adding priorities to the plurality of addresses so that an address having later date and time gets a higher priority.

[0494] That is, the content-storage-location list includes the plurality of relaying devices or the plurality of content playing devices which possess the content requested by the content playing device which is the source, so that the plurality of relaying devices or the

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plurality of content playing devices are arranged in order of time, specifically, in order of time when each of the plurality of relaying devices or the plurality of content playing devices has possessed the content. The content playing device, which is the source, can therefore select, as, e.g., a device from which the content is acquired, a relaying device or a content playing device which has stored the content recently.

[0495] There may occur, for example, a case where a content transmitted by the content distributing device is updated to obtain a new data or a case where a relaying device or a content playing device which possesses content discards the content thus held or modifies the content. Even in such a case, the content playing device which is the source can surely acquire the content same as a content transmitted by the content distributing device by acquiring the content from a relaying device or a content playing device which contains the latest date and time when the relaying device or the content playing device has stored the content. This makes it possible to surely acquire the content same as a content transmitted by the content distributing device.

[0496] Further, it is preferable that a content distributing device in accordance with the present invention further include: distance calculating means for calculating, on the basis of an address contained in any one of the plurality of pieces of content-storage-location information, a physical or network-structural distance between (A) a relaying device or a content playing device which is indicated by the address and (B) the content playing device that the content-acquiring-location instructing means instructs on a device from which the content is acquired, wherein: the content-acquiring-location instructing means creates the content-storage-location list by (I) arranging the plurality of addresses, which are contained in the respective plurality of pieces of content-storage-location information, on the basis of distances calculated by the distance calculating means, and (II) adding priorities to the plurality of addresses so that an address having a shorter distance gets a higher priority.

[0497] According to the arrangement, the distance calculating means calculates, on the basis of an address contained in any one of the plurality of pieces of content-storage-location information, a physical or network-structural distance between (A) a relaying device or a content playing device which is indicated by the address and (B) the content playing device that the content-acquiring-location instructing means instructs on a device from which the content is acquired. Further, the content-acquiring-location instructing means creates the content-storage-location list by (I) arranging the plurality of addresses, which are contained in the respective plurality of pieces of content-storage-location information, on the basis of distances calculated by the distance calculating means, and (II) adding priorities to the plurality of addresses so that an address having a shorter distance gets a higher priority.

[0498] That is, the content-storage-location list includes a plurality of relaying devices and a plurality of content playing devices, each of which possesses the content requested by the content playing device which (i) is the source and (ii) the content-acquiring-location instructing means instructs on a device from which the content is acquired. The plurality of relaying devices and the plurality of content playing devices are listed so that a device having a shorter physical or network-structural distance gets a higher priority. Accordingly, with reference to the content-storage-location list, the content playing device which is the source can, for example, select, as a device from which the content is acquired, a relaying device or a content playing device which is the nearest from the content playing device itself. This makes it possible to reduce a load of the network in a case where the content playing device which is the source acquires the content.

[0499] Further, it is preferable that the content distributing device in accordance with the present invention further include transmission record creating means for creating a response transmission record by associating (A) a destination to which a response is transmitted in response to the request with (B) date and time when the response has been transmitted, wherein, with reference to response transmission record created by the transmission record creating means, the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to acquire the content from a relaying device or a content playing device which (i) is indicated by an address that the content-storage-location information associates with the content thus requested and (ii) is not included in the response transmission record within a predetermined time period

[0500] According to the arrangement, transmission record creating means makes a response transmission record by associating (A) a destination to which a response is transmitted in response to the request with (B) date and time when the response has been transmitted. Then, with reference to response transmission record created by the transmission record creating means, the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to acquire the content from a relaying device or a content playing device which (i) is indicated by an address that the content-storage-location information associates with the content thus requested and (ii) is not included in the response transmission record within a predetermined time period.

[0501] By referring the response transmission record, the content-acquiring-location instructing means can predict date and time when the relaying device or the content playing device, which has been the destination to which the response is transmitted, has received the response. To put it another way, the content-acquiring-location instructing means can predict date and time when the relaying device or the content playing device has carried out transmission of the request, reception of

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the response, or a process regarding the transmission of the request and the reception of the response. Accordingly, "a destination which is not included in the response transmission record within a predetermined time period" means a relaying device or a content playing device which is considered not to have carried out a process regarding the transmission and the reception of the response within the predetermined time period.

[0502] That is, the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to acquire the content thus requested from a relaying device or a content playing device which (i) possesses the content thus requested and (ii) is considered not to have carried out a process regarding transmission and reception of the content within a predetermined time period. Accordingly, when the content playing device, which is the source, acquires content from a relaying device or a content playing device designated by the content-acquiring-location instructing means, it is possible to reduce a delay caused by an increase in throughput of the relaying device or the content playing device from which the content is acquired.

[0503] Further, a content playing device in accordance with the present invention (A) transmits a request to the content distributing device, (B) receives a content-storage-location list in response to the request, and (C) acquires the content thus requested from a relaying device or a content playing device which is indicated by an address included in the content-storage-location list thus received, wherein, in a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed, the relaying device or the content playing device, from which the content is acquired, is changed to a relaying device or a content playing device which is indicated by another address included in the content-storage-location list.

[0504] According to the arrangement, the content playing device selects one of a relaying device and a content playing device which is indicated by an address included in the content-storage-location list thus received. In a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed when the content playing device acquires the content thus requested from the relaying device or the content playing device thus selected, the content playing device changes the relaying device or the content playing device thus selected to a relaying device or a content playing device which is indicated by another address included in the content-storage-location list.

[0505] The content playing device can, therefore, keep a receiving speed required to acquire content faster than a predetermined receiving speed, and can stably acquire the content without causing a huge delay.

[0506] The delay in acquiring of content may be caused by, for example, the following reasons: an increase in throughput of a relaying device or a content playing device from which the content is acquired; or a deterioration in communication status of a network between (i) the content playing device and (ii) the relaying device or the content playing device from which the content is acquired. The content playing device changes, due to the delay, the relaying device or the content playing device, from which the content is acquired, to another relaying device or another content playing device, so that it is possible to effectively use resources for (i) the relaying device or the content playing device from which the content is acquired and (ii) a network between a content playing device for acquiring the content and the relaying device or the content playing device from which the content is acquired.

[0507] A content playing device in accordance with the present invention (A) transmits a request to the content distributing device, (B) receives the content-storage-location list in response to the request, and (C) acquires a requested content from a relaying device or a content playing device indicated by an address which is the highest on the content-storage-location list thus received, and, in a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed, the content playing device changes a relaying device or a content playing device, from which the requested content is to be acquired, to a relaying device or a content playing device indicated by an address which is the second highest on the content-storage-location list.

[0508] According to the arrangement, the content playing device selects a relaying device or a content playing device which is indicated by an address which is the highest on the content-storage-location list thus received. In a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed when the content playing device acquires the content thus requested from the relaying device or the content playing device thus selected, the content playing device changes the relaying device or the content playing device thus selected, from which the requested content is to be acquired, to a relaying device or a content playing device indicated by another address which is the second highest on the content-storage-location list.

[0509] The content playing device can, therefore, keep a receiving speed required to acquire content faster than a predetermined receiving speed, and can stably acquire the content without causing a huge delay.

[0510] Further, in a case where priorities are assign to each of relaying devices and content playing devices on the basis of date and time when each relaying device or content playing device has stored the content, the content playing device for acquiring the content can acquire the content from a relaying device or a content playing device which has the highest possibility to possess the content same as that transmitted by the content distributing device. It is therefore possible to quickly and surely acquire the content same as that transmitted by the content distributing device. Meanwhile, in a case where priorities are assigned to each of relaying devices and content playing devices on the basis of a distance between each relaying device or content playing device, from

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which the content is acquired, and the content playing device for acquiring the content, the content playing device acquires the content from a relaying device or a content playing device having a shortest distance with respect to the content playing device for acquiring the content. It is therefore possible to stably acquire the content while reducing a load of a network.

[0511] Further, a content distributing system in accordance with the present invention includes: the content distributing device; a relaying device for requesting the content distributing device to transmit a content, possessing the content thus requested, and transferring the content thus requested to a content playing device; and a content playing device for requesting the content distributing device to transmit a content and acquiring the content thus requested from a device designated by the content distributing device.

[0512] According to the arrangement, the content distributing system has an effect same as that of the content distributing device.

[0513] Further, a content distributing device for transmitting, in response to a request, a content to a source which has transmitted the request, in accordance with the present invention, includes: determining means for determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; content-storage-location information acquiring means for acquiring, in response to the request, an address of another content distributing device possessing the content thus requested, among predetermined other content distributing devices, in a case where the determining means determines that the source is a content playing device; and content-acquiring-location instructing means for transmitting, to the content playing device which is the source, an instruction to acquire the content from the another content distributing device which is indicated by the address acquired by the content-storage-location information acquiring means.

[0514] Further, a method for controlling a content distributing device for transmitting, in response to a request, a content to a source which has transmitted the request, the method in accordance with the present invention, includes: a determining step of determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested; a content-storage-location information acquiring step of acquiring, in response to the request, an address of another content distributing device including the content thus requested, among content distributing devices connected to the content distributing device, in a case where it is determined that, in the determining step, the source is the content playing device; and a content-acquiring-location instructing step of transmitting, to the content playing device which is the source, an instruction to acquire the content from the another content distributing device which is indicated by the address acquired in the content-storage-location information acquiring step.

[0515] According to the arrangement, the determining means determines whether a source which has transmitted a request is a relaying device or a content playing device, and, in a case where the determining means determines that the source is a content playing device, the content-storage-location information acquiring means acquires, in response to the request, an address of another content distributing device including the content thus requested, among predetermined content distributing devices. Then, the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to acquire the content from the another content distributing device which is indicated by the address acquired by the content-storage-location information acquiring means.

[0516] That is, in a case where the content distributing device receives a request from a content playing device, the content distributing device does not directly transmit a content to the content playing device which is a source which has transmitted the request, but transmits, to the content playing device which is the source, an instruction to acquire the content from another content distributing device which possesses the content thus requested. The content playing device, which is the source, acquires the content thus requested from the designated another content distributing device. That is, the content distributing device, has received the request from the content playing device, can acquire content, without carrying out a process for transmitting the content.

[0517] In a case where a load of a network which is used to transmit data from the content distributing device received the request from the content playing device and a load of the content distributing device are relatively large, the content distributing device causes another content distributing device to acquire the content. This makes it possible to distribute the load of the network which is used to transmit data from the content distributing device and the load of the content distributing device.

[0518] Further, it is preferable that, in a content distributing device in accordance with the present invention, the content-storage-location information acquiring means transmits, to the predetermined other content distributing devices, an inquiry as to whether or not the predetermined other content distributing devices include the content thus requested, so as to acquire the address of the another content distributing device that has responded, to the inquiry, that the content distributing device possesses the content thus requested.

[0519] According to the arrangement, the content-storage-location information acquiring means transmits, to the predetermined other content distributing devices, an inquiry as to whether or not the predetermined other content distributing devices include the content thus requested, so as to acquire the address of the another content distributing device that has responded, to the inquiry, that

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the content distributing device possesses the content thus requested.

[0520] The content-acquiring-location instructing means transmits, to the content playing device, an instruction to acquire the content on the basis of the address acquired by the content-storage-location information acquiring means having carrying out the inquiry. This makes it possible to transmits, to the content playing device, the instruction to acquire the content on the basis of highly accurate (correct) information. The content playing device can therefore surely acquire the content thus requested.

[0521] Further, it is preferable that the content distributing device in accordance with the present invention further include content-storage-location information generating means for (A) generating content-storage-location information by associating (i) the address of the another content distributing device including the content, which address has been acquired by the content-storage-location information acquiring means, with (ii) the content identification information indicative of the content and (B) causing a storage section to store the content-storage-location information, wherein the content-storage-location information acquiring means (I) reads out the content-storage-location information from the storage section, and (II) acquires the address, associated with the content identification information, from the content-storage-location information in a case where the content-storage-location information thus read out contains the content identification information indicative of the content thus requested, or transmits the inquiry to thereby acquire the address of the another content distributing device possessing the content thus requested in a case where the content-storage-location information thus read out does not contain the content identification information indicative of the content thus requested.

[0522] According to the arrangement, content-storage-location information generating means (A) generates content-storage-location information by associating (i) the address of the another content distributing device including the content, which address has been acquired by the content-storage-location information acquiring means, with (ii) the content identification information indicative of the content and (B) causing a storage section to store the content-storage-location information. Then, the content-storage-location information acquiring means (I) reads out the content-storage-location information from the storage section, and (II) acquires the address associated with the content identification information in a case where the content-storage-location information thus read out contains the content identification information indicative of the content thus requested, or transmits the inquiry to thereby acquire the address of the another content distributing device possessing the content thus requested in a case where the content-storage-location information thus read out does not contain the content identification information indicative of the content thus requested.

[0523] That is, in a case where the content-storage-location information acquiring means acquires the address of the another content distributing device including the content thus requested, the content-storage-location information acquiring means refers the content-storage-location information stored in the storage section. In a case where the storage section stores the content-storage-location information including the content identification information indicative of the content thus requested, i.e., in a case where the content-storage-location information acquiring means has acquired before an address of another content distributing device including the content, the content-storage-location information acquiring means acquires the address from the content-storage-location information stored in the storage section.

[0524] Meanwhile, in a case where the content-storage-location information acquiring means refers the content-storage-location information stored in the storage section and the storage section does not store the content-storage-location information including the content identification information indicative of the content thus requested, i.e., in a case where the content-storage-location information acquiring means has never acquired an address of another content distributing device including the content, the content-storage-location information acquiring means transmits the inquiry, so as to acquire an address of another content distributing device including the content thus requested.

[0525] It is predicted that another content distributing device, indicated by an address included in the content-storage-location information stored in the storage section, would include the content indicated by the content identification information corresponding to the address.

[0526] It is therefore possible to acquire the address of the another content distributing device including the content thus requested by carrying out a simple process, i.e., by using the address which has been acquired before. This makes it possible to reduce a process load of the content distributing device.

[0527] Further, it is preferable that, in the content distributing device in accordance with the present invention, the content-storage-location information acquiring means (i) acquire a plurality of addresses included in a plurality of content distributing devices, respectively, each of the plurality of content distributing devices including the content thus requested, and (ii) create a content storage server list including the plurality of addresses thus acquired and content identification information indicative of the content; and the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to acquire the content from the content distributing device indicated by the address included in the content storage server list created by the content-storage-location information acquiring means.

[0528] According to the arrangement, the content-storage-location information acquiring means (i) acquires a

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plurality of addresses included in a plurality of content distributing devices, respectively, each of the plurality of content distributing devices including the content thus requested, and (ii) creates a content storage server list including the plurality of addresses thus acquired and content identification information indicative of the content; and the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to acquire the content from the content distributing device indicated by the address included in the content storage server list created by the content-storage-location information acquiring means.

[0529] That is, the content playing device can acquire the content thus requested from one of the other content distributing devices. This makes it possible to distribute the load of the network which is used to transmit data from the content distributing device and the load of the content distributing device.

[0530] Further, a content playing device for (A) transmitting a request to the content distributing device, (B) receiving the content storage server list in response to the request, and (C) acquiring a requested content from another content distributing device indicated by one of a plurality of addresses included in the content storage server list thus received, the content playing device in accordance with the present invention, includes acquiring location changing means for, in a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed, changing the another content distributing device, from which the requested content is to be acquired, to another content distributing device indicated by another address, which is different from the one of the plurality of addresses, included in the content storage server list.

[0531] According to the arrangement, the content playing device selects another content distributing device indicated by one of the plurality of addresses included in the content storage server list thus received. In a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed when the content playing device acquires the content thus requested from the another content distributing device thus selected, the content playing device changes the another content distributing device, from which the requested content is to be acquired, to a still another content distributing device indicated by another address, which is different from the one of the plurality of addresses, included in the content storage server list.

[0532] The content playing device can, therefore, keep a receiving speed required to acquire content faster than a predetermined receiving speed, and can stably acquire the content without causing a huge delay.

[0533] The delay in acquiring of content may be caused by, for example, the following reasons: an increase in throughput of a content distributing device from which the content is acquired; or a deterioration in communication status of a network between the content playing device and the content distributing device from which the content is acquired. The content playing device changes, due to the delay, the content distributing device, from which the content is acquired, to another content distributing device which is different from the content distributing device, so that it is possible to effectively use resources for (i) the content distributing device from which the content is acquired and (ii) a network between a content playing device for acquiring the content and the content distributing device from which the content is acquired.

[0534] Further, a content distributing system in accordance with the present invention includes the content distributing device, a relaying device for requesting the content distributing device to transmit a content, possessing the content thus requested, and transferring the content thus requested to a content playing device; and the content playing device for requesting the content distributing device to transmit the content, and acquiring the content thus requested from a device designated by the content distributing device.

[0535] According to the arrangement, the content distributing system has an effect same as that of the content distributing device.

[0536] Further, the content distributing device for transmitting, in response to a request, data to a source which has transmitted the request, the content distributing device in accordance with the present invention includes: managing means for managing (A) content and (B) meta data of the content, the meta data containing (i) content-storage-location information in which content identification information for specifying the content and an address of another content distributing device including the content are associated with each other or (ii) a storage-location address indicative of a location of the content-storage-location information; request determining means for determining whether the request is a content request or a meta data request; and transmitting means for transmitting the content thus requested to the source in a case where the request determining means determines that the request is the content request, and for transmitting the meta data thus requested to the source in a case where the request determining means determines that the request is the meta data request.

[0537] Further, a method for controlling a content distributing device for transmitting, in response to a request, data to a source which has transmitted the request, the method managing (A) content and (B) meta data of the content, the meta data containing (i) content-storage-location information in which content identification information for specifying the content and an address of another content distributing device including the content are associated with each other or (ii) a storage-location address indicative of a location of the content-storage-location information, the method in accordance with the present invention includes a request determining step of determining whether the request is a content request or a meta data request; and a transmitting step of transmitting the content thus requested to the source in a case where it is determined that, in the request determining step, the

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request is the content request, and of transmitting the meta data thus requested to the source in a case where it is determined that, in the request determining step, the request is the meta data request.

[0538] According to the arrangement, the managing means manages (A) content and (B) meta data of the content, the meta data containing (i) content-storage-location information in which content identification information for specifying the content and an address of another content distributing device including the content are associated with each other or (ii) a storage-location address indicative of a location of the content-storage-location information, and the request determining means determines whether the request is a content request or a meta data request, and the transmitting means transmits the content thus requested to the source in a case where the request determining means determines that the request is the content request, and for transmitting the meta data thus requested to the source in a case where the request determining means determines that the request is the meta data request.

[0539] That is, upon receipt of a content request from the content playing device, the content distributing device directly transmits the content to the content playing device which is the source. Meanwhile, upon receipt of a meta data request from the content playing device, the content distributing device does not directly transmit the content to the content playing device which is the source, but transmits, to the content playing device which is the source, an instruction to acquire the content from another content distributing device including the content thus requested. The content playing device which is the source acquires the content thus requested from a designated content distributing device. That is, in a case where the content playing device requests to acquire the content with use of meta data of the content, not the content distributing device which has received the meta data request, but the another content distributing carries out a process for transmitting the content. The content playing device, which is the source, can therefore acquire the content.

[0540] Therefore, in a case where (i) the content playing device requests to acquire a content with use of meta data of the content and (ii) a load of a network which is used to transmit data from the content distributing device which has received the request from the content playing device and a load of the content distributing device are relatively large, the content playing device acquires the content from another content distributing device. This makes it possible to distribute the load of the network which is used to transmit the data from the content distributing device and the load of the content distributing device.

[0541] It is preferable that, in the content distributing device in accordance with the present invention, the request determining means determine whether the request is the content request, the meta data request, or a content-storage-location information request including the storage-location address; and, in a case where the request determining means determines that the request is the content-storage-location information including the storage-location address, the transmitting means transmit, to a device which is the source, the content-storage-location information whose location is indicated by the storage-location address.

[0542] According to the arrangement, the request determining means determines whether the request is the content request, the meta data request, or a content-storage-location information request including the storage-location address; and, in a case where the request determining means determines that the request is the content-storage-location information including the storage-location address, the transmitting means transmits, to a device which is the source, the content-storage-location information whose location is indicated by the storage-location address.

[0543] Therefore, upon receipt of the meta data request from the content playing device, the content distributing device can send the content playing device with not only content-storage-location information indicative of a device from which the content corresponding to the meta data is acquired, but also content-storage-location information which indicates, when the content distributing device receives the content storage-location information request from the playing device, a device from which the content corresponding to the meta data is acquired. By, for example, transmitting the content-storage-location information request when the content is played, it is possible to know the another content playing device including the content can, therefore, know the another content distributing device including the content when the content is played.

[0544] Accordingly, the content distributing device can send the content playing device with highly accurate (correct) information, and the content playing device can reduce such an error that the content playing device cannot acquire a requested content from a device from which the content is acquired. This makes it possible to stably acquire the content.

[0545] Further, it is preferable that a content distributing device in accordance with the present invention further include: content-storage-location information acquiring means for transmitting, to predetermined other content distributing devices, an inquiry as to whether or not the predetermined other content distributing devices contain a predetermined content, and acquiring an address of a content distributing device that has responded, to the inquiry, that the content distributing device includes the predetermined content; content-storage-location information generating means for (A) generating content-storage-location information by associating (i) the address of the content distributing device including the predetermined content, which address has been acquired by the content-storage-location information acquiring means, with (ii) the content identification information for specifying the predetermined content and (B) causing a

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storage section to store the content-storage-location information; and update determining means for determining whether to update the content-storage-location information stored in the storage section, wherein, in a case where the request determining means determines that the request is the content-storage-location information request including the storage-location address and the update determining means determines to update the content-storage-location information whose location is indicated by the storage-location address, the content-storage-location information acquiring means transmits the inquiry to acquire the address, the content-storage-location information generating means generates the content-storage-location information based on the address, and the transmitting means transmits the content-storage-location information to a device which is the source, or, in a case where the request determining means determines that the request is the content-storage-location information request including the storage-location address and the update determining means determines not to update the content-storage-location information whose location is indicated by the storage-location address, the transmitting means transmits, to the device which is the source, the content-storage-location information whose location is indicated by the storage-location address.

[0546] According to the arrangement, the request determining means determines that the request is the content-storage-location information request including the storage-location address and the update determining means determines to update the content-storage-location information whose location is indicated by the storage-location address, the content-storage-location information acquiring means transmits the inquiry to acquire the address, the content-storage-location information generating means generates the content-storage-location information based on the address, and the transmitting means transmits the content-storage-location information to a device which is the source. Meanwhile, the request determining means determines that the request is the content-storage-location information request including the storage-location address and the update determining means determines not to update the content-storage-location information whose location is indicated by the storage-location address, the transmitting means transmits, to the device which is the source, the content-storage-location information whose location is indicated by the storage-location address.

[0547] That is, in a case where the update determining means determines not to update the content-storage-location information stored in the storage section when the content-storage-location information acquiring means acquires the address of the content distributing device including the requested content, the content-storage-location information acquiring means acquires the address from the content-storage-location information stored in the storage section. Meanwhile, in a case where the update determining means determines to update the content-storage-location information stored in the storage section, the content-storage-location information acquiring means transmits the inquiry to thereby acquire the address of the content distributing device including the content thus requested.

[0548] Here, "a case where the update determining means determines to update the content-storage-location information whose location is indicated by the storage-location address" means, for example, a case where the content-storage-location information stored in the storage section is old, or a case where the content-storage-location information including content identification information indicative of the requested content is not stored in the storage section, i.e., a case where the content-storage-location information acquiring means has never acquired before an address of a content distributing device including the content.

[0549] Therefore, in a case where the update determining means determines not to update the content-storage-location information stored in the storage section, the content-storage-location information acquiring means can acquire the address of the content distributing device including the required content by carrying out a simple process, i.e. by using the address which has been acquired before. This makes it possible to reduce the process load of the content distributing device.

[0550] Further, by updating content-storage-location information stored in the storage section, the content distributing device can send the content playing device with highly accurate (correct) information, and the content playing device can reduce such an error that the content playing device cannot acquire a requested content from a device from which the content is acquired. This makes it possible to stably acquire the content.

[0551] Further, it is preferable that, in the content distributing device in accordance with the present invention, the meta data can include a plurality of storage location addresses each indicative of a location of content-storage-location information which is set per unit into which the content is divided at a predetermined time interval.

[0552] According to the arrangement, the meta data can include a plurality of storage location addresses each indicative of a location of content-storage-location information which is set per unit into which the content is divided at a predetermined time interval. Therefore, the content distributing device can send, to the content playing device, pieces of content-storage-location information, each of which is sent per unit obtained by dividing the content by a predetermined time interval.

[0553] The content distributing device can therefore improve a degree of freedom of a device from which a content is acquired more than that of the content playing device. This makes it possible to distribute the load of the network which is used to transmit data from the content distributing device and the load of the content distributing device.

[0554] Further, it is preferable that, in the content distributing device in accordance with the present invention,

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the content include a plurality of media segments; and the content divided by the predetermined time interval include at least one media segment.

[0555] According to the arrangement, the content divided by the predetermined time interval includes at least one media segment. It is therefore possible to manage, per unit of a media segment, the degree of freedom of the device from which the content is acquired.

[0556] Further, it is preferable that, in the content distributing device in accordance with the present invention, the meta data include a content storage server list containing the plurality of pieces of content-storage-location information or a storage location address indicative of a location of the content storage server list.

[0557] According to the arrangement, the meta data includes a content storage server list including the plurality of pieces of content-storage-location information or a storage-location address indicative of the content storage server list. The content distributing device can therefore cause the content playing device to acquire one of the other content distributing devices which correspond to the meta data. This makes it possible to distribute the load of the network which is used to transmit data from the content distributing device and the load of the content distributing device.

[0558] Further, a content playing device for transmitting a meta data request to the content distributing device, receiving the meta data in response to the request, and acquiring the content in accordance with the meta data thus received, the content playing device in the present invention includes content acquiring means for acquiring the content from another content distributing device indicated by an address included in any one of the plurality of pieces of content-storage-location information contained in the content storage server list, when said content playing device receives the content storage server list included in the meta data thus received, or when said content playing device transmits a content-storage-location information request with use of a storage-location address included in the meta data thus received and receives, in response to the request, the content storage server list; and acquiring location changing means for, in a case where a receiving speed required to acquire the content of the content acquiring means is slower than a predetermined receiving speed, changing the another content distributing device, from which the content is to be acquired, to a still another content distributing device indicated by another address, which is different from the address, included in the content storage server list.

[0559] According to the arrangement, when the content playing device receives the content storage server list, the content acquiring means acquires, on the basis of the meta data thus received, the content from another content distributing device indicated by an address included in one of pieces of content-storage-location information included in the content storage server list thus received. In a case where a receiving speed required for the content acquiring means to acquire the content is slower than the predetermined receiving speed, the acquiring location changing means changes the another content distributing device, from which the content is to be acquired, to a still another content distributing device indicated by another address, which is different from the address, included in the content storage server list.

[0560] The content playing device can, therefore, keep a receiving speed required to acquire content faster than a predetermined receiving speed, and can stably acquire the content without causing a huge delay.

[0561] The delay in acquiring of content may be caused by, for example, the following reason: an increase in throughput of a content distributing device from which the content is acquired; or a deterioration in communication status of a network between the content playing device and the content distributing device from which the content is acquired. The content playing device changes, due to the delay, the content distributing device, from which the content is acquired, to another content distributing device which is different from the content distributing device, so that it is possible to effectively use resources for (i) the content distributing device from which the content is acquired and (ii) a network between a content playing device for acquiring the content and the content distributing device from which the content is acquired.

[0562] Further, a content distributing system in accordance with the present invention includes the content distributing device, a relaying device for requesting the content distributing device to transmit a content, possessing the content thus requested, and transferring the content thus requested to a content playing device, the content playing device for transmitting, to the content distributing device, a content request to request the content so as to acquire the content from the content distributing device, and for transmitting, to the content distributing device, a meta data request to request meta data of the content, receiving the meta data from the content distributing device, and acquiring, on the basis of the meta data thus received, the content corresponding to the meta data.

[0563] According to the arrangement, the content distributing system has an effect same as that of the content distributing device.

[0564] Note that the content distributing device may be achieved by a computer. In this case, the present invention encompasses a controlling program for realizing the content distributing device with use of computer by operating the computer as each means of the content distributing device and a computer readable recording medium in which the controlling program is stored.

[Supplementary description]

[0565] The present invention is not limited to the description of the embodiments above, and can be modified in numerous ways by a skilled person as long as such modification falls within the scope of the claims. An embodiment derived from a proper combination of technical means disclosed in different embodiments is also en-

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compassed in the technical scope of the present invention.

[0566] Each block of the server 2, the proxy 3, and the client 4, especially, the server controlling section 14, the proxy controlling section 22, and the client control section 32 can be configured by means of hardware logic or can alternatively be realized by software with use of a CPU (Central Processing Unit) as follows.

[0567] Specifically, the server 2, the proxy 3, and the client 4 each include: a CPU, such as an MPU, for executing commands of a program to realize each function; a ROM (Read Only Memory) which stores the program; a RAM (Random Access Memory) in which the program is developed in an executable format; and a storage device (recording medium), such as a memory, which stores the program and various kinds of data. Further, the object of the present invention can be also realized in such a manner that: recording media are provided to the server 2, the proxy 3, and the client 4, respectively, which recording media have stored program codes (execution mode program, intermediate code program, and source program) (serving as software for realizing the aforementioned functions) of control programs of the server 2, the proxy 3, and the client 4 so as to be readable by a computer; and the program codes stored in the recording medium are read out and carried out by the computer (or CPU or MPU).

[0568] Examples of the recording medium encompass: tapes such as a magnetic tape and a cassette tape; disks such as magnetic disks (e.g., a floppy (registered trademark) disk and a hard disk) and optical disks (e.g., a CD-ROM, an MO, an MD, a DVD, and a CD-R); cards such as an IC card (including a memory card) and an optical card; and semiconductor memories (e.g., a mask ROM, an EPROM, an EEPROM, and a flash ROM).

[0569] Further, the server 2, the proxy 3, and the client 4 may be configured to be connected to a communication network, and the program code may be supplied via the communication network. The communication network is not particularly limited, and examples of the communication network encompass the Internet, an intranet, an extranet, a LAN, an ISDN, a VAN, a CATV communication network, a virtual private network, a telephone network, a mobile communication network, and a satellite communication network. In addition, a transmission medium constituting the communication network is not particularly limited, and examples of the transmission medium encompass: wired transmission media such as IEEE1394, a USB, a power-line carrier, a cable TV line, a telephone line, and an ADSL; and wireless transmission media such as infrared rays (e.g., IrDA and a remote controller), Bluetooth (registered trademark), 802.11 wireless, an HDR, a cell-phone network, and a satellite line, and a digital terrestrial network. Note that the present invention may be also realized by a computer data signal which has the program codes specified with electronic transmission and is embedded in a carrier wave.

Industrial Applicability

[0570] The present invention can be applied to a content distributing system for distributing a content to a client from a server in response to a request transmitted from the client for playing the content, and a content distributing device, a relaying device, and a content playing device for configuring the content distributing system.

Reference Signs List

[0571]

1, 1a, 1b, 1c content distributing system
2 server (content distributing device)
3 proxy (relaying device)
4 client (content playing device, relaying device)
15 response executing section (determining section, content transmitting means, content-acquiring-location instructing means, transmission record creating means, request determining section, transmitting means)
16 relaying device specifying section (content-acquiring-location instructing means, distance calculating means)
17 content-storage-location information generating section (content-storage-location information generating means)
18 acquiring location specifying section (content-storage-location information acquiring means, content-storage-location information generating means, update determining means)
35 response/ request executing section (content acquiring means)
37 relaying device selecting section (relaying device changing means)
38 acquiring location specifying section (acquiring location changing means)

Claims

1. A content distributing device for transmitting, in response to a request, a content to a source which is a sender of the request,
the content distributing device comprising:

determining means for determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested;
content transmitting means for transmitting, in response to the request, the content thus requested to the relaying device in a case where the determining means determines that the source is a relaying device;

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content-storage-location information generating means for generating content-storage-location information by associating (A) content identification information for specifying the content transmitted by the content transmitting means with (B) an address of the relaying device, which is a destination to which the content is to be transmitted, or an address of the content playing device, to which the content is to be transferred from the relaying device; and

content-acquiring-location instructing means for transmitting, in response to the request, an instruction to the content playing device which is the source in a case where the determining means determines that the source is a content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address that the content-storage-location information associates with the content identification information indicative of the content thus requested or (ii) a content playing device indicated by an address that the content-storage-location information associates with the content identification information indicative of the content thus requested.

2. The content distributing device as set forth in claim 1, wherein

the determining means determines that, in a case where the request contains transmission path information indicative of a transmission path via which the request is transferred, the source is a relaying device and, in a case where the request does not contain the transmission path information, the source is a content playing device.

3. The content distributing device as set forth in claim 1 or 2, wherein

in a case where there are a plurality of pieces of the content-storage-location information which include a plurality of addresses, respectively, each of the plurality of addresses being associated with the content identification information indicative of the content thus requested, the content-acquiring-location instructing means (A) creates a content-storage-location list including the plurality of addresses included in the plurality of pieces of content-storage-location information and (B) transmit, to the content playing device which is the source, an instruction to acquire the content from (I) a relaying device indicated by an address included in the content-storage-location list thus created or (II) a content playing device indicated by an address included in the content-storage-location list thus created.

4. The content distributing device as set forth in claim 3, wherein:

the content-storage-location information generating means generates the content-storage-location information by associating (A) the content identification information indicative of the content which has been transmitted by the content transmitting means with (B) date and time when the content transmitting means has transmitted the content; and

the content-acquiring-location instructing means creates the content-storage-location list by (I) arranging the plurality of addresses, which are contained in the plurality of pieces of content-storage-location information, on the basis of date and time associated with the content identification information and (II) adding priorities to the plurality of addresses so that an address having later date and time gets a higher priority.

5. A content distributing device as set forth in claim 3, further comprising:

distance calculating means for calculating, on the basis of an address included in any one of the plurality of pieces of content-storage-location information, a physical or network-structural distance between (A) a relaying device or a content playing device which is indicated by the address and (B) the content playing device that the content-acquiring-location instructing means instructs on a device from which the content is acquired, wherein:

the content-acquiring-location instructing means creates the content-storage-location list by (I) arranging the plurality of addresses, which are included in the respective plurality of pieces of content-storage-location information, on the basis of distances calculated by the distance calculating means, and (II) adding priorities to the plurality of addresses so that an address having a shorter distance gets a higher priority.

6. A content distributing device as set forth in any one of claims 1 through 5, further comprising:

transmission record creating means for creating a response transmission record by associating (A) a destination to which a response is transmitted in response to the request with (B) date and time when the response has been transmitted,

wherein, with reference to response transmission record created by the transmission record creating means, the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to

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acquire the content from a relaying device or a content playing device which (i) is indicated by an address that the content-storage-location information associates with the content thus requested and (ii) is not included in the response transmission record within a predetermined time period.

7. A content playing device for (A) transmitting a request to a content distributing device recited in claim 3, (B) receiving the content-storage-location list in response to the request, and (C) acquiring the content thus requested from a relaying device or a content playing device which is indicated by an address included in the content-storage-location list thus received,
wherein, in a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed, the relaying device or the content playing device, from which the content is acquired, is changed to a relaying device or a content playing device which is indicated by another address included in the content-storage-location list.

8. A content playing device for (A) transmitting a request to a content distributing device recited in claim 4 or 5, (B) receiving the content-storage-location list in response to the request, and (C) acquiring a requested content from a relaying device or a content playing device indicated by an address which is the highest on the content-storage-location list thus received,
the content playing device comprising
relaying device changing means for, in a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed, changing a relaying device or a content playing device, from which the requested content is to be acquired, to a relaying device or a content playing device indicated by an address which is the second highest on the content-storage-location list.

9. A content distributing system, comprising:

a content distributing device recited in any one of claims 1 through 6;
a relaying device for requesting the content distributing device to transmit a content, possessing the content thus requested, and transferring the content thus requested to a content playing device; and
a content playing device for requesting the content distributing device to transmit a content and acquiring the content thus requested from a device designated by the content distributing device.

10. A method for controlling content distributing device for transmitting, in response to a request, a content to a source which is a sender of the request,
the method comprising:

a determining step of determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested;
a content transmitting step of transmitting, in response to the request, the content thus requested to the relaying device in a case where it is determined that, in the determining step, the source is a relaying device;
a content-storage-location information generating step of generating content-storage-location information by associating (A) content identification information for indicating the content transmitted in the content transmitting step with (B) an address of the relaying device, which is a destination to which the content is to be transmitted, or an address of the content playing device, to which the content is to be transferred from the relaying device; and
a content-acquiring-location instructing step of transmitting, in response to the request, an instruction to the content playing device which is the source in a case where it is determined that, in the content-storage-location information generating step, the source is the content playing device, which instruction is to acquire the content from (i) a relaying device indicated by an address associated, in the content-storage-location information, with the content identification information indicative of the content thus requested or (ii) a content playing device indicated by an address associated, in the content-storage-location information, with the content identification information indicative of the content thus requested.

11. A content distributing device for transmitting, in response to a request, a content to a source which is a sender of the request,
the content distributing device comprising:

determining means for determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested;
content-storage-location information acquiring means for acquiring, in response to the request, an address of another content distributing device possessing the content thus requested, among predetermined other content distributing

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devices, in a case where the determining means determines that the source is a content playing device; and

content-acquiring-location instructing means for transmitting, to the content playing device which is the source, an instruction to acquire the content from the another content distributing device which is indicated by the address acquired by the content-storage-location information acquiring means.

12. The content distributing device as set forth in claim 11, wherein

the content-storage-location information acquiring means transmits, to the predetermined other content distributing devices, an inquiry as to whether or not the predetermined other content distributing devices include the content thus requested, so as to acquire the address of the another content distributing device that has responded, to the inquiry, that the content distributing device possesses the content thus requested.

13. A content distributing device as set forth in claim 12, further comprising

content-storage-location information generating means for (A) generating content-storage-location information by associating (i) the address of the another content distributing device including the content, which address has been acquired by the content-storage-location information acquiring means, with (ii) the content identification information indicative of the content and (B) causing a storage section to store the content-storage-location information, wherein

the content-storage-location information acquiring means (I) reads out the content-storage-location information from the storage section, and (II) acquires the address, associated with the content identification information, from the content-storage-location information in a case where the content-storage-location information thus read out contains the content identification information indicative of the content thus requested, or transmits the inquiry to thereby acquire the address of the another content distributing device possessing the content thus requested in a case where the content-storage-location information thus read out does not contain the content identification information indicative of the content thus requested.

14. The content distributing device as set forth in any one of claims 11 through 13, wherein:

the content-storage-location information acquiring means (i) acquires a plurality of addresses included in a plurality of content distributing devices, respectively, each of the plurality of content distributing devices including the content thus requested, and (ii) creates a content storage server list including the plurality of addresses thus acquired and content identification information indicative of the content; and

the content-acquiring-location instructing means transmits, to the content playing device which is the source, an instruction to acquire the content from the another content distributing device indicated by the address included in the content storage server list created by the content-storage-location information acquiring means.

15. A content playing device for (A) transmitting a request to a content distributing device recited in claim 14, (B) receiving the content storage server list in response to the request, and (C) acquiring a requested content from another content distributing device indicated by one of a plurality of addresses included in the content storage server list thus received,

the content playing device comprising

acquiring location changing means for, in a case where a receiving speed required to acquire the content is slower than a predetermined receiving speed, changing the another content distributing device, from which the requested content is to be acquired, to another content distributing device indicated by another address, which is different from the one of the plurality of addresses, included in the content storage server list.

16. A content distributing system, comprising:

a content distributing device recited in any one of claims 11 through 14,

a relaying device for requesting the content distributing device to transmit a content, possessing the content thus requested, and transferring the content thus requested to a content playing device; and

the content playing device for requesting the content distributing device to transmit the content, and acquiring the content thus requested from a device designated by the content distributing device.

17. A method for controlling a content distributing device for transmitting, in response to a request, a content to a source which is a sender of the request,

the method comprising:

a determining step of determining whether the source is (A) a relaying device for receiving the content thus requested and possessing and transferring the content to a content playing device or (B) the content playing device for playing the content thus requested;

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a content-storage-location information acquiring step of acquiring, in response to the request, an address of another content distributing device including the content thus requested, among other content distributing devices connected to the content distributing device, in a case where it is determined that, in the determining step, the source is the content playing device; and

a content-acquiring-location instructing step of transmitting, to the content playing device which is the source, an instruction to acquire the content from the another content distributing device which is indicated by the address acquired in the content-storage-location information acquiring step.

18. A content distributing device for transmitting, in response to a request, data to a source which has transmitted the request,
the content distributing device comprising:

managing means for managing (A) content and (B) meta data of the content, the meta data containing (i) content-storage-location information in which content identification information for specifying the content and an address of another content distributing device including the content are associated with each other or (ii) a storage-location address indicative of a location of the content-storage-location information;

request determining means for determining whether the request is a content request or a meta data request; and

transmitting means for transmitting the content thus requested to the source in a case where the request determining means determines that the request is the content request, and for transmitting the meta data thus requested to the source in a case where the request determining means determines that the request is the meta data request.

19. The content distributing device as set forth in claim 18, wherein:

the request determining means determines whether the request is the content request, the meta data request, or a content-storage-location information request including the storage-location address; and

in a case where the request determining means determines that the request is the content-storage-location information including the storage-location address, the transmitting means transmits, to a device which is the source, the content-storage-location information whose location is indicated by the storage-location address.

20. A content distributing device as set forth in claim 19, further comprising:

content-storage-location information acquiring means for transmitting, to predetermined other content distributing devices, an inquiry as to whether or not the predetermined other content distributing devices includes a predetermined content, and acquiring an address of another content distributing device that has responded, to the inquiry, that the another content distributing device includes the predetermined content;

content-storage-location information generating means for (A) generating content-storage-location information by associating (i) the address of the another content distributing device including the predetermined content, which address has been acquired by the content-storage-location information acquiring means, with (ii) the content identification information for specifying the predetermined content and (B) causing a storage section to store the content-storage-location information; and

update determining means for determining whether to update the content-storage-location information stored in the storage section, wherein

in a case where the request determining means determines that the request is the content-storage-location information request including the storage-location address and the update determining means determines to update the content-storage-location information whose location is indicated by the storage-location address, the content-storage-location information acquiring means transmits the inquiry to acquire the address, the content-storage-location information generating means generates the content-storage-location information based on the address, and the transmitting means transmits the content-storage-location information to a device which is the source, or, in a case where the request determining means determines that the request is the content-storage-location information request including the storage-location address and the update determining means determines not to update the content-storage-location information whose location is indicated by the storage-location address, the transmitting means transmits, to the device which is the source, the content-storage-location information whose location is indicated by the storage-location address.

21. The content distributing device as set forth in claim 20, wherein
the meta data can include a plurality of storage location addresses each indicative of a location of con-

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tent-storage-location information which is set per unit into which the content is divided at a predetermined time interval.

22. The content distributing device as set forth in claim 21, wherein:

the content includes a plurality of media segments; and
the content divided at a predetermined time interval includes at least one media segment.

23. The content distributing device as set forth in any one of claims 20 to 22, wherein
the meta data includes a content storage server list containing the plurality of pieces of content-storage-location information or a storage location address indicative of a location of the content storage server list.

24. A content playing device for transmitting a meta data request to a content distributing device recited in claim 23, receiving the meta data in response to the request, and acquiring the content in accordance with the meta data thus received,
the content playing device comprising
content acquiring means for acquiring the content from another content distributing device indicated by an address included in any one of the plurality of pieces of content-storage-location information contained in the content storage server list, when said content playing device receives the content storage server list included in the meta data thus received, or when said content playing device transmits a content-storage-location information request with use of a storage-location address included in the meta data thus received and receives, in response to the request, the content storage server list; and
acquiring location changing means for, in a case where a receiving speed required to acquire the content of the content acquiring means is slower than a predetermined receiving speed, changing the another content distributing device, from which the content is to be acquired, to a still another content distributing device indicated by another address, which is different from the address, included in the content storage server list.

25. A content distributing system, comprising:

a content distributing device recited in any one of claims 18 to 23,
a relaying device for requesting the content distributing device to transmit a content, possessing the content thus requested, and transferring the content thus requested to a content playing device,
the content playing device for transmitting, to the content distributing device, a content request to request the content so as to acquire the content from the content distributing device, and for transmitting, to the content distributing device, a meta data request to request meta data of the content, receiving the meta data from the content distributing device, and acquiring, on the basis of the meta data thus received, the content corresponding to the meta data.

26. A method for controlling a content distributing device for transmitting, in response to a request, data to a source which has transmitted the request, the method managing (A) content and (B) meta data of the content, the meta data containing (i) content-storage-location information in which content identification information for specifying the content and an address of another content distributing device including the content are associated with each other or (ii) a storage-location address indicative of a location of the content-storage-location information,
the method comprising
a request determining step of determining whether the request is a content request or a meta data request; and
a transmitting step of transmitting the content thus requested to the source in a case where it is determined that, in the request determining step, the request is the content request, and of transmitting the meta data thus requested to the source in a case where it is determined that, in the request determining step, the request is the meta data request.

27. A controlling program for causing a content distributing device recited in any one of claims 1 through 6, 11 through 14, and 18 through 23 to operate, the controlling program causing a computer to function as each means.

28. A computer readable recording medium in which a controlling program recited in claim 27 is recorded.

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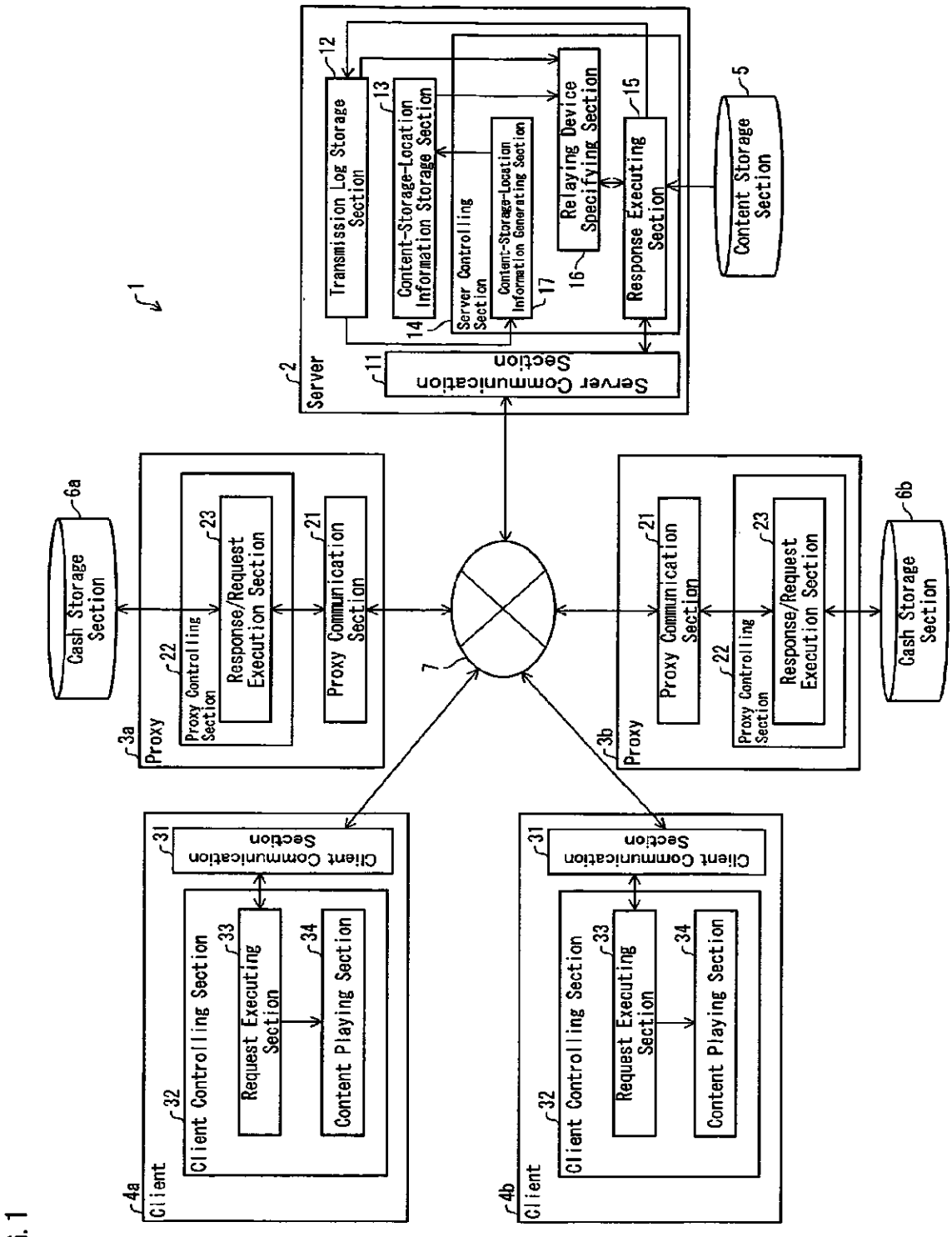


FIG. 1

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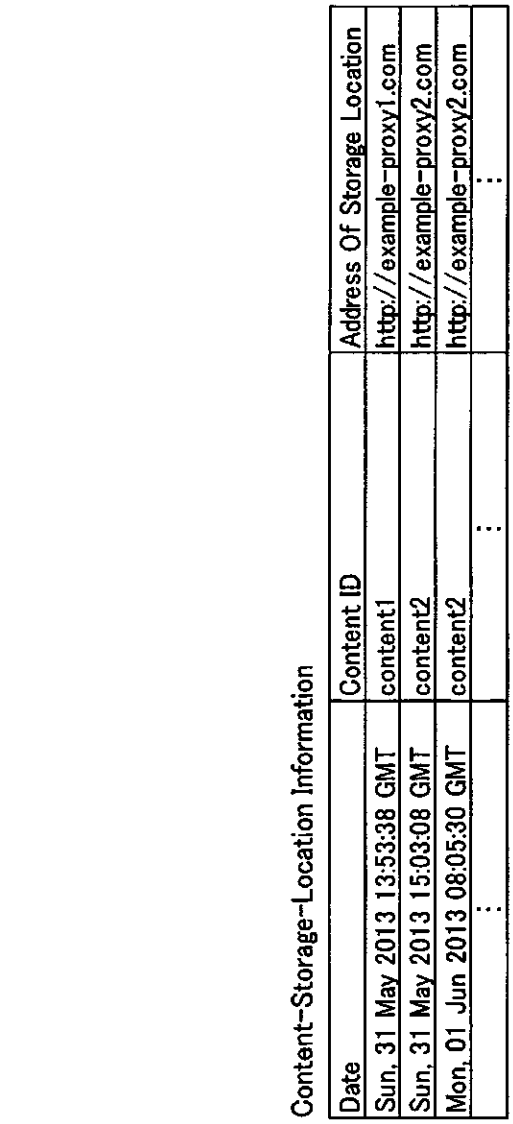
FIG. 2

Transmission Log

Date	Address Of Destination	Transmitted Contents	Content ID
Sun, 31 May 2013 13:52:22 GMT	http://example-client1.com	305 Use Proxy (proxy1)	content1
Sun, 31 May 2013 13:53:38 GMT	http://example-proxy1.com	200 OK	content1
Sun, 31 May 2013 15:02:11 GMT	http://example-client2.com	305 Use Proxy (proxy2)	content2
Sun, 31 May 2013 15:03:08 GMT	http://example-proxy2.com	200 OK	content2
Mon, 01 Jun 2013 08:04:06 GMT	http://example-client1.com	305 Use Proxy (proxy2)	content2
Mon, 01 Jun 2013 08:05:30 GMT	http://example-proxy2.com	304 Not Modified	content2
⋮	⋮	⋮	⋮

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FIG. 3

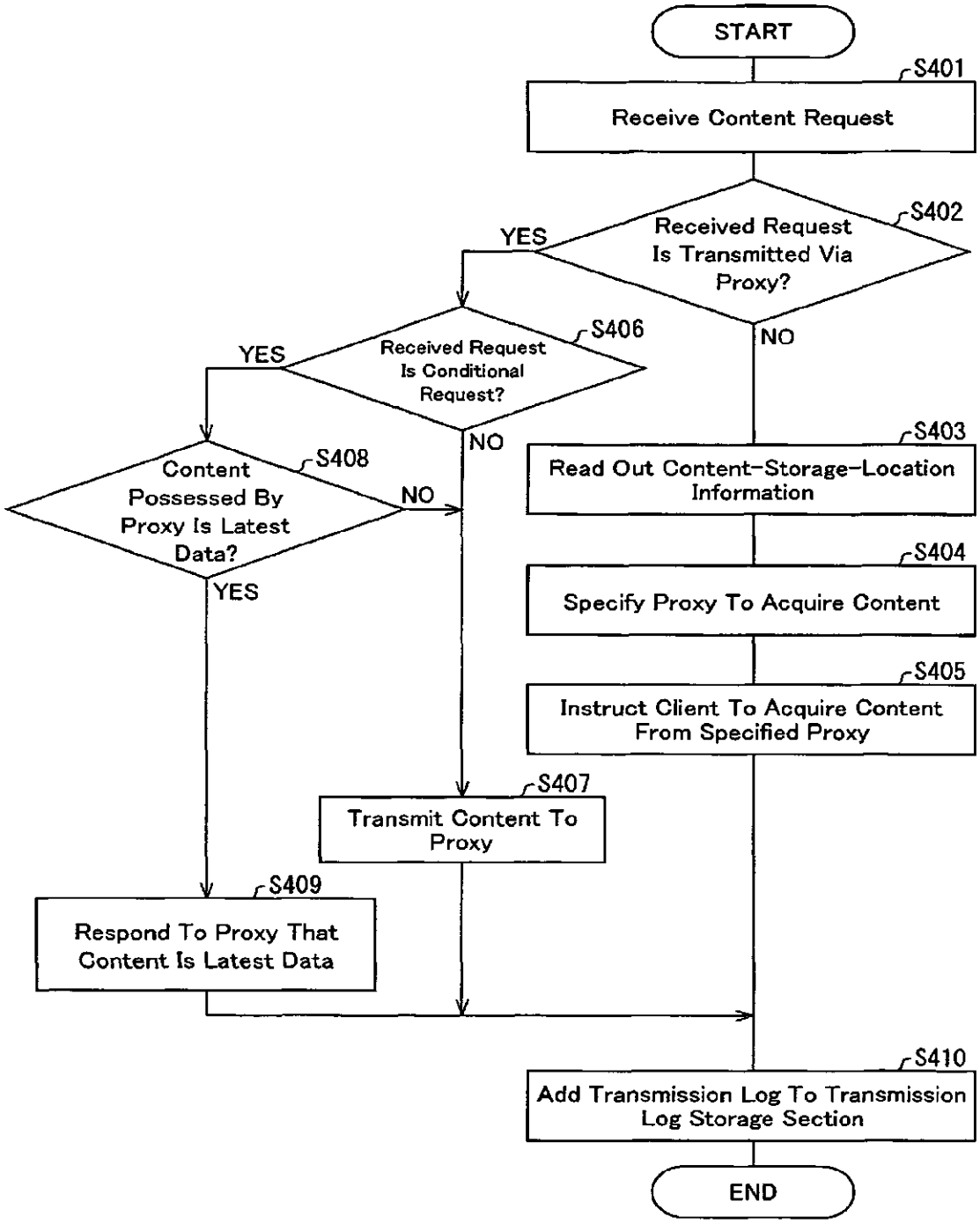


Content-Storage-Location Information

Date	Content ID	Address Of Storage Location
Sun, 31 May 2013 13:53:38 GMT	content1	http://example-proxy1.com
Sun, 31 May 2013 15:03:08 GMT	content2	http://example-proxy2.com
Mon, 01 Jun 2013 08:05:30 GMT	content2	http://example-proxy2.com
⋮	⋮	⋮

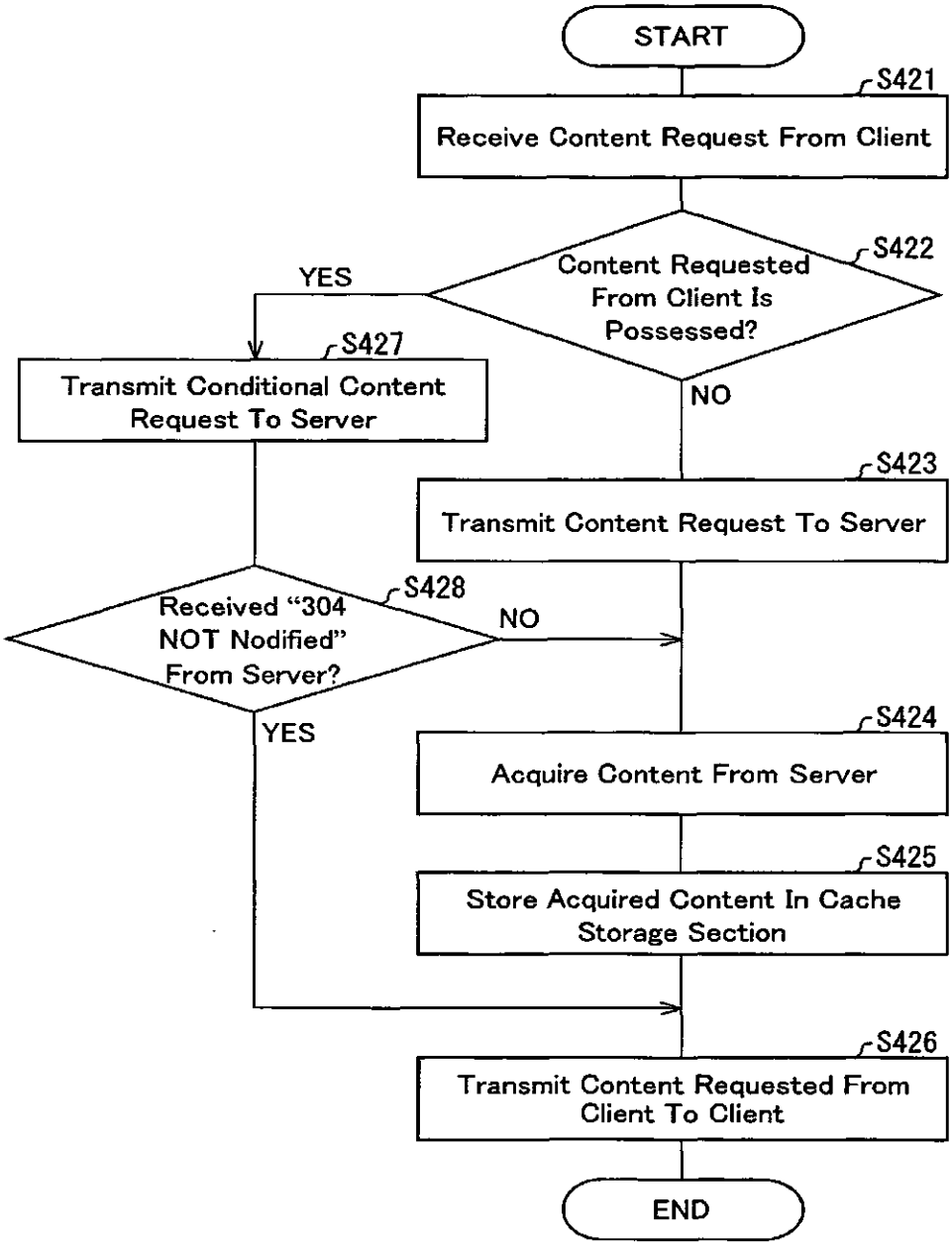
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FIG. 4



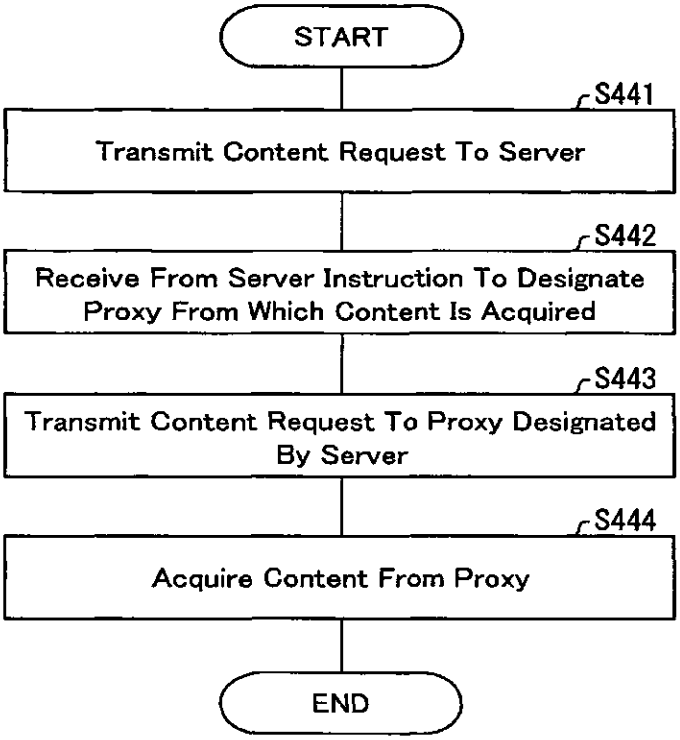
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FIG. 5



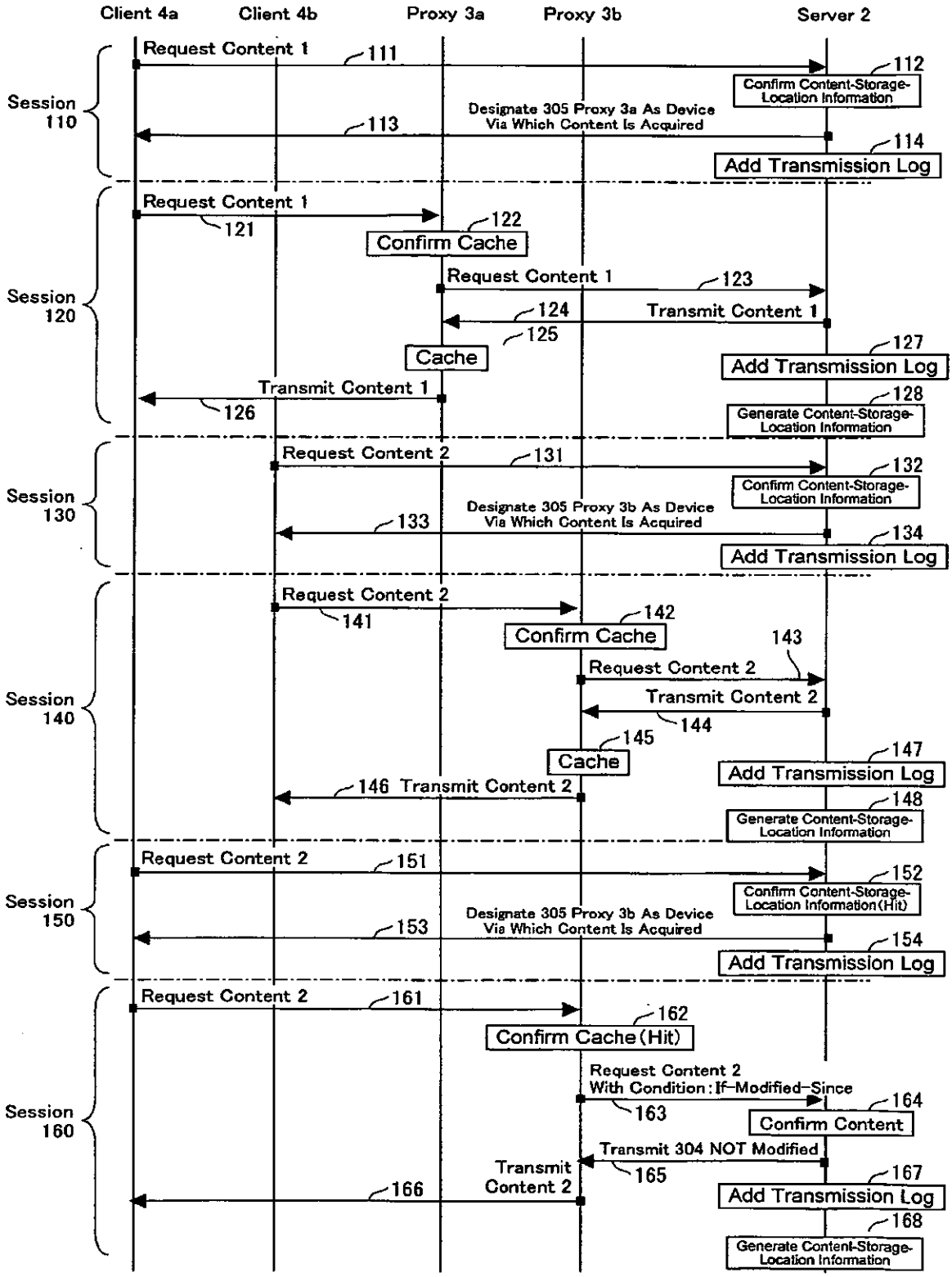
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FIG. 6



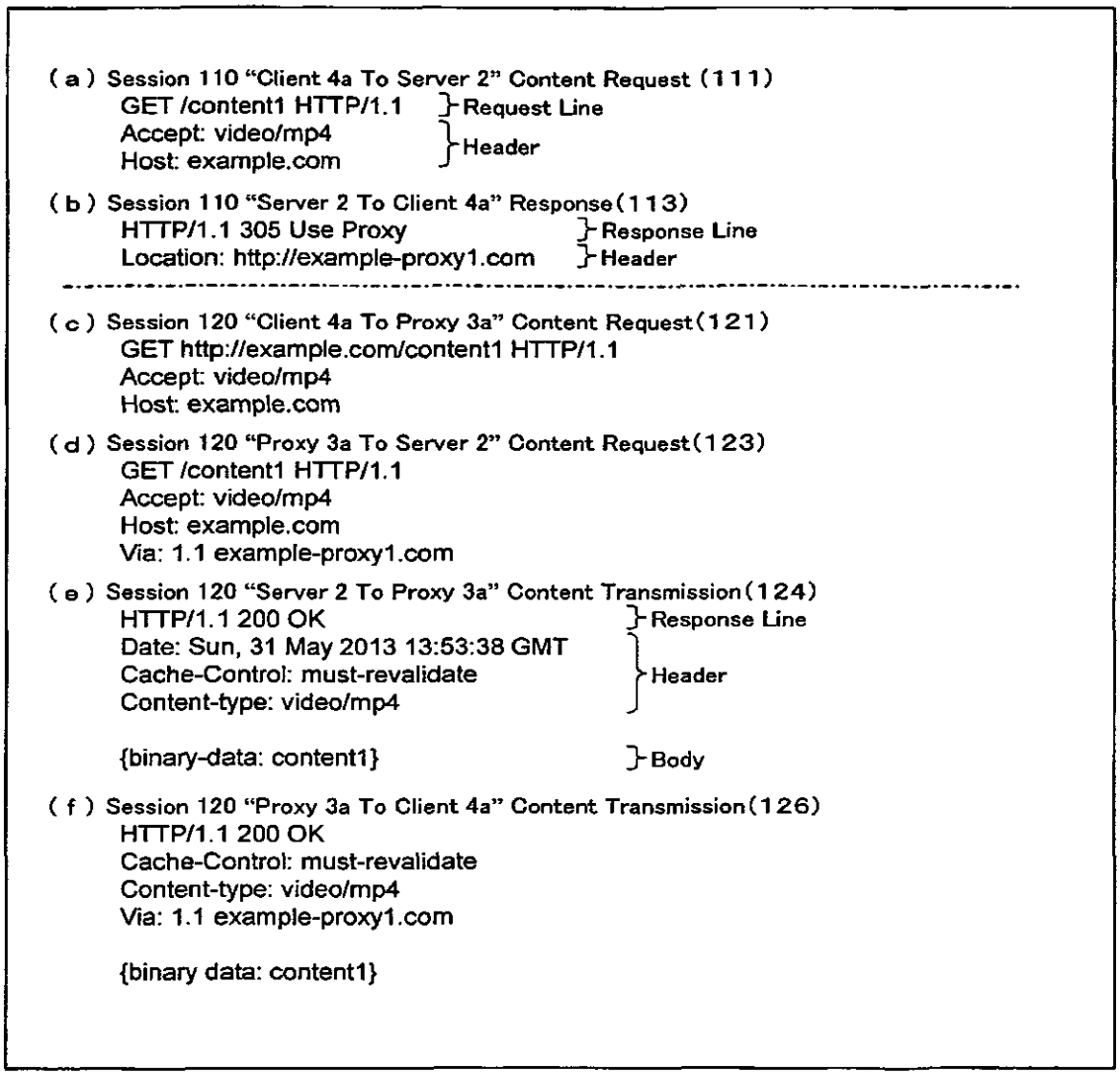
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FIG. 7



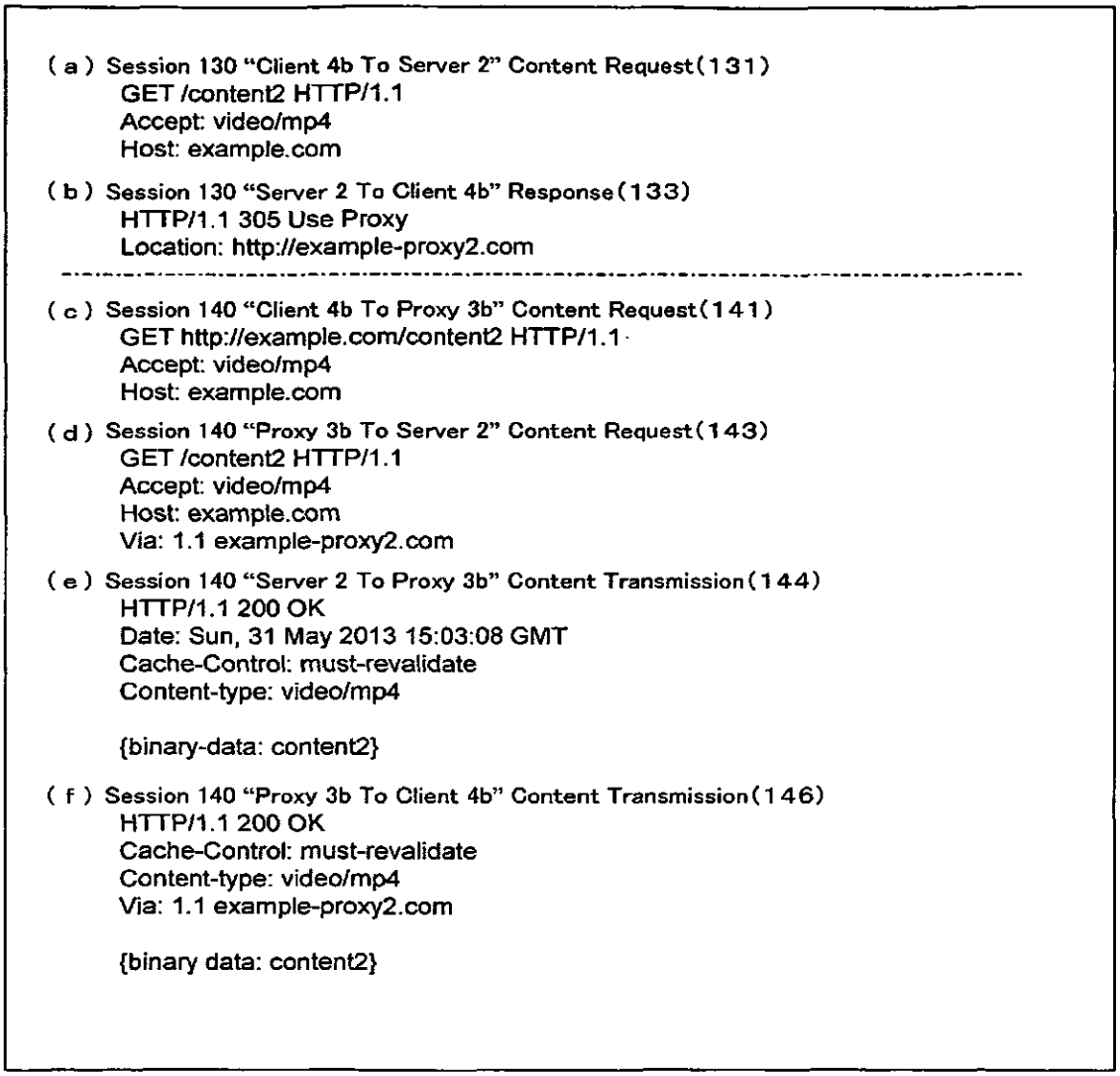
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FIG. 8



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FIG. 9



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FIG. 10

(a) Session 150 "Client 4a To Server 2" Content Request(151)
GET /content2 HTTP/1.1
Accept: video/mp4
Host: example.com

(b) Session 150 "Server 2 To Client 4a" Response(153)
HTTP/1.1 305 Use Proxy
Location: http://example-proxy2.com

(c) Session 160 "Client 4a To Proxy 3b" Content Request(161)
GET http://example.com/content2 HTTP/1.1
Accept: video/mp4
Host: example.com

(d) Session 160 "Proxy 3b To Server 2" Conditional Content Request(163)
GET /content2 HTTP/1.1
If-Modified-Since Sun, 31 May 2013 15:03:08 GMT
Accept: video/mp4
Host: example.com
Via: 1.1 example-proxy2.com

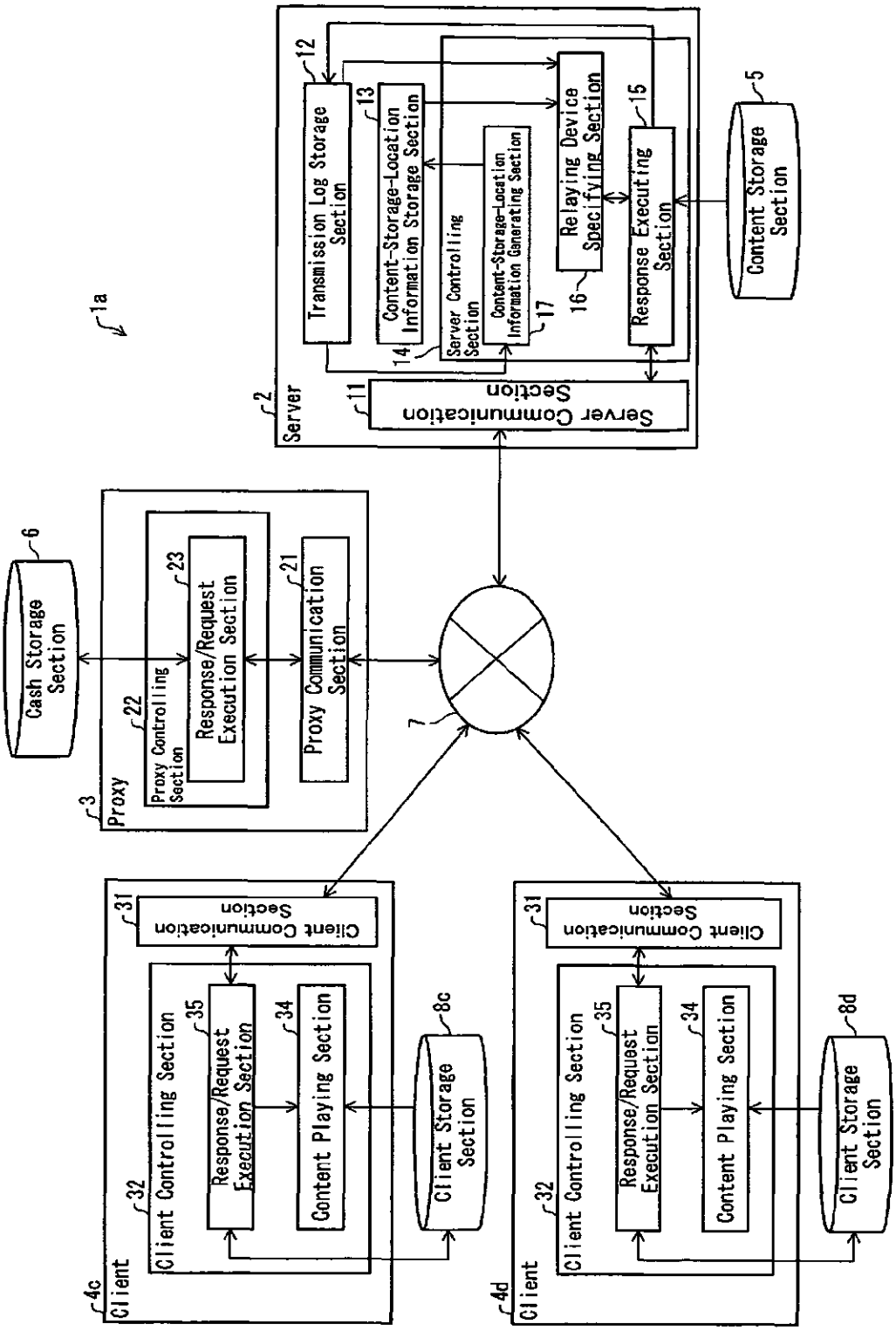
(e) Session 160 "Server 2 To Proxy 3b" Response(165)
HTTP/1.1 304 Not Modified
Date: Mon, 01 Jun 2013 08:05:30 GMT

(f) Session 160 "Proxy 3b To Client 4a" Content Transmission(166)
HTTP/1.1 200 OK
Cache-Control: must-revalidate
Content-type: video/mp4
Via: 1.1 example-proxy2.com

{binary data: content2}

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FIG. 11



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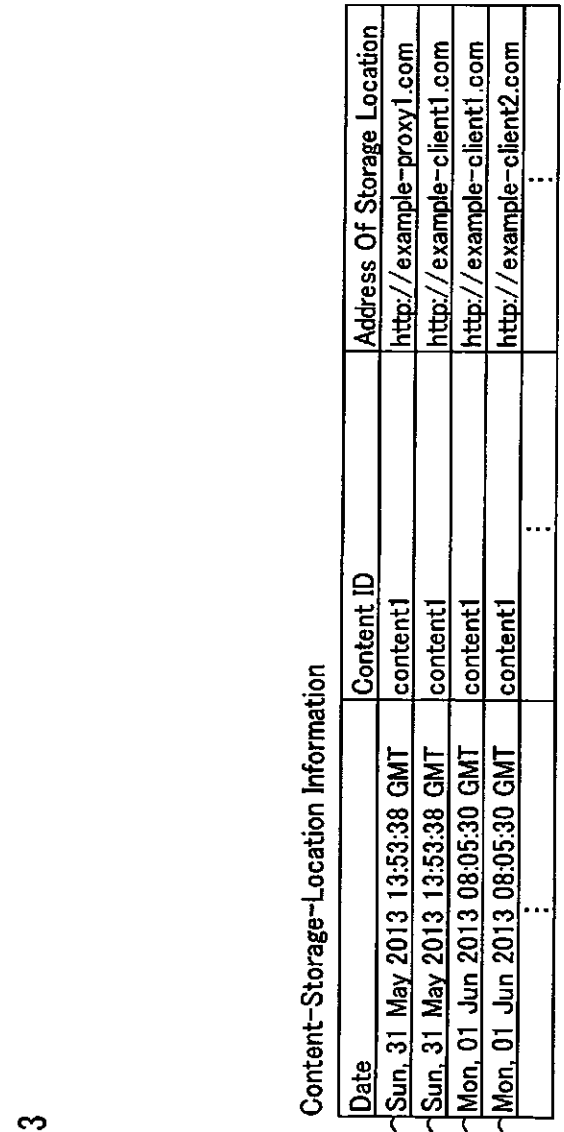
FIG. 12

Transmission Log

	Date	Address Of Destination	Transmitted Contents	Content ID
41	Sun, 31 May 2013 13:52:22 GMT	http://example-client1.com	305 Use Proxy (proxy1)	content1
42	Sun, 31 May 2013 13:53:38 GMT	http://example-proxy1.com	200 OK	content1
43	Mon, 01 Jun 2013 08:04:10 GMT	http://example-client2.com	305 Use Proxy (client1)	content1
44	Mon, 01 Jun 2013 08:05:30 GMT	http://example-client1.com	304 Not Modified	content1
	⋮	⋮	⋮	⋮

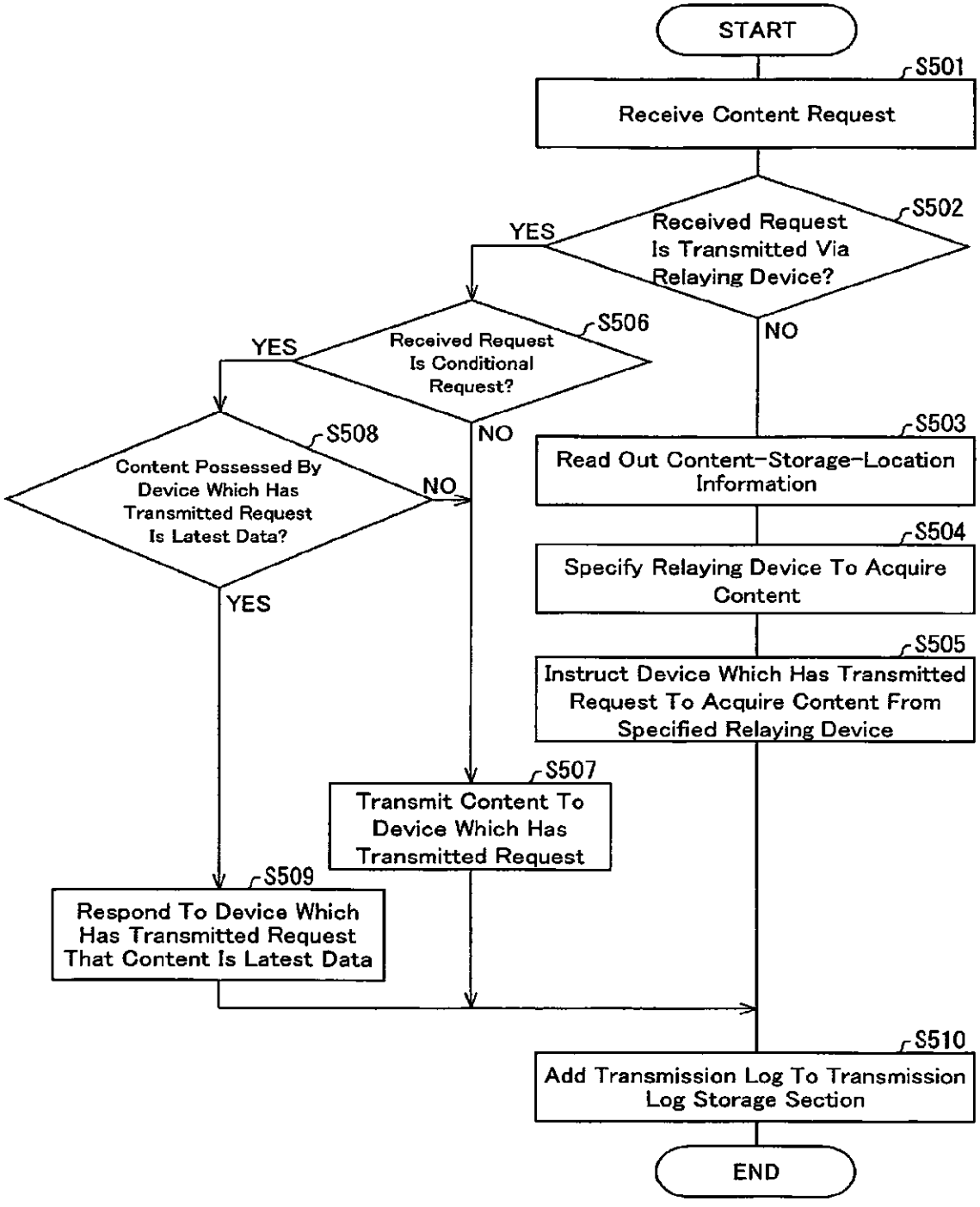
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FIG. 13



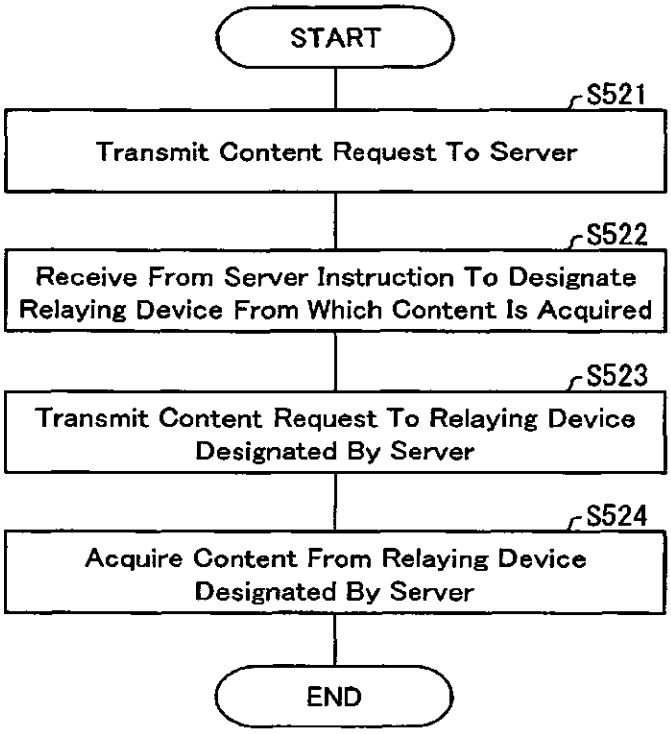
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FIG. 14



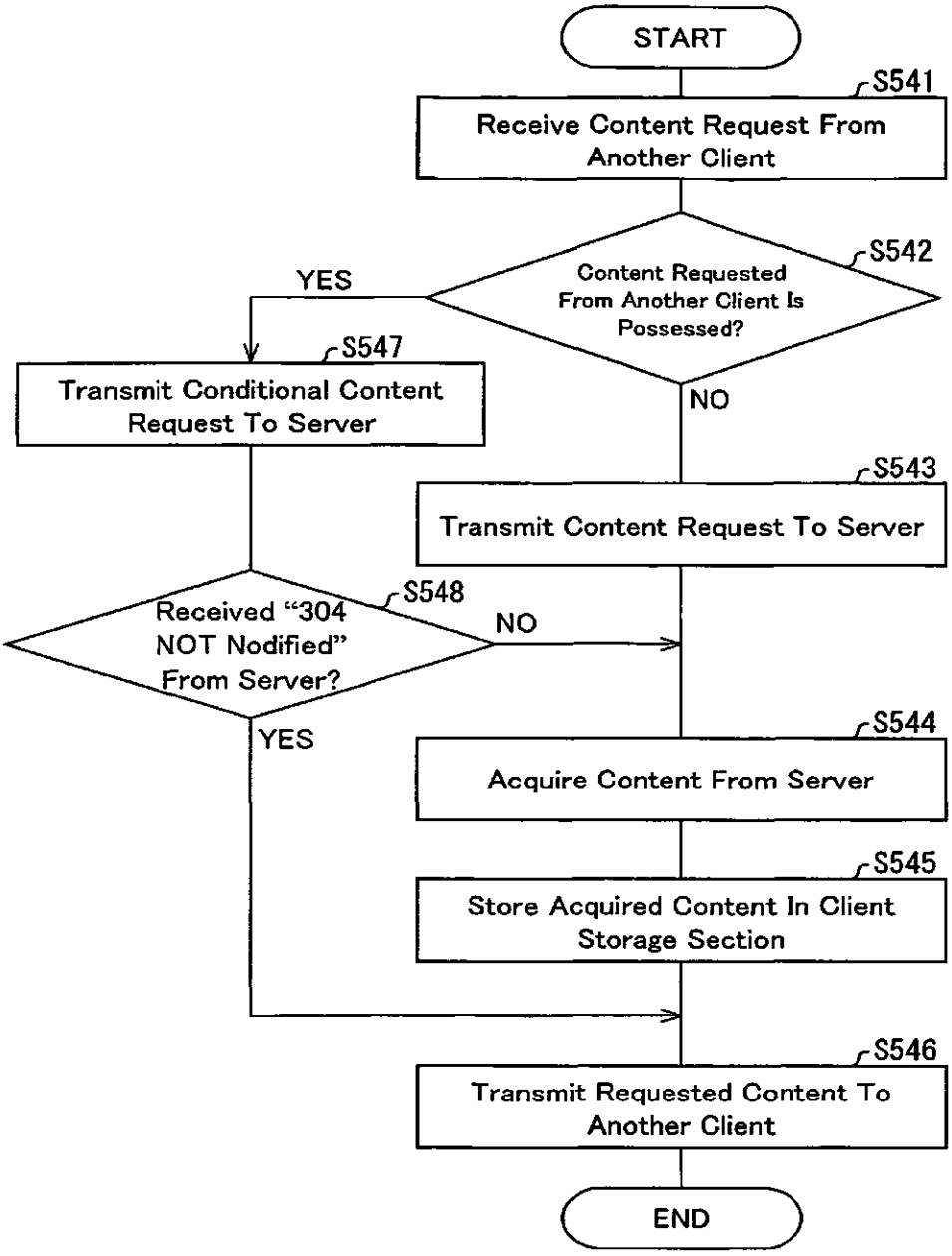
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FIG. 15



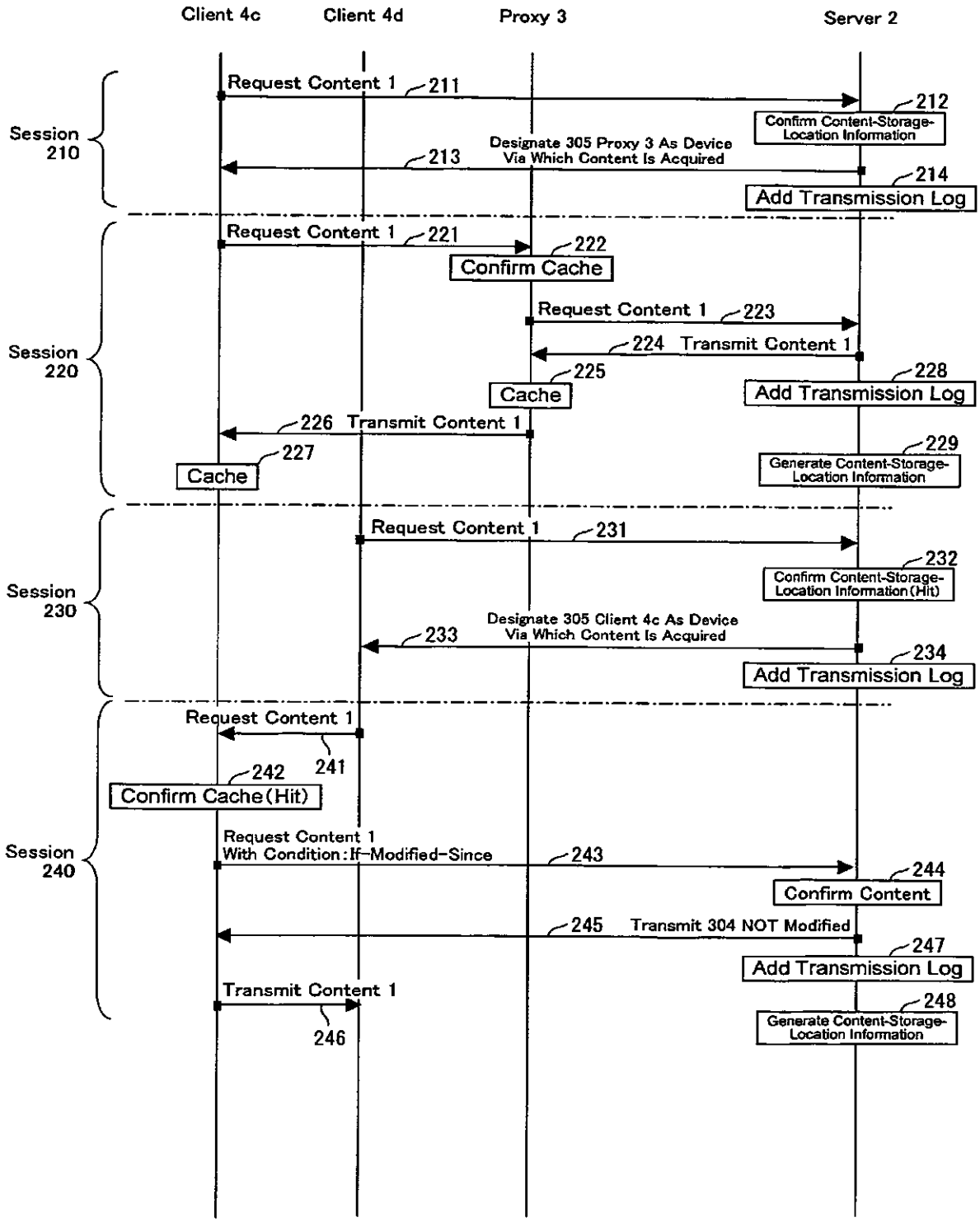
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FIG. 16



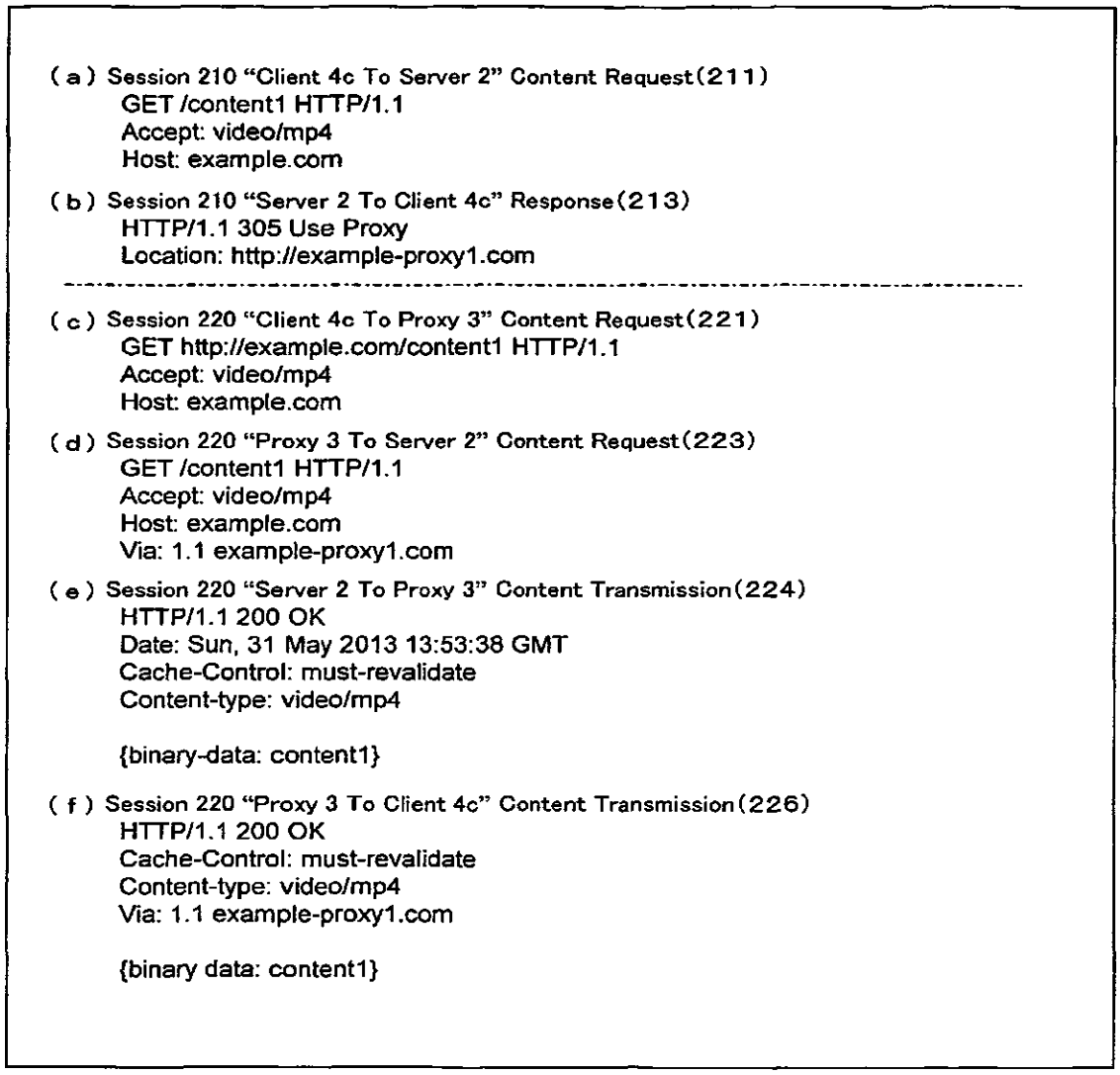
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FIG. 17



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FIG. 18



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FIG. 19

(a) Session 230 "Client 4d To Server 2" Content Request(231)
GET /content1 HTTP/1.1
Accept: video/mp4
Host: example.com

(b) Session 230 "Server 2 To Client 4d" Response(233)
HTTP/1.1 305 Use Proxy
Location: http://example-client1.com

(c) Session 240 "Client 4d To Client 4c" Content Request(241)
GET http://example.com/content1 HTTP/1.1
Accept: video/mp4
Host: example.com

(d) Session 240 "Client 4c To Server 2" Conditional Content Request(243)
GET /content1 HTTP/1.1
If-Modified-Since Sun, 31 May 2013 13:53:38 GMT
Accept: video/mp4
Host: example.com
Via: 1.1 example-client1.com

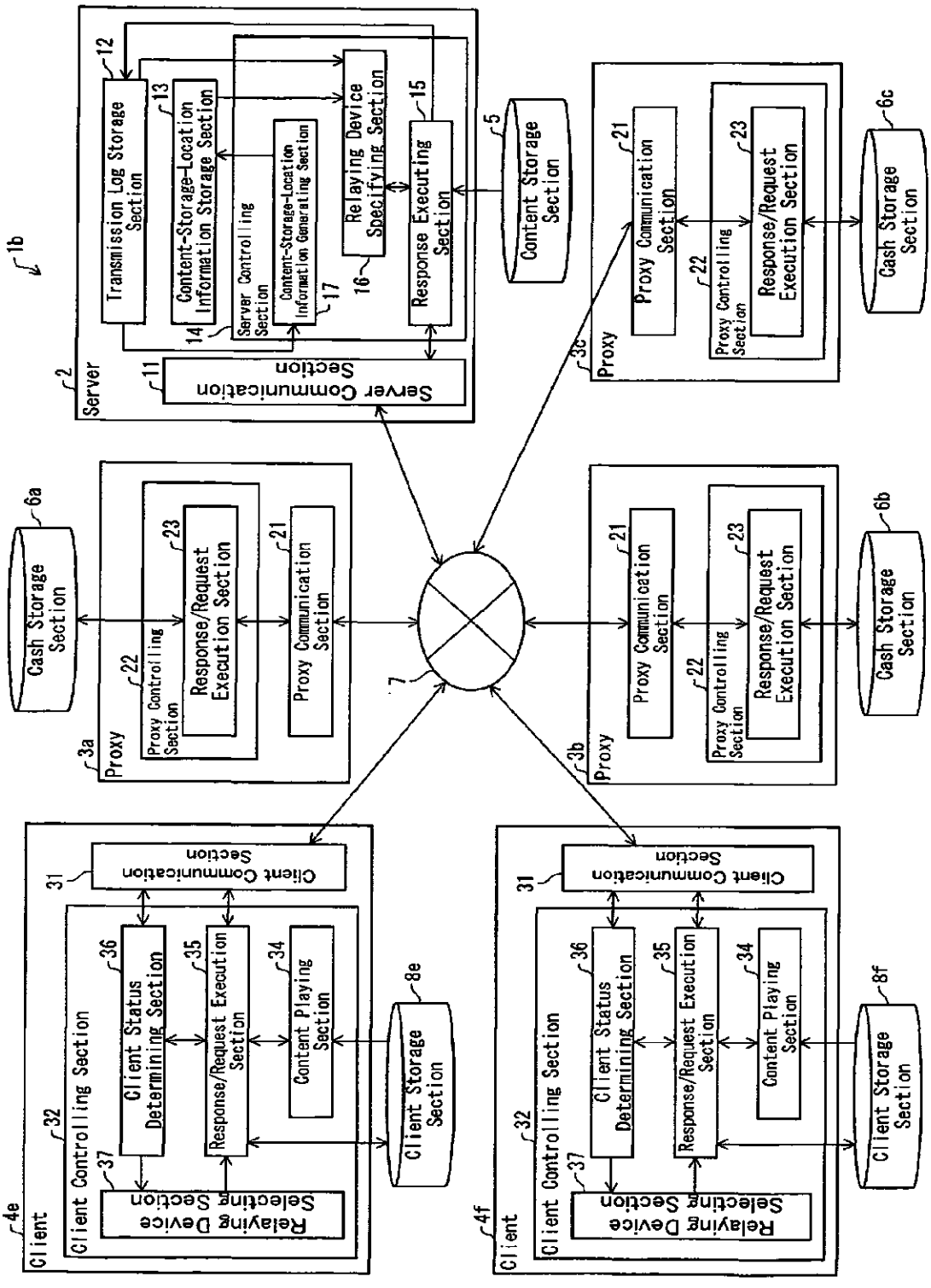
(e) Session 240 "Server 2 To Client 4c" Response(245)
HTTP/1.1 304 Not Modified
Date: Mon, 01 Jun 2013 08:05:30 GMT

(f) Session 240 "Client 4c To Client 4d" Content Transmission(246)
HTTP/1.1 200 OK
Cache-Control: must-revalidate
Content-type: video/mp4
Via: 1.1 example-client1.com

{binary data: content1}

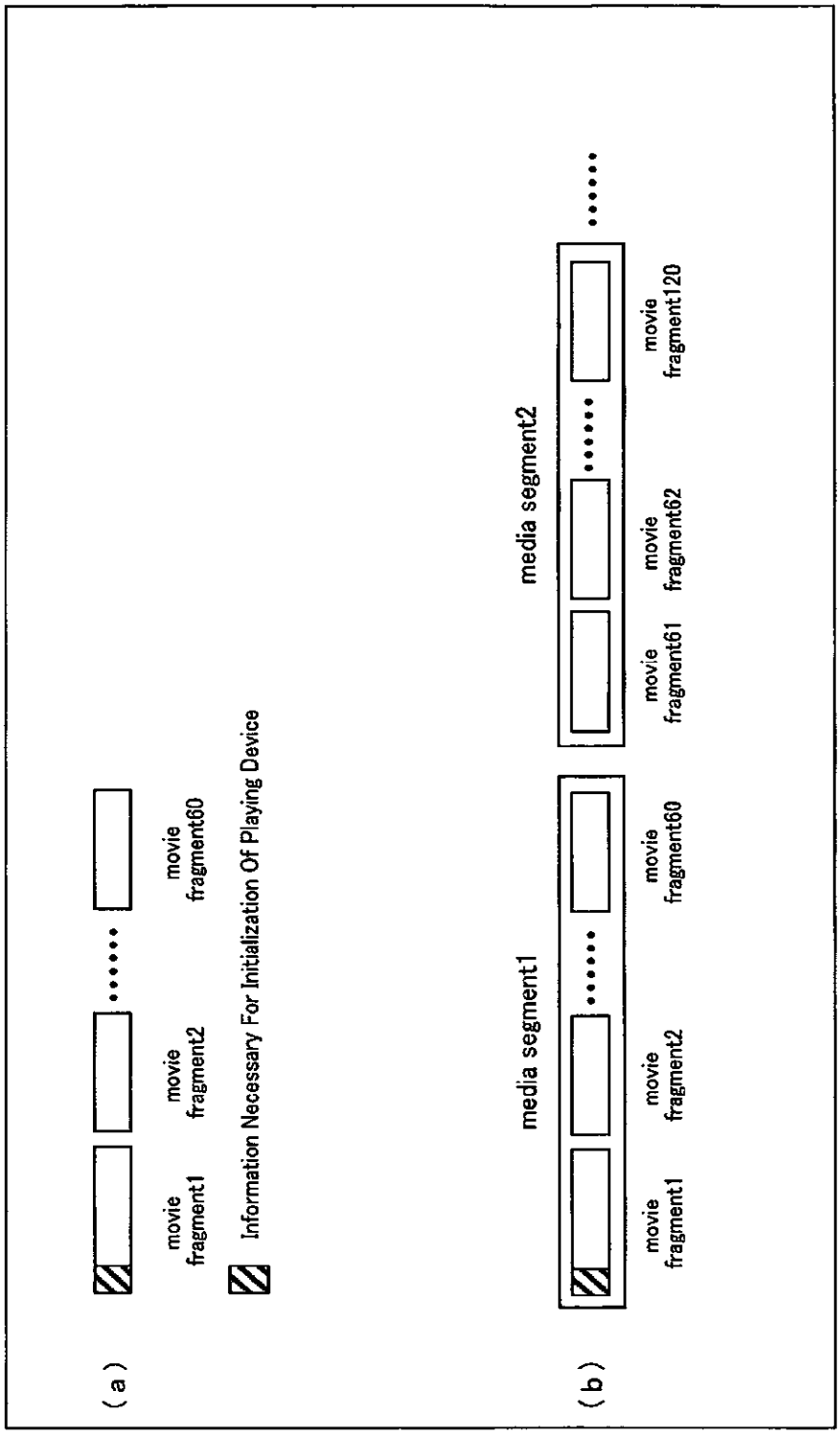
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FIG. 20



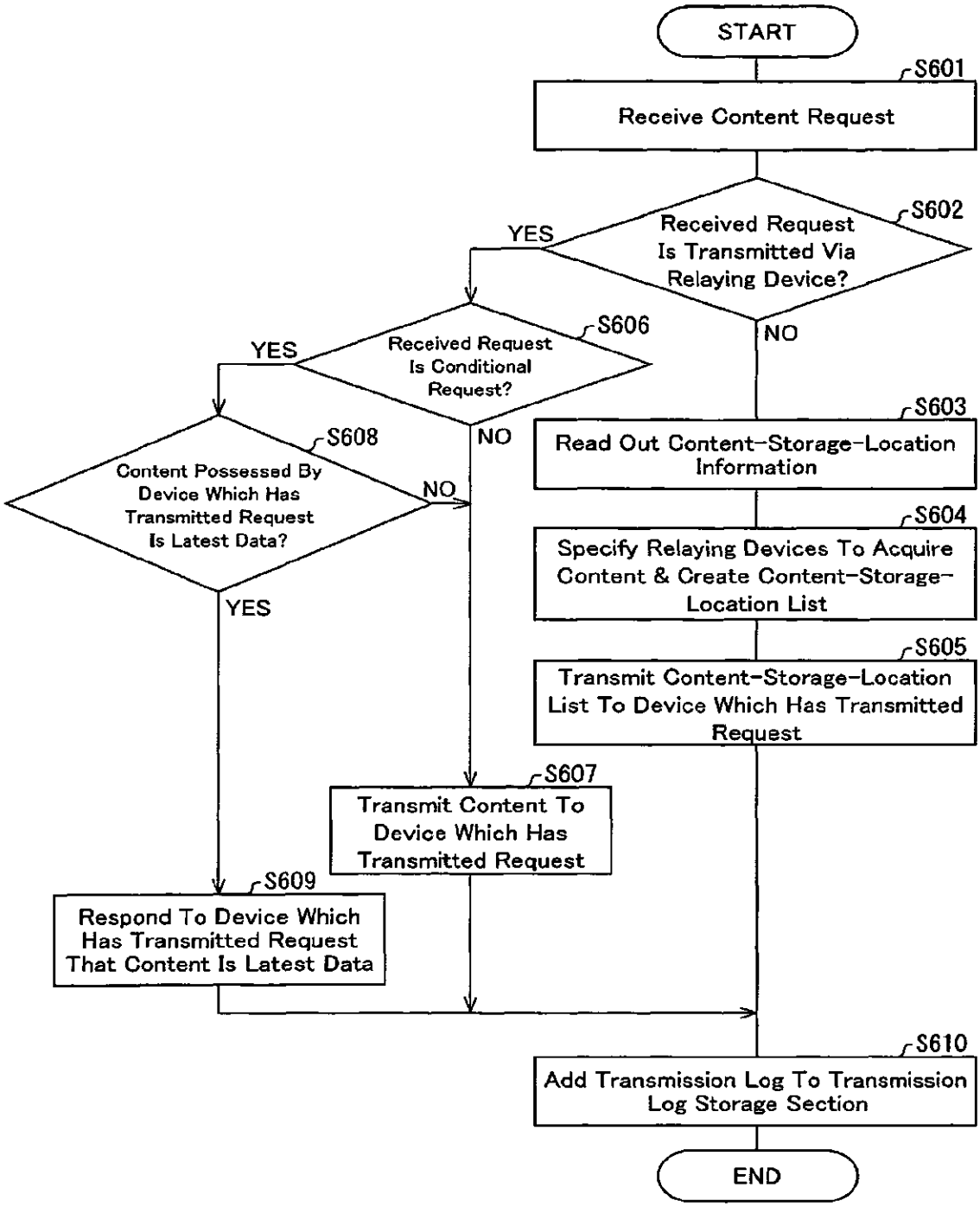
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FIG. 21



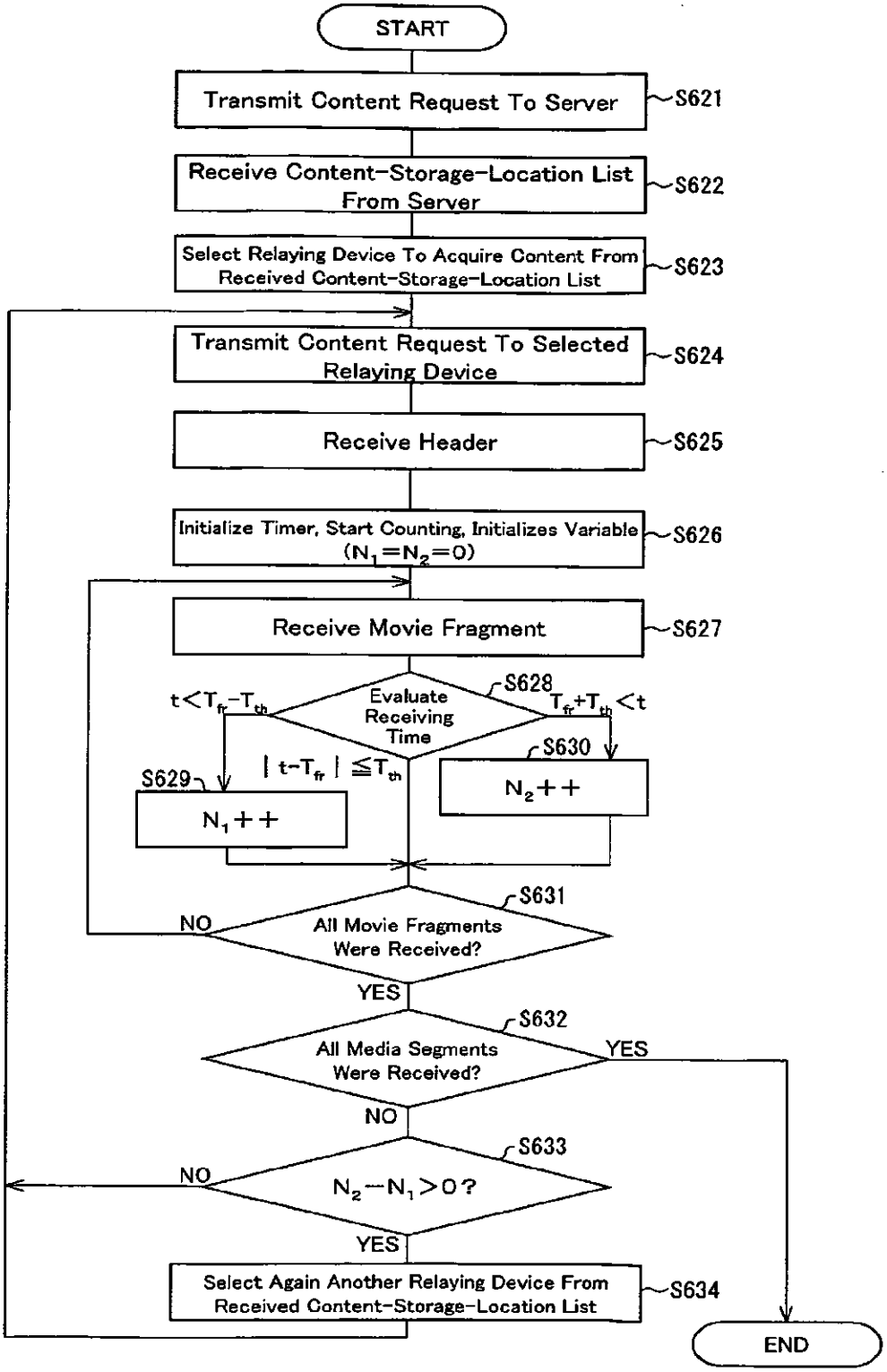
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FIG. 22



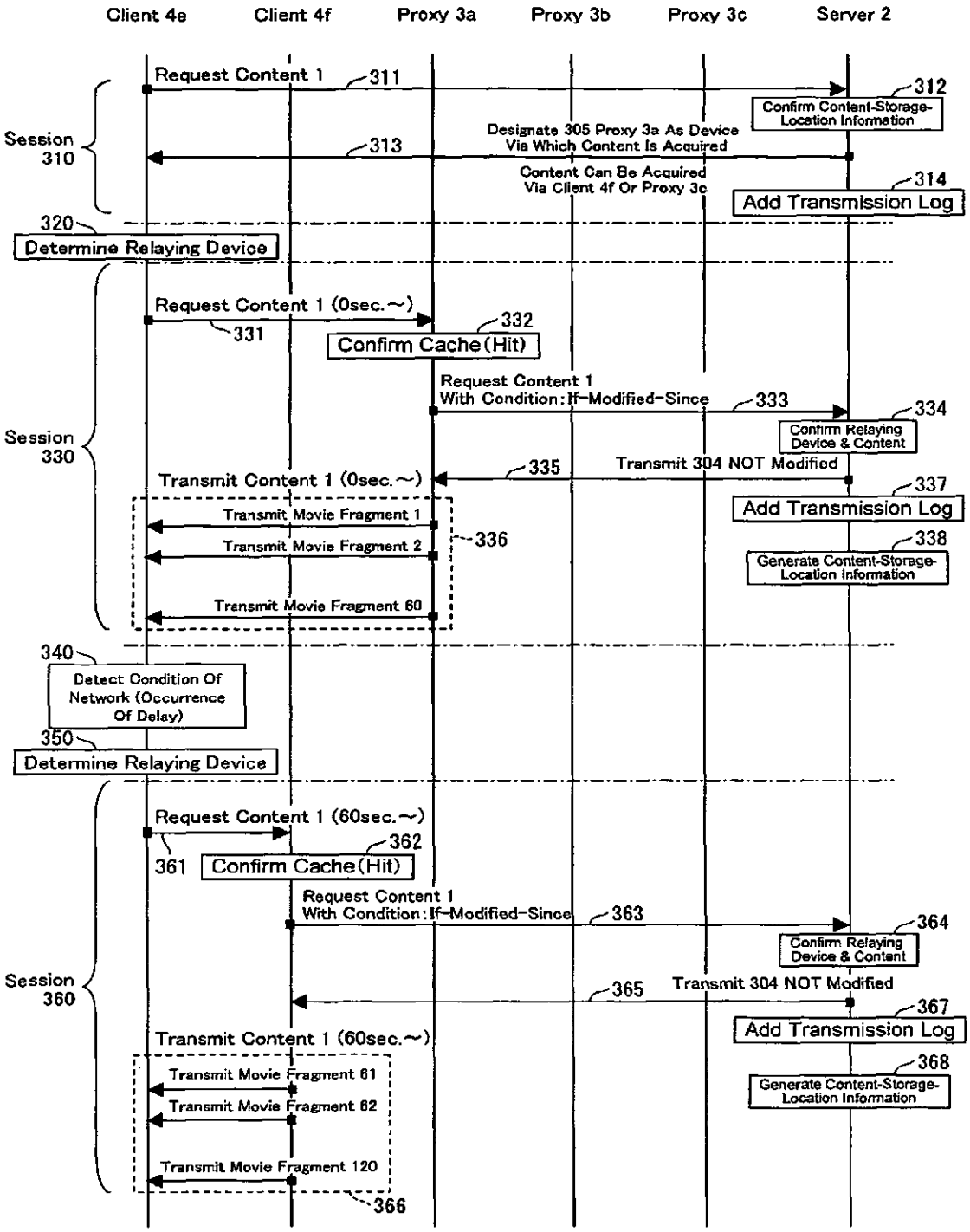
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FIG. 23



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FIG. 24



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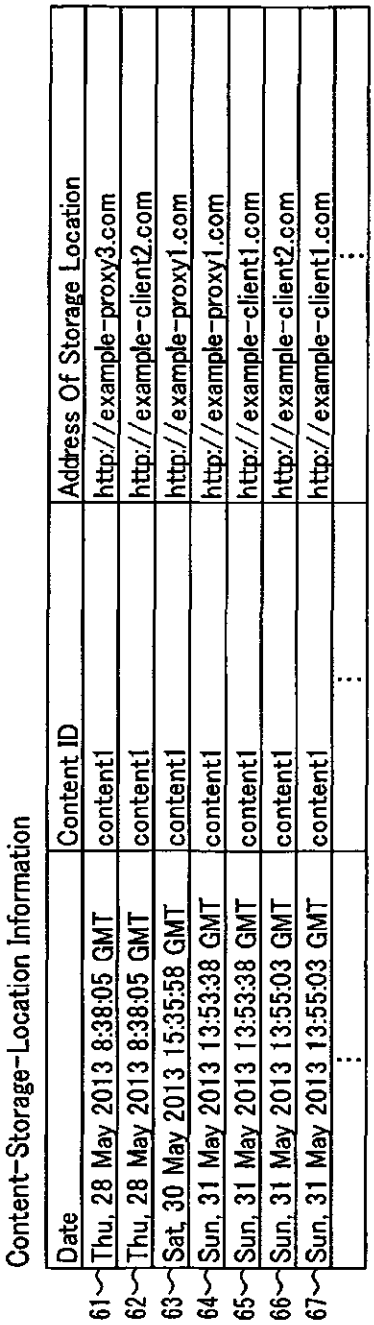
FIG. 25

Transmission Log

	Date	Address Of Destination	Transmitted Contents	Content ID
51	Thu, 28 May 2013 8:36:58 GMT	http://example-client2.com	305 Use Proxy (proxy3)	content1
52	Thu, 28 May 2013 8:38:05 GMT	http://example-proxy3.com	200 OK	content1
	⋮	⋮	⋮	⋮
53	Sat, 30 May 2013 15:35:58 GMT	http://example-proxy1.com	304 Not Modified	content1
	⋮	⋮	⋮	⋮
54	Sun, 31 May 2013 13:52:22 GMT	http://example-client1.com	305 Use Proxy (proxy1, client2, proxy3)	content1
55	Sun, 31 May 2013 13:53:38 GMT	http://example-proxy1.com	304 Not Modified	content1
56	Sun, 31 May 2013 13:55:03 GMT	http://example-client2.com	304 Not Modified	content1
	⋮	⋮	⋮	⋮

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FIG. 26



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FIG. 27

(a) Session 310 "Client 4e To Server 2" Content Request(311)

```
GET /content1/0 HTTP/1.1
Accept: video/mp4, multipart/media-segment
Host: example.com
```

(b) Session 310 "Server 2 To Client 4e" Response(313)

```
HTTP/1.1 305 Use Proxy
Location: http://example-proxy1.com
X-Alternative-Proxy-List: http://example-client2.com, http://example-proxy3.com
```

(c) Session 330 "Client 4e To Proxy 3a" Content Request(331)

```
GET http://example.com/content1/0 HTTP/1.1
Accept: video/mp4, multipart/media-segment
Host: example.com
```

(d) Session 330 "Proxy 3a To Server 2" Content Request(333)

```
GET /content1/0 HTTP/1.1
If-Modified-Since: Sat, 30 May 2013 15:35:58 GMT
Accept: video/mp4, multipart/media-segment
Host: example.com
Via: 1.1 example-proxy1.com
```

(e) Session 330 "Server 2 To Proxy 3a" Response(335)

```
HTTP/1.1 304 Not Modified
Date: Sun, 31 May 2013 13:53:38 GMT
```

(f) Session 330 "Proxy 3a To Client 4e" Content Transmission(336)

```
HTTP/1.1 200 OK
Content-type: mutipart/media-segment; boundary=THIS_STRING_SEPARATES
Content-Location: http://example.com/content1/0
Cache-Control: must-revalidate
Via: 1.1 example-proxy1.com
X-Media-Segment-Index: 1/60

--THIS_STRING_SEPARATES
Content-type: video/mp4
X-Timestamp: 0.0
{binary-data: movie fragment 1}
                .
                .
                .
--THIS_STRING_SEPARATES
Content-type: video/mp4
X-Timestamp: 59.0
{binary-data: movie fragment 60}

--THIS_STRING_SEPARATES--
```


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FIG. 28

(a) Session 360 "Client 4e To Client 4f" Content Request(361)
GET http://example.com/content1/1 HTTP/1.1
Accept: video/mp4, multipart/media-segment
Host: example.com

(b) Session 360 "Client 4f To Server 2" Content Request(363)
GET /content1/1 HTTP/1.1
If-Modified-Since: Thu, 28 May 2013 8:38:05 GMT
Accept: video/mp4, multipart/media-segment
Host: example.com
Via: 1.1 example-client2.com

(c) Session 360 "Server 2 To Client 4f" Response(365)
HTTP/1.1 304 Not Modified
Date: Sun, 31 May 2013 13:55:03 GMT

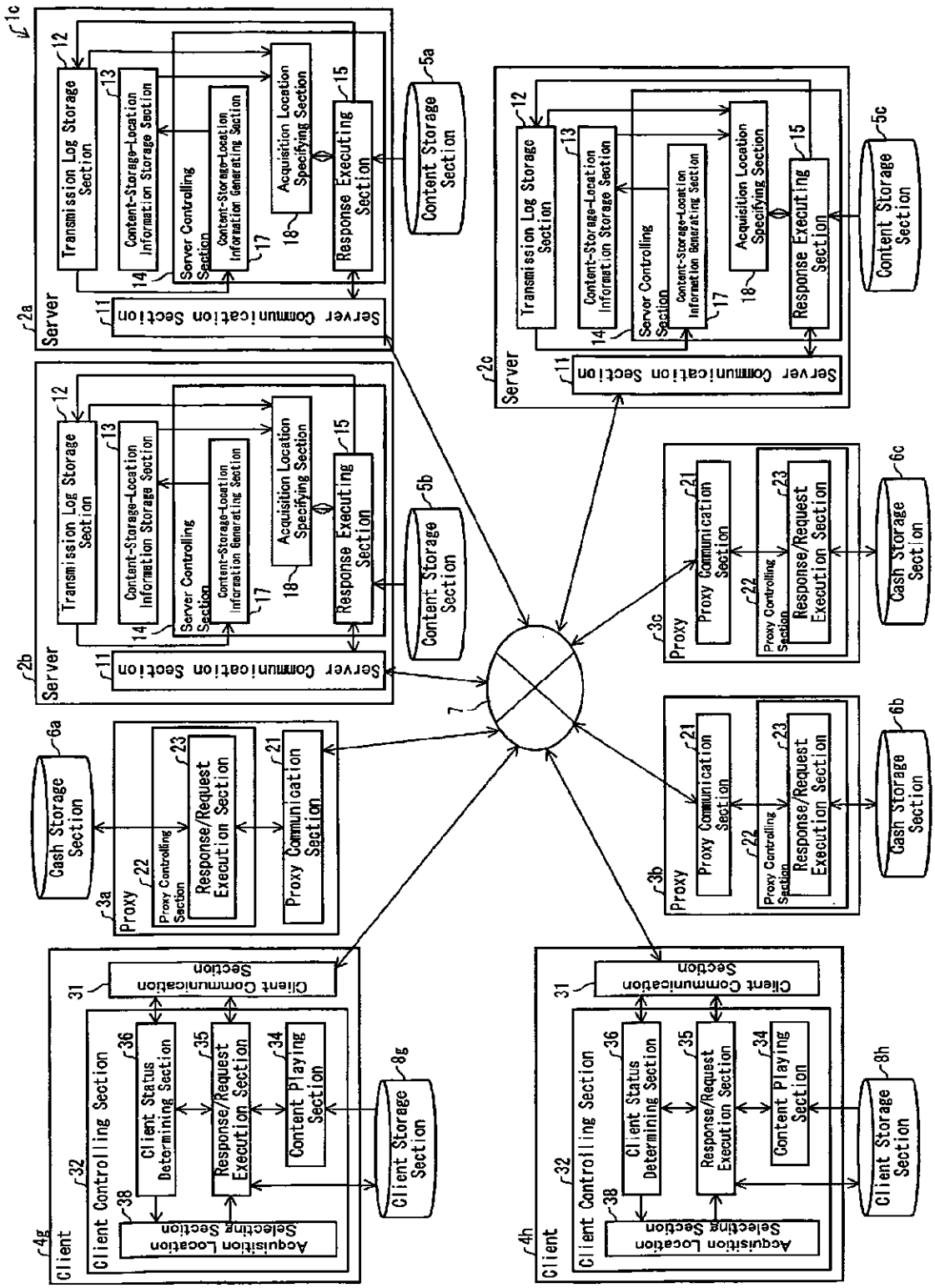
(d) Session 360 "Client 4f To Client 4e" Content Transmission(366)
HTTP/1.1 200 OK
Content-type: mutipart/media-segment; boundary=THIS_STRING_SEPARATES
Content-Location: http://example.com/content1/1
Cache-Control: must-revalidate
Via: 1.1 example-client2.com
X-Media-Segment-Index: 2/60

--THIS_STRING_SEPARATES
Content-type: video/mp4
X-Timestamp: 60.0
{binary-data: movie fragment 61}
.
.
.
--THIS_STRING_SEPARATES
Content-type: video/mp4
X-Timestamp: 119.0
{binary-data: movie fragment 120}

--THIS_STRING_SEPARATES--

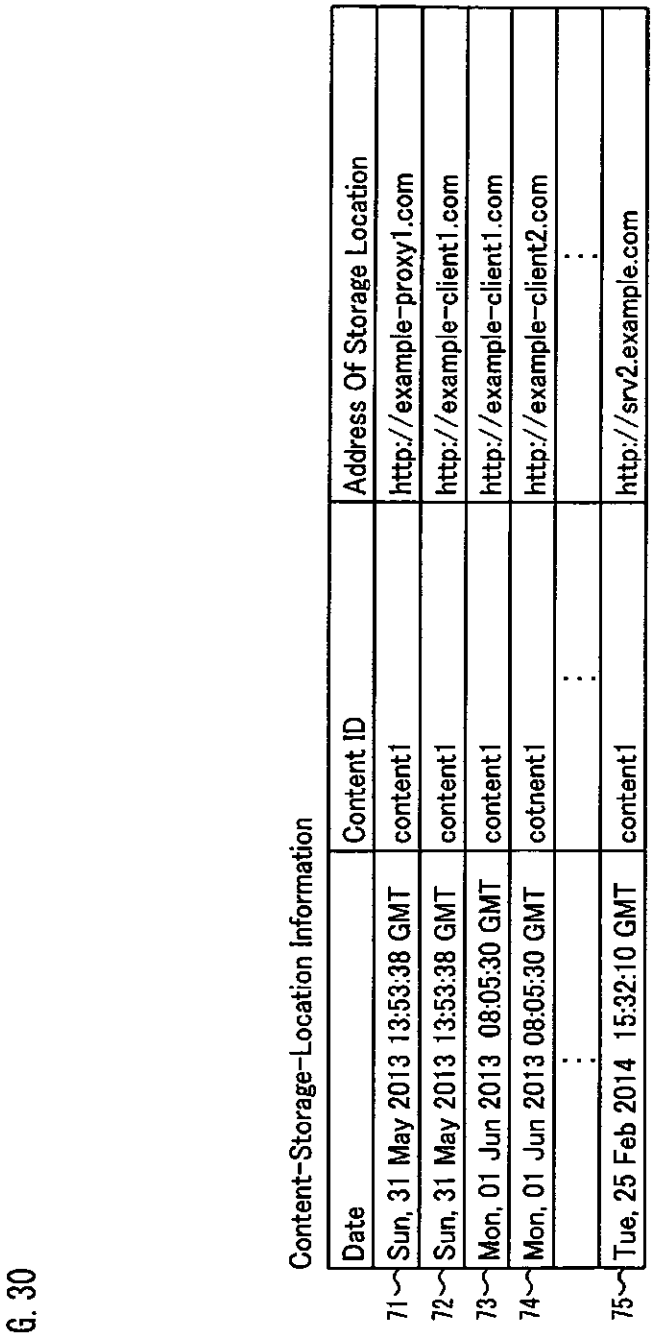
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FIG. 29



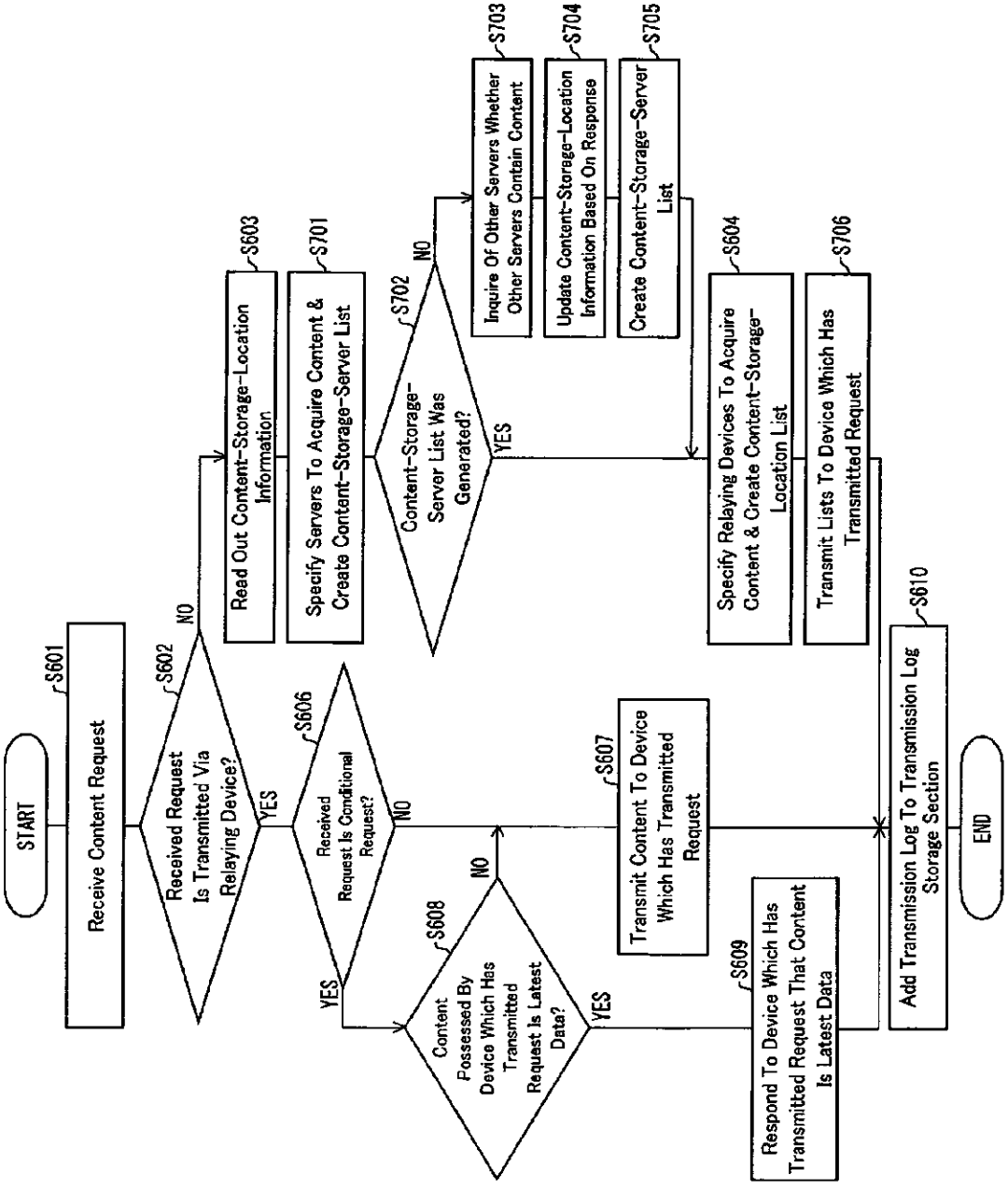
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FIG. 30



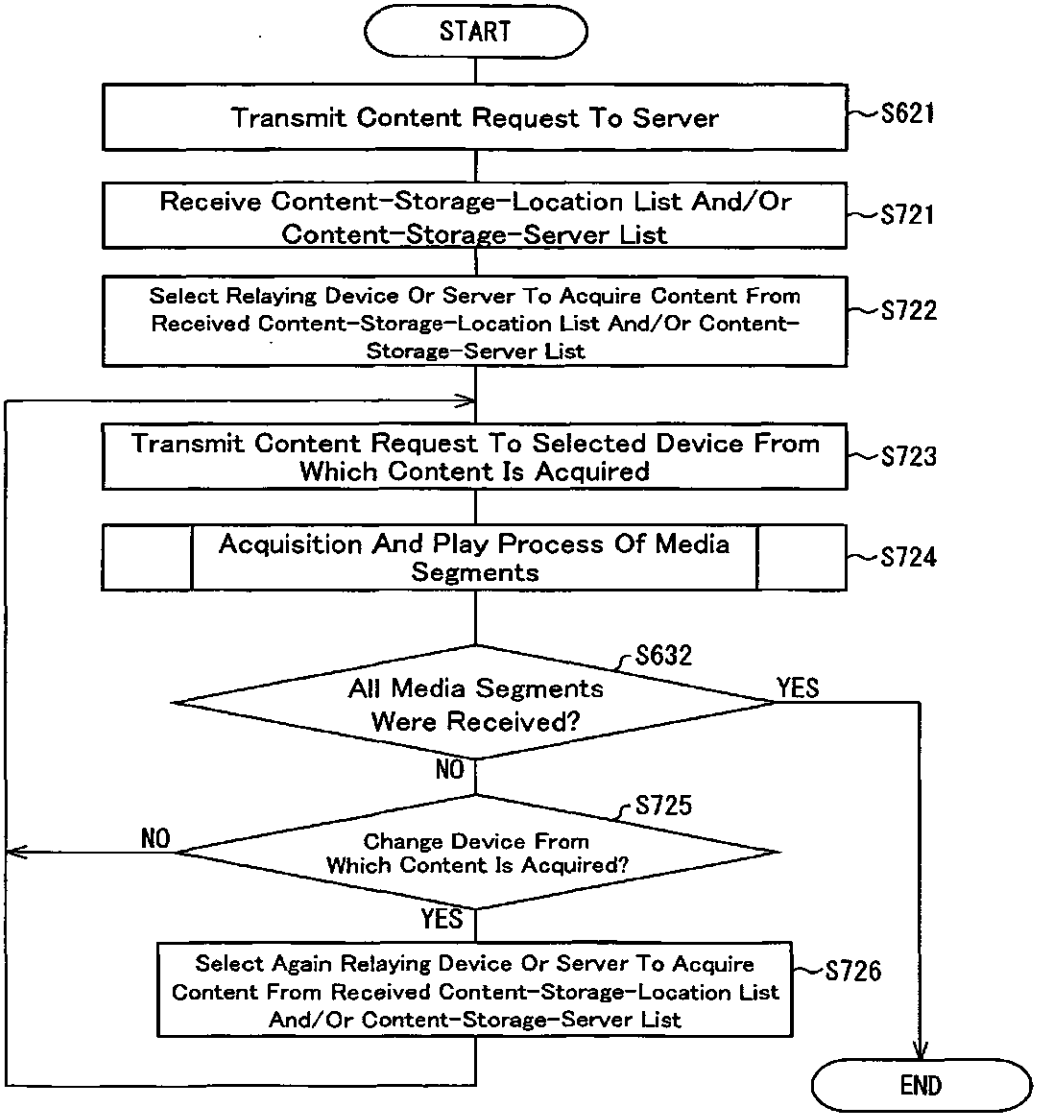
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FIG. 31



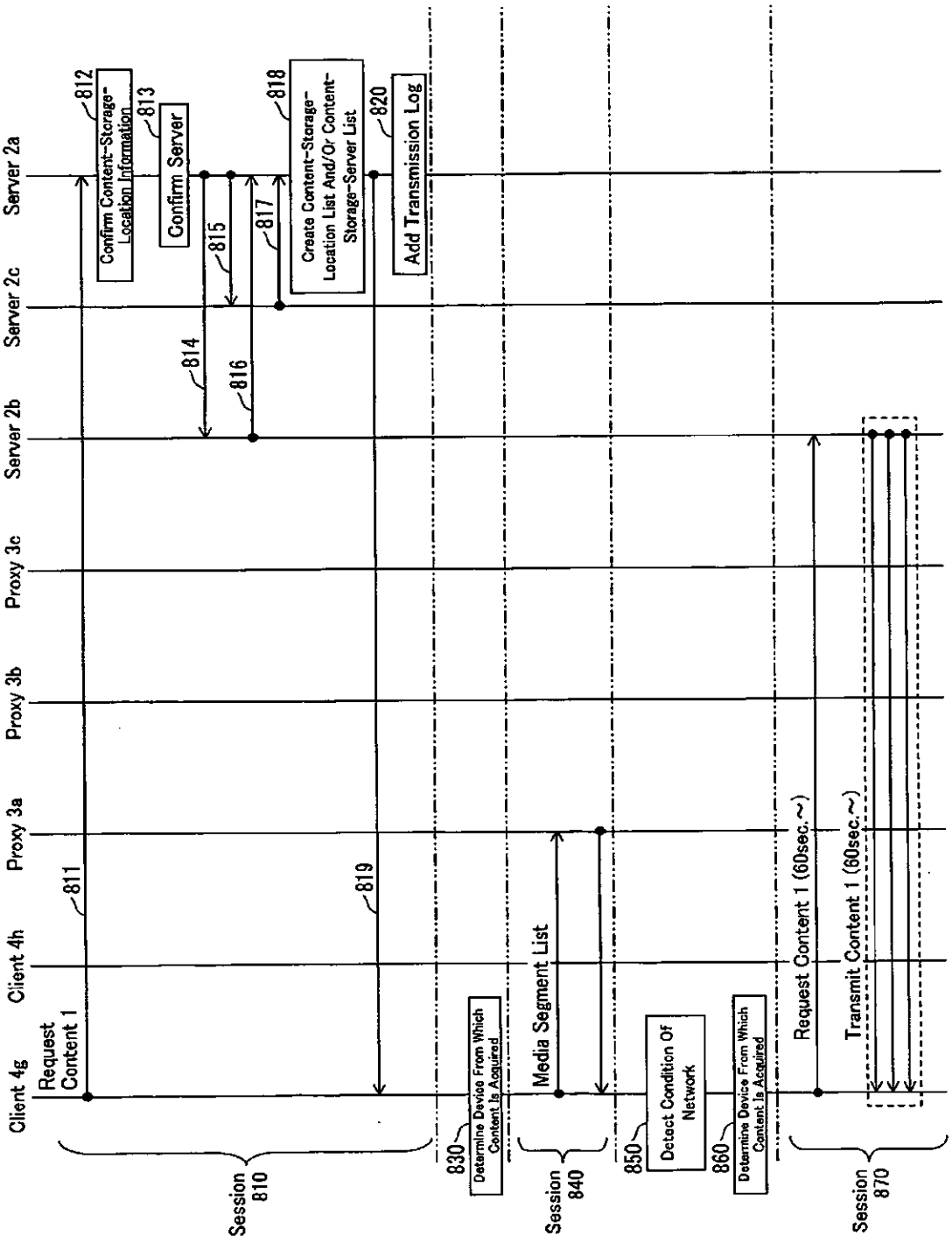
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FIG. 32



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FIG. 33



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FIG. 34

(a) Session 810 "Server 2a To Client 4g" Response(819)

HTTP1.1 305 Use Proxy
Location: http://example-proxy1.com
X-Alternative-Proxy-List: http://example-client2.com, http://example-proxy3.com
X-Alternative-Server-List: http://srv2.example.com, http://srv3.example.com

(b) Session 810 "Server 2a To Client 4g" Response(819)

HTTP1.1 303 See Other
Location: http://srv2.example.com/content1/0
X-Alternative-Server-List: http://srv3.example.com

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FIG. 35

(a)

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<MPD
    mediaPresentationDuration="PT120S"minBufferTime="PT1S" type="OnDemand" >

<Period id="0">
        <Group mimeType="video/3gpp; codecs='avc1,mp4a'" lang="jp">
            <SegmentInfoDefault >
                <BaseURL>http://srv2.example.com/</BaseURL>
                <BaseURL>http://srv3.example.com/</BaseURL>
            </SegmentInfoDefault>
            <Representation bandwidth="19000000" id="1">
                <SegmentInfo>
                    <Url sourceURL="content1/0.mp4"/>
                    <Url sourceURL="content1/1.mp4"/>
                    <Url sourceURL="content1/2.mp4"/>
                    <Url sourceURL="content1/3.mp4"/>
                    <Url sourceURL="content1/4.mp4"/>
                    <Url sourceURL="content1/5.mp4"/>
                    <Url sourceURL="content1/6.mp4"/>
                    <Url sourceURL="content1/7.mp4"/>
                    <Url sourceURL="content1/8.mp4"/>
                    <Url sourceURL="content1/9.mp4"/>
                    <Url sourceURL="content1/10.mp4"/>
                    <Url sourceURL="content1/11.mp4"/>
                </SegmentInfo>
            </Representation>
        </Group>
</Period>
</MPD>
```

(b)

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<MPD
    mediaPresentationDuration="PT120S"minBufferTime="PT1S" type="OnDemand" >

<Period id="0">
        <Group mimeType="video/3gpp; codecs='avc1,mp4a'" lang="jp">
            <SegmentInfoDefault >
                <BaseURL>http://srv2.example.com/</BaseURL>
                <BaseURL>http://srv3.example.com/</BaseURL>
            </SegmentInfoDefault>
            <Representation bandwidth="19000000" id="1">
                <SegmentInfo>
                    <Url sourceURL="content1/0.mp4"/>
                    <Url sourceURL="content1/1.mp4"/>
                    <Url sourceURL="content1/2.mp4"/>
                </SegmentInfo>
            </Representation>
            <Representation bandwidth="4000000" id="2">
                <SegmentInfo>
                    <Url sourceURL="content2/0.mp4"/>
                    <Url sourceURL="content2/1.mp4"/>
                    <Url sourceURL="content2/2.mp4"/>
                </SegmentInfo>
            </Representation>
        </Group>
</Period>


</MPD>
```


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FIG. 36

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<MPD
      mediaPresentationDuration="PT120S"minBufferTime="PT1S" type="OnDemand" >

<Period id="0">
        <Group
                xlink:href ="http://example.com/content1/resource1.xml"
                xlink:actuate="onRequest"
                mimeType="video/3gpp; codecs='avc1,mp4a'" lang="jp"/>
</Period>

</MPD>
```

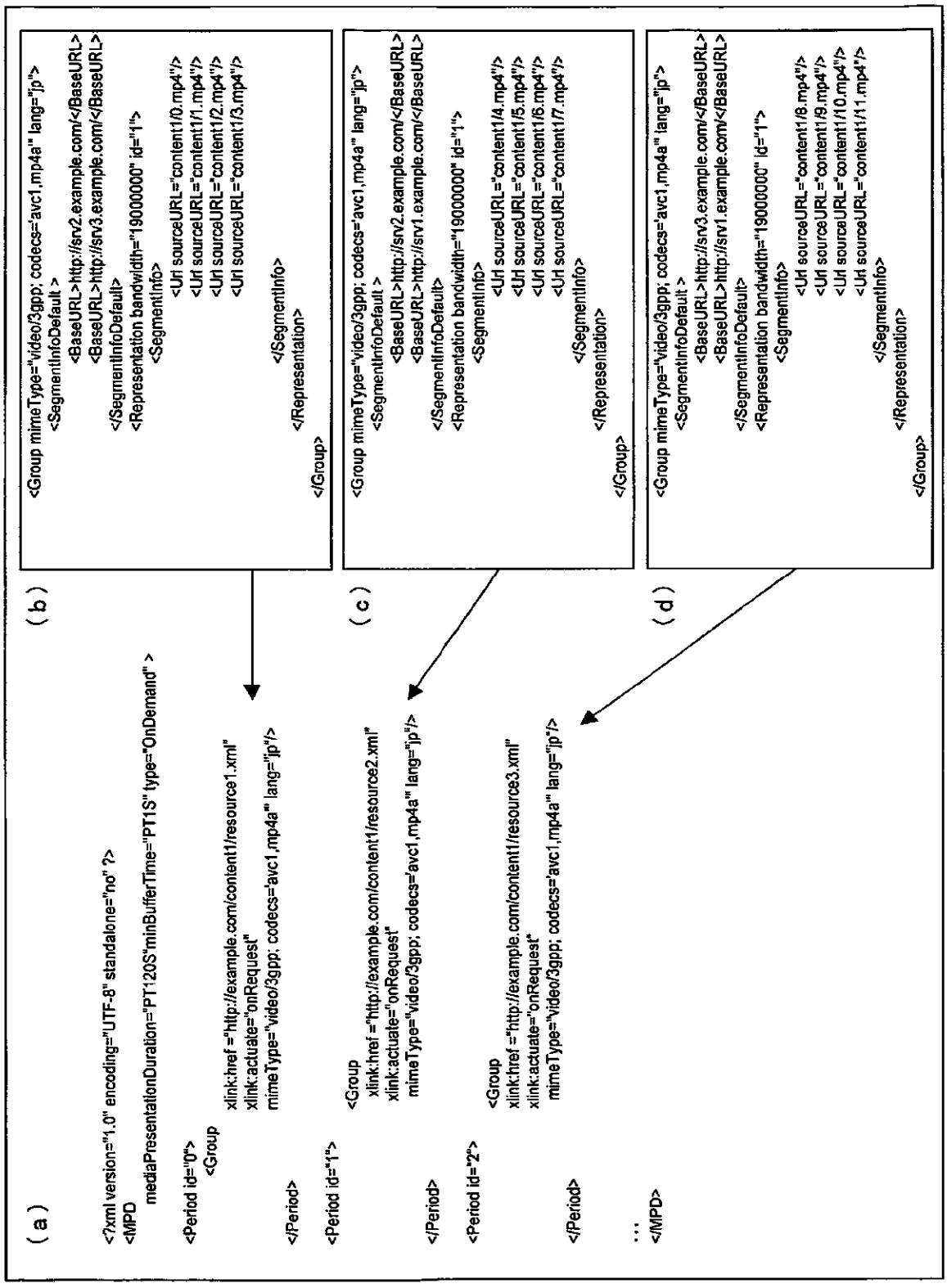

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FIG. 37

```
<Group mimeType="video/3gpp; codecs='avc1,mp4a"' lang="jp">
        <SegmentInfoDefault >
                <BaseURL>http://srv2.example.com/</BaseURL>
                <BaseURL>http://srv3.example.com/</BaseURL>
        </SegmentInfoDefault>
        <Representation bandwidth="19000000" id="1">
                <SegmentInfo>
                        <Url sourceURL="content1/0.mp4"/>
                        <Url sourceURL="content1/1.mp4"/>
                        <Url sourceURL="content1/2.mp4"/>
                        <Url sourceURL="content1/4.mp4"/>
                        <Url sourceURL="content1/5.mp4"/>
                        <Url sourceURL="content1/6.mp4"/>
                        <Url sourceURL="content1/70.mp4"/>
                        <Url sourceURL="content1/8.mp4"/>
                        <Url sourceURL="content1/9.mp4"/>
                        <Url sourceURL="content1/10.mp4"/>
                        <Url sourceURL="content1/11.mp4"/>
                </SegmentInfo>
        </Representation>
</Group>
```

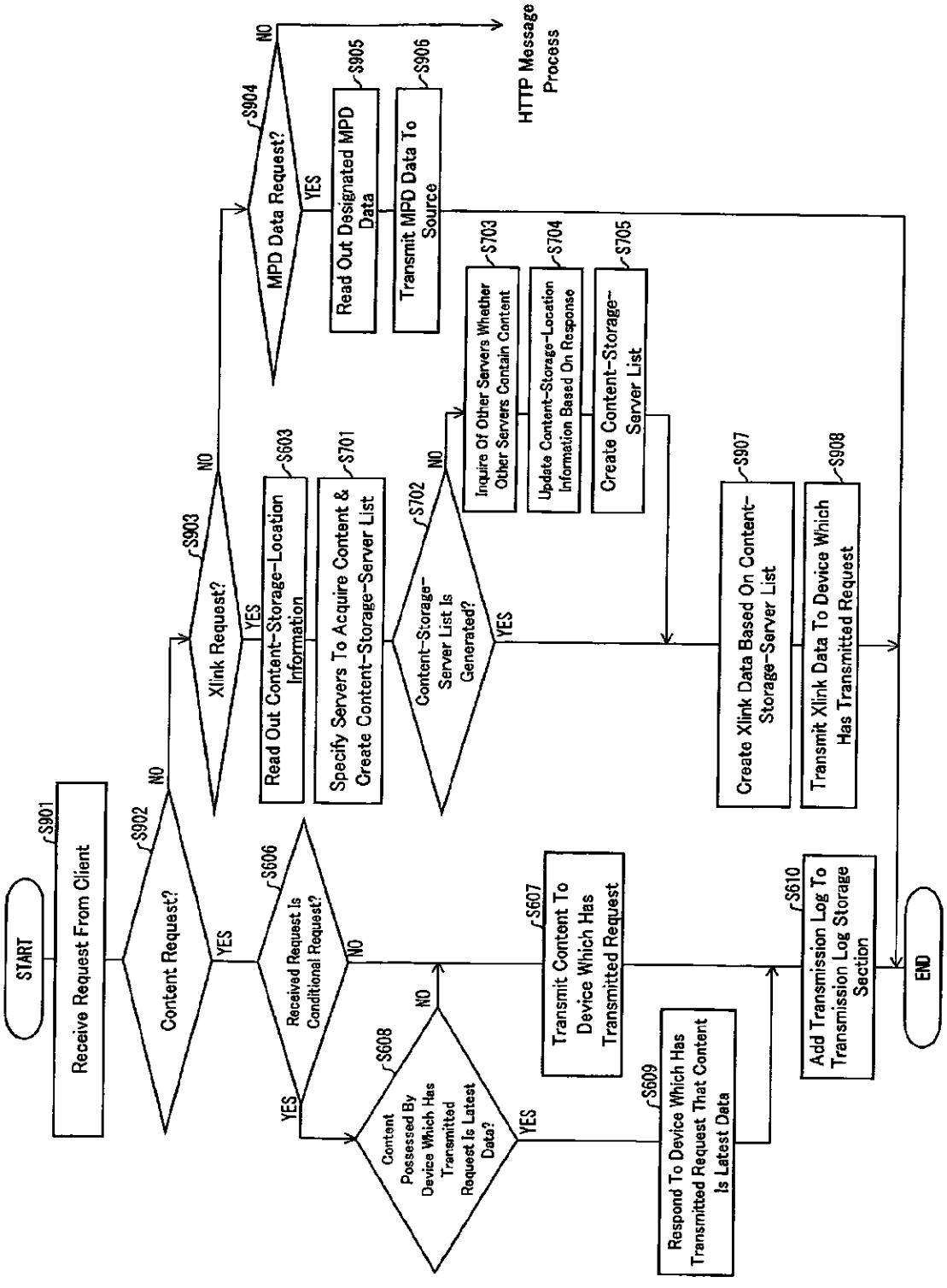

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FIG. 38



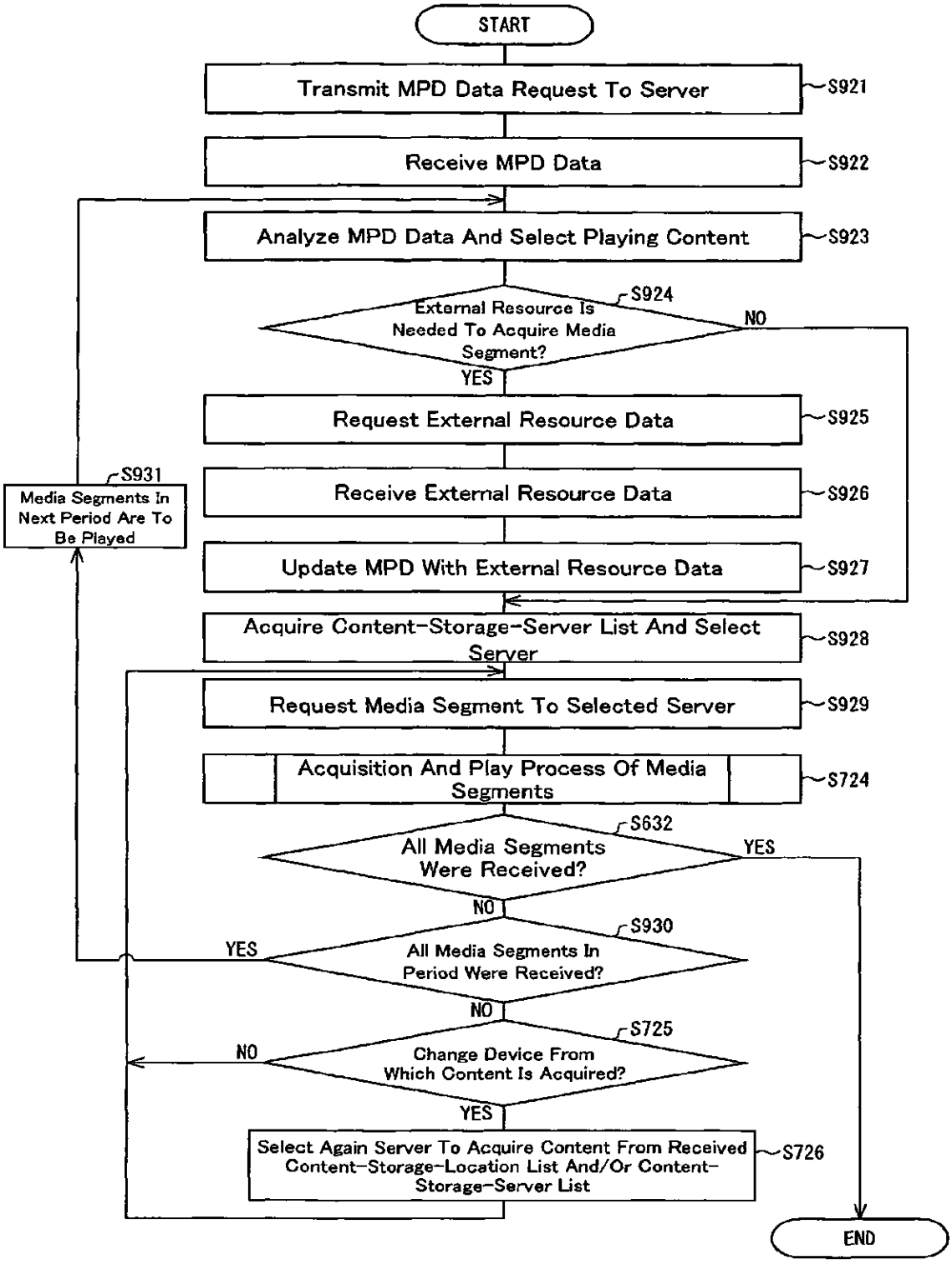
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FIG. 39



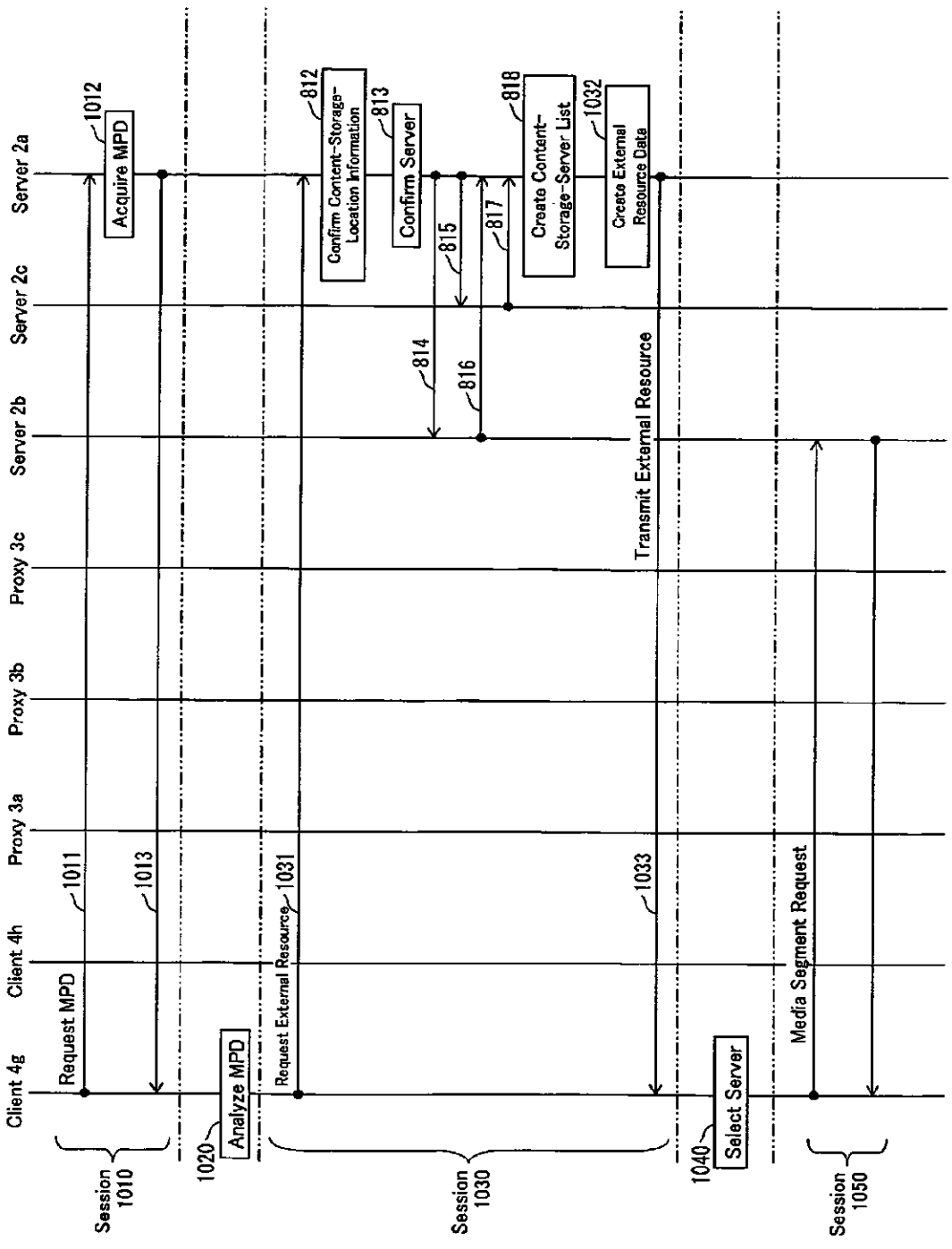
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FIG. 40



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FIG. 41



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/066279

A. CLASSIFICATION OF SUBJECT MATTER
H04N7/173(2011.01)i, *G06F13/00*(2006.01)i, *H04L12/56*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N7/173, G06F13/00, H04L12/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2011
Kokai Jitsuyo Shinan Koho 1971-2011 Toroku Jitsuyo Shinan Koho 1994-2011

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2003-223378 A (Fujitsu Ltd.), 08 August 2003 (08.08.2003), paragraphs [0029] to [0031]; fig. 3 & US 2003/0145066 A1 & EP 1331788 A2	1-28
A	R. Fielding et al., RFC 2616 Hypertext Transfer Protocol HTTP/1.1, 1999.06, "14.45 Via"	2

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 August, 2011 (19.08.11)	30 August, 2011 (30.08.11)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005110244 A **[0004]**

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6 February 2009 (06.02.2009)

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(74) Agent: **SJÖBERG, Mats**; Ericsson AB, Box 1505, S-125 25 Älvsjö (SE).

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Published:

— *with international search report (Art. 21(3))*

(54) **Title**: NETWORK AWARE PEER TO PEER

(57) **Abstract**: The present invention relates to a method for selecting suitable peers in a peer to peer network for content downloading whereby identities of peers possessing a specified content are received to a coordinating node. The method comprises steps of fetching network parameters associated with the received identities from a public data base and steps of grouping the peers with respect to the network parameters.

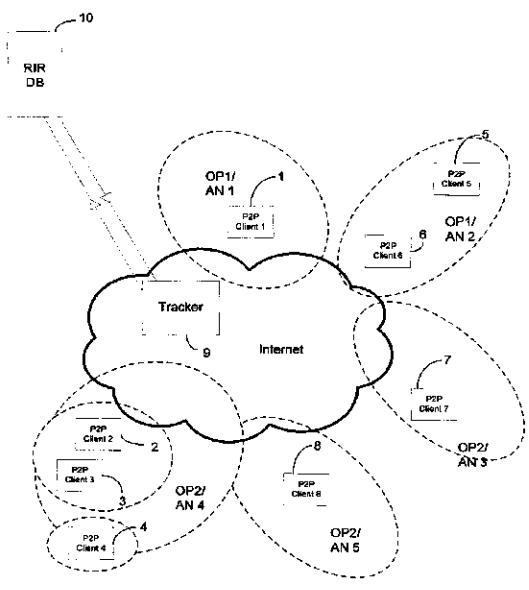


Fig. 1

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NETWORK AWARE PEER TO PEER

TECHNICAL FIELD

The present invention relates to methods and arrangements for selecting suitable peers for content downloading, in a peer to peer network.

BACKGROUND

The increased bandwidth introduced by the penetration of broadband and the availability of enhanced terminal capabilities, content creation and publishing tools has significantly increased in availability on the Internet of user generated content, e.g. YouTube, Podcasting, etc. Software distribution such as Microsoft update, Linux distributions, and content aggregators such as Joost, BBC iPlayer are also becoming established sources of legal online content.

Peer-to-peer technology has shown itself as a viable technology for distributing user generated content and technology of choice of the content aggregators. For example, the iPlayer utilizes an IMP P2P client. Peer-to-peer P2P architecture is a type of network in which each workstation has equivalent capabilities and responsibilities. This differs from client/server architectures where some computers are dedicated to serving the others. The P2P network distributes the computing power between connected peers in the network and utilizes the aggregated resources, e.g. network available bandwidth, for efficient content distribution. P2P is often used as a term to describe one user linking with another user to transfer

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information and files through the use of a common P2P client to download material, such as software upgrades or media files.

When downloading content using P2P clients, pieces or chunks of the selected file are gathered from several nodes simultaneously in order to decrease download time and to increase robustness of the P2P network. The set of peers to download data chunks from has been selected by a so called Tracker which functions as a gateway between peers in the P2P network. In P2P systems based on Tracker architecture when a client requests content, it contacts the Tracker in order to obtain addresses of peers having the desired data chunks. The Tracker replies with a list of addresses to peers having the data. For example, in the BitTorrent protocol the list of peers in the tracker response is by default 50, if the number of available peers is equal or above 50. If there are more peers that have the desired chunk of content, the tracker randomly selects peers to include in the response, or the tracker may choose to implement a more intelligent mechanism for peer selection when responding to a request. This selection can for example be made based on locality, network measurements and similar. All based on the viewpoint of the Tracker.

The problem is that much locality information and other operator specific information is not usually available to a central Internet based Tracker. Further, the Tracker may not always take the operator needs into account - such as keeping traffic local to the operator at hand.

The limited knowledge of the network location of the different peers causes the traffic flow to be non optimal from a network point of view. This will put unnecessary load on expensive peering connections between Internet Service Providers ISPs, especially when transit peering is

used. This also causes longer download times for the end-users.

To overcome this problem there is an initiative called Proactive network Provider Participation for P2P (P4P). The P4P working group has participants from the ISP, Movie/Content, and P2P industries. The working group is focused on helping ISPs handle the demands of large media files and enabling legal distribution using P2P technology, they are building what they believe will be a more effective model of transmitting movies and other large files to customers.

P4P works by having an ISP use an "iTracker" which provides information on how its network is configured. P2P software can query the iTracker and identify preferred data routes and network connections to avoid, or change depending on the time of day. The P2P software can then co-operatively connect to peers which are closer or cheaper for the specific ISP, selectively favoring peers instead of choosing peers randomly, or based on access or sharing speeds.

The drawback with the iTracker; are that the ISP must install an iTracker into there network and the P2P applications must be aware of the ISP specific iTracker and be allowed to connect to it. The P4P iTracker concept is also working against Net Neutrality regulations.

SUMMARY

An object of the invention to overcome above identified limitations of the prior art. The invention focuses on improving the way of managing P2P traffic in an optimal way from network point of view.

The problem of managing P2P traffic is solved by a method for grouping peers by utilizing public information of the distribution network. The invention describes mechanisms and techniques for selecting peers that possess required content and grouping the peers in a coordinating node, based on network topology. Basically, the method involves grouping of peers based on network information fetched from a public database to the coordinating node.

According to a first exemplary embodiment a tracker receives information of peers that possess requested content. The tracker then collects information with regard to network topology related to the content holding peers, from the public database. The tracker groups the peers with respect to received topology parameters such as for example relative geographical position between peers. After having received a content request from a requesting client, the tracker ranks the grouped peers with respect to for example most favourable location of grouped peers in relation to the requesting client.

In another aspect of the invention, instead of using a tracker as search mechanism, a distributed Hash Table has been used and instead of sending the request from the requesting client to the tracker, the request is forwarded to the most appropriate peer in accordance to the DHT implementation. So, instead of the tracker responding back with the ranked list of IP addresses of peers with the desired content, the found peer that possess the IP addresses, will after having consulted the public database respond back and deliver the ranked list.

An object of the invention is to optimize traffic flow from network point of view without working against Net Neutrality regulations. This object and others are achieved by methods, arrangements, nodes, systems and articles of manufacture.

The invention results in advantages such as it gives the P2P application better knowledge of the network location of the different peers, and by ranking and choosing the download peers based on their peer-to-peer network location it will result in a more optimal traffic flow from a network point of view. This will reduce the P2P applications traffic load on expensive peering and transit connections between ISPs, and try to keep the P2P traffic local to the ISP's network if possible. This will also reduce download times for the end-users.

The invention will now be described more in detail with the aid of preferred embodiments in connection with the enclosed drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block schematic illustration disclosing a plurality of clients connected via various access networks to internet. A central P2P Tracker is located in the internet. The Tracker is associated with a central public database.

Figure 2 discloses a signal sequence diagram representing a method for grouping and ranking suitable peers and downloading a ranking list to a requesting client, according to a first embodiment.

Figure 3 discloses the same block schematic illustration as is shown in figure 1 disclosing a plurality of clients connected via various access networks to internet. The figure also discloses a grouping table showing content holding peers grouped in relation to a requesting client.

Figure 4 discloses a signal sequence diagram that represents a method for grouping peers.

Figure 5 discloses a block schematic illustration of a coordinating node.

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DETAILED DESCRIPTION

Figure 1 discloses according to an exemplary embodiment, a peer to peer P2P network that includes plural clients **1-8** connected via various access networks AN1-AN5 to INTERNET. The figure discloses a very simplified example and the number of clients are in the reality much higher. The clients **1-8** may be, for example, a mobile phone, a computer, a set top box, or other devices that are capable of exchanging information with the internet. The access networks AN1-AN5 may be, for example, a communication network, a phone network, an internet service provider, etc. In this exemplified embodiment a first operator OP1 is accessible in the access networks AN1-AN2 and a second operator OP2 is accessible in AN3-AN5. The client **1** is attached to OP1/AN1, the clients **5** and **6** are attached to OP1/AN2, the clients **2-4** are attached OP2/AN4, client **7** is attached to OP2/AN3 and client **8** is attached to OP2/AN5. A central tracker **9** is in this example located within the Internet. The tracker functions as a directory service for the clients, also called peers, in the P2P network. A P2P tracker may be any P2P searching mechanism (e.g. the BitTorrent tracker system). The tracker gathers information on which peers have what data chunks and spread information to any requesting peer. The central tracker is capable to communicate and fetch information from a public database RIR **10** (see for example "Wikipedia" in general or "http://en.wikipedia.org/wiki/Regional_Internet_Registry"). The public database is in this example a so called Regional Internet Registrie RIR that manage, distribute, and register public Internet Number Resources within their respective regions. A regional Internet registry (RIR) is an organization overseeing the allocation and registration of Internet number resources within a particular region of the world. Resources include IP addresses (both Ipv4 and Ipv6) and autonomous system numbers. RIRs work closely together,

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and with others, to develop consistent policies and promote best current practice for the Internet. Internet Number Resources (IP addresses and Autonomous System AS Numbers) are distributed in a hierarchical way. RIRs allocate IP address space and AS Numbers to Local Internet Registries that assign these resources to end users. In this first embodiment that will be explained more in detail together with figure 2, a method for grouping and ranking suitable peers for content downloading will be shown. According to the first exemplary embodiment, a tracker receives information of peers that possess requested content. The tracker then, according to the invention, collects information related to content holding peers, with regard to network topology, from the public database RIR. Instead of a RIR the Tracker might fetch public information from an Internet Routing Registry IRR (see for example "Wikipedia" or "http://www.irr.net/docs/list.html"). The tracker groups the peers with respect to network parameters such as for example relative geographical position between the peers. After having received a request for the content from a requesting client, the tracker ranks the grouped peers with respect to, for example, most favourable location of grouped peers in relation to the requesting client.

The method according to the first embodiment will now be explained together with figure 2. Figure 2 is a signal sequence diagram wherein the signalling points RIR **10**, Tracker **9** and the clients **1-8** that were briefly explained earlier together with figure 1 have been disclosed. According to the well known P2P protocol, the Tracker continuously receives torrent files from peers/clients. The Torrent files comprise metadata pointing at peers where pieces of data chunks, from now referred to as the content, can be obtained from or be delivered to. The method comprises the following steps:

- A torrent file comprising an identity i.e. an IP address pointing at client **1** is received **21** from client **1** to the Tracker **9**. Client **1** hereby informs the tracker that it is willing to download the content.

- According to the invention, the Tracker searches a local storage to see if the file pointing at the client **1** already has been cashed in the storage. The storage can be located "within" or "outside" the Tracker.

- In this example the file was not cashed since before and the Tracker sends **22** a network parameter requests comprising the IP address pointing at client **1**, to the public database RIR. It is to be noted that the Internet Service Provider ISP, Autonomous System AS and routed IP subnet information is not changing that often, and can then be cashed by the tracker. So next time a client connects from the same IP subnet as a previous peer/client, the cached information can be used instead of queering the RIR or IRR database. The mentioned query **22** uses a standard that is interface with RIR specific command options. The query may point out another RIR as the one responsible for managing the information. E.g. a request towards the ARIN RIR (see for example "Wikipedia" or "http://www.arin.net/") for an IP address in a network in Europe, will point out RIPE as the RIR for handling the information, and this will require a subsequent query towards the RIPE database.

- The RIR replies **23** with network parameters associated with the IP address of client **1**, from the public database to the Tracker. In case the file pointing at client **1** was cashed in the local storage since before,

the steps **22** and **23** of sending and replying would not have been performed.

- The tracker cashes **24** the response from the RIR in the local storage and checks according to the invention if an IP address pointing at a peer holding the same content also is cashed in the storage. If that was the case, grouping will start. The grouping will be further explained later in the description.

- In the same way as described above, after having received **25** a torrent file comprising an IP address pointing at client **2** that is willing to download content, the Tracker searches a local storage to see if the file pointing at the client **2** already has been cashed in the storage. In this example the file was not cashed and the Tracker sends **26** a network parameter requests comprising the IP address pointing at client **2**, to the public database RIR that replies **27** with network parameters associated with the IP address of client **2**, from the public database to the Tracker.

- The tracker cashes **28** the response from the RIR in the local storage and checks according to the invention if an IP address pointing at a peer holding the same content already is cashed in the storage. The IP address of client **1** is hereby found and grouping of the two content holding peers **1** and **2** now takes place. The grouping will be further clarified later in the description together with figure 3A.

- In the same way as described above, after having received **29,33,37,41,45** torrent files comprising IP addresses pointing at clients **4,5,6,7,8** (the clients are all willing to download content), the Tracker searches the local storage. In this example the files

were not cashed and the Tracker sends **30,34,38,42,46** network parameter requests comprising IP addresses pointing at clients **4,5,6,7,8** to the public database RIR that replies **31,35,39,43,47** with network parameters associated with the IP addresses of the clients.

- The tracker cashes **32,36,40,44,48** the responses from the RIR in the local storage and checks if an IP address pointing at a peer holding the same content already was cashed in the storage. In this exemplified embodiment the tracker has received and cashed information from the clients **1,2,4-8,** which clients all possess pieces of data chunks that constitutes a subset of the content. Grouping of the peers has continuously been performed after network parameters associated with the IP addresses of clients was cashed in the local storage. The grouping has been performed according to predefined rules. The rule that has been applied in this embodiment can be seen later in the description.

The client **3,** from now on referred to as the requesting client, decides to send a request for the content to the Tracker. A prerequisite is that the requesting client **3** by some means know the address of a tracker which has information about which peers that possess the desired content for example by downloading a torrent file such as BitTorrent.

- A torrent file comprising an IP address pointing at the requesting client **3** is received **49** from client **3** to the Tracker. Client **3** hereby informs the tracker of it's desire to obtain the content from the P2P network. Like before, the Tracker searches the local storage to see if the file pointing at the client **3** already was cashed in the storage.

- Since the file was not cashed in this example, the Tracker sends **50** a network parameter requests comprising the IP address pointing at client **3**, to the public database RIR. The RIR replies **51** with network parameters associated with the IP address of client **3**, from the public database to the Tracker.

- The tracker cashes the response from the RIR in the local storage and starts to group the cashed addresses that belong to the clients **1,2,4-8** together with the newly received address of the requesting client **3**. This final grouping of content holding clients together with the requesting client is disclosed in figure 2 with a block symbol and will now be further explained together with figure 3.

Figure 3 discloses the same network configuration as was disclosed in figure 1. The figure also discloses a table showing the final grouping performed after having received the request for content from the requesting client **3**. The grouping has been done according to the below shown ranking scheme. To be noted is that the scheme in this example is based on currently available operator preferences and is just an example. Another parameter that can be considered for the ranking is for example operator possession. The network ranking can also be used together with common P2P client information like access line bandwidth and maximum up-load speed, to get the best peer-to-peer relationship ranking etc.

Below is the mentioned ranking scheme following rules from a geographical network location point of view that has been applied in this embodiment:

A. Extremely Good, Within a /22 address range in the ISP assigned IP-subnet

B. Very Good, Within ISP assigned IP-subnet

C. Good, Different IP-subnet within the same ISP's AS number

D. Fairly Good, IP-subnet in an different AS, but within the same ISP

E. Fair, Direct peering between different ISP's AS

F. Very Bad, Transit Peering via multiple AS hops

As can be seen in the table in figure 3, peer **3** has been ranked in relation with peer **2** as a group B relation, i.e. "Very good, Within ISP assigned IP-subnet". Peer **3** has been ranked in relation with peer **4** as a group C relation, i.e. "Good" and in relation with peers **1,5,6,8** as a group E relation i.e. "Fair", while in relation to peer **7**, peer **3** has been ranked as a group F relation i.e. "Very bad". The tracker creates a ranking list regarding the requesting client's most favourable peers to download content from, with the most favourable peer at the top of the list. The created ranking list in this example looks like follows:

1. Client 2
2. Client 4
3. Clients 1,5,6,8
4. Client 7

When the ranking list is finalized in the Tracker, the tracker sends **52** the ranking list to the requesting client **3**. This can be seen in figure 2. The requesting client now decides which peers to download content from by using the ranking list as reference, and contacts the chosen content holding peers and starts to download the content according to well known conventional P2P technique.

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If the client was unable to establish a connection to top ranked peers from the list for example if the peer has left the P2P network, or if the aggregated download speed from the selected peers is too low, the requesting client could either select lower ranked peers or request a further list of ranked peers from the Tracker.

A second embodiment of the invention will now briefly be discussed. Instead of using a tracker as search mechanism, a Distributed Hash Table may be used. One of the central parts of a P2P system is a directory service. Basically the directory service is a database which contains IP addresses of peers that have a specific content. In a centralized P2P implementation this directory is called tracker (as discussed above), in a distributed P2P implementation it is called Distributed Hash Table DHT. In DHT a plurality of distributed databases resides on many peers rather than in a single node like in the tracker case; hence it is a distributed database. The DHT algorithm is well known by persons skilled in the art. In this second embodiment instead of sending the request from the requesting client to the tracker, the request is forwarded to the most appropriate peer in accordance to the DHT implementation. So, instead of the tracker responding back with the ranked list of IP addresses of peers with the desired content, the found peer - also called a coordinating node, that possess the IP addresses, will after having consulted the public database RIR respond back and deliver the ranked list (For more information of "trackerless" torrent see e.g. "http://www.bittorrent.org/beps/bep 0005.html"). As an alternative a DHT based tracker can exist in carrier domain that contains several servers, then the solution is more stable.

The invention can also be used in server to client communication when the same content should be distributed to many clients, with the option to use Unicast or Multicast

distribution depending on multiple clients' network location.

Figure 4 discloses a flow chart illustrating some essential method steps of the invention. The flow chart is to be read together with the earlier shown figures. The flow chart comprises the following steps:

- identities of peers willing to deliver/receive content is received to the coordinating node. This step is shown in the figure with a block 101.
- If not already cached, the coordinating node requests network parameters related to the received identities, from a public database. This step is shown in the figure with a block 102.
- The coordinating node receives network parameters related to the identities, from the public database. This step is shown in the figure with a block 103.
- The coordinating node groups the peers from a network point of view. This step is shown in the figure with a block 104.

Figure 5 discloses in some more detail an example of the coordinating node **9** that has been discussed earlier in the application together with the previous figures 1-3. In the previous figures the coordinating node has been represented by for example the tracker.

This section describes as an example some for the invention important parts of the coordinating node. As can be seen in figure 5, the coordinating node comprises two main blocks i.e. a capturing block and a processing block. Data files from content holding peers (or peers that desire to receive

content) are received to a receiver REC and forwarded to the capturing block.

The capturing block is responsible for extracting the identities for peers from the data files and to query the local data base LS to see if a peer already has been cashed in the database.

The processing block is responsible for the requesting of network parameters associated with IP addresses extracted from the messages in the capturing block; from a public database PD. The processing block also receives the network parameters from the public database. The processing block is also responsible for the earlier discussed grouping and ranking of peers by querying the local data base LS. A created ranking list is forwarded from the coordinating node to a requesting peer via a sender SEND.

A system that can be used to put the invention into practice is schematically shown in the figure 1 and figure 5. Enumerated items are shown in the figures as individual elements. In actual implementations of the invention, however, they may be inseparable components of other electronic devices such as a digital computer. Thus, actions described above may be implemented in software that may be embodied in an article of manufacture that includes a program storage medium. The program storage medium includes data signal embodied in one or more of a carrier wave, a computer disk (magnetic, or optical (e.g., CD or DVD, or both), non-volatile memory, tape, a system memory, and a computer hard drive.

The systems and methods of the present invention may be implemented for example on any of the Third Generation Partnership Project (3GPP), European Telecommunications Standards Institute (ETSI), American National Standards Institute (ANSI) or other standard telecommunication network

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architecture. Other examples are the Institute of Electrical and Electronics Engineers (IEEE) or The Internet Engineering Task Force (IETF).

The description, for purposes of explanation and not limitation, sets forth specific details, such as particular components, electronic circuitry, techniques, etc., in order to provide an understanding of the present invention. But it will be apparent to one skilled in the art that the present invention may be practiced in other embodiments that depart from these specific details. In other instances, detailed descriptions of well-known methods, devices, and techniques, etc., are omitted so as not to obscure the description with unnecessary detail. Individual function blocks are shown in one or more figures. Those skilled in the art will appreciate that functions may be implemented using discrete components or multi-function hardware. Processing functions may be implemented using a programmed microprocessor or general-purpose computer. The invention is not limited to the above described and in the drawings shown embodiments but can be modified within the scope of the enclosed claims.

CLAIMS

1. Method for selecting peers (1,2,4-8) suitable for content downloading in a peer to peer network, whereby identities of peers possessing a specified content are received to a coordinating node (9), c h a r a c t e r i z e d in steps of fetching network parameters associated with the received identities and steps of grouping the peers with respect to the network parameters.

2. Method for selecting suitable peers according to claim 1, which steps of fetching information comprises:

- sending a network parameter request comprising an IP address identity of a peer, from the coordinating node (9) to a public database (10);

- receiving network parameters associated with the IP address, from the public database (10) to the coordinating node (9).

3. Method for selecting suitable peers according to claim 1, which steps of fetching information comprises:

- checking if a network parameter related to an IP address identity of a peer, is cashed in a storage (LS).

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4. Method for selecting suitable peers according to any of claims 1-3, which steps of grouping the peers comprises:

- checking if a content corresponding peer is cashed;
- grouping peer-to-peer relationship with regard to network parameters.

5. Method for selecting suitable peers according to any of the claims 1-2, wherein a requesting client (3) requests the specified content and whereby grouped peers are ranked with respect to network parameters of the requesting client (3) versus parameters of the grouped peers (1,2,4-8).

6. Method for selecting suitable peers according to claims 5, whereby a list of ranked peers is sent from the coordinating node to the requesting client (3).

7. Method for selecting suitable peers according to any of the previous claims, which public database (10), manage, distribute and/or register public internet number resources within their respective regions.

8. Method for selecting suitable peers according to according to any of the previous claims, wherein each group contains peers related to each other by a specific criterion.

9. Method for selecting suitable peers according to claims 8, which criterion is based on at least one of the following rules:

- geographical network location;
- operator possession;
- access line bandwidth;
- up-load speed.

10. A node (9) for selecting peers (1,2,4-8) suitable for content downloading in a peer to peer network, whereby identities of peers possessing a specified content are received to the node (9), which node is c h a r a c t e r i z e d by means of fetching network parameters associated with the received identities and means of grouping the peers with respect to the network parameters.

11. A node (9) for selecting suitable peers according to claim 10, which node further comprises:

- means for sending a network parameter request comprising an IP address identity of a peer, from the node (9) to a public database (10);
- means for receiving network parameters associated with the IP address, from the public database (10) to the coordinating node (9).

12. A node for selecting suitable peers according to claim 10, which node further comprises:

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- means for checking if a network parameter related to an IP address identity of a peer, is cashed in a storage (LS).

13. A node for selecting suitable peers according to any of claims 10-12, which node further comprises:

- means for checking if a content corresponding peer is cashed;

- means for grouping peer-to-peer relationship with regard to network parameters.

14. A node for selecting suitable peers according to any of the claims 10-13, wherein a requesting client (3) requests the specified content, which node further comprise means for ranking grouped peers with respect to network parameters of a requesting client (3) versus parameters of the grouped peers (1,2,4-8).

15. A node for selecting suitable peers according to claims 14, which node further comprises means for sending a list of ranked peers from the node to the requesting client (3).

16. A node for selecting suitable peers according to any of the claims 11-15, wherein the node is a tracker (9).

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17. A node for selecting suitable peers according to claim 16, which tracker (9) is decentralized.

18. Article of manufacture comprising a program storage medium having a computer readable code embodied therein to select suitable peers (1,2,4-8) in a peer to peer network for content downloading, the program code comprising:

- computer readable program code able to receive identities of peers possessing a specified content; c h a r a c t e r i z e d by
- computer readable program code able to fetch network parameters associated with the received identities;
- computer readable program code able to group the peers with respect to the network parameters.

19. A network operator system for content downloading from suitable peers in a peer to peer network, the system comprising:

- means for receiving identities of peers possessing a specified content; c h a r a c t e r i z e d by
- means for sending a network parameter request comprising an IP address identity of a peer, from a node (9) to a public database (10);
- means for receiving network parameters associated with the IP address, from the public database (10) to the coordinating node (9);

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- means for grouping the peers with respect to the network parameters.

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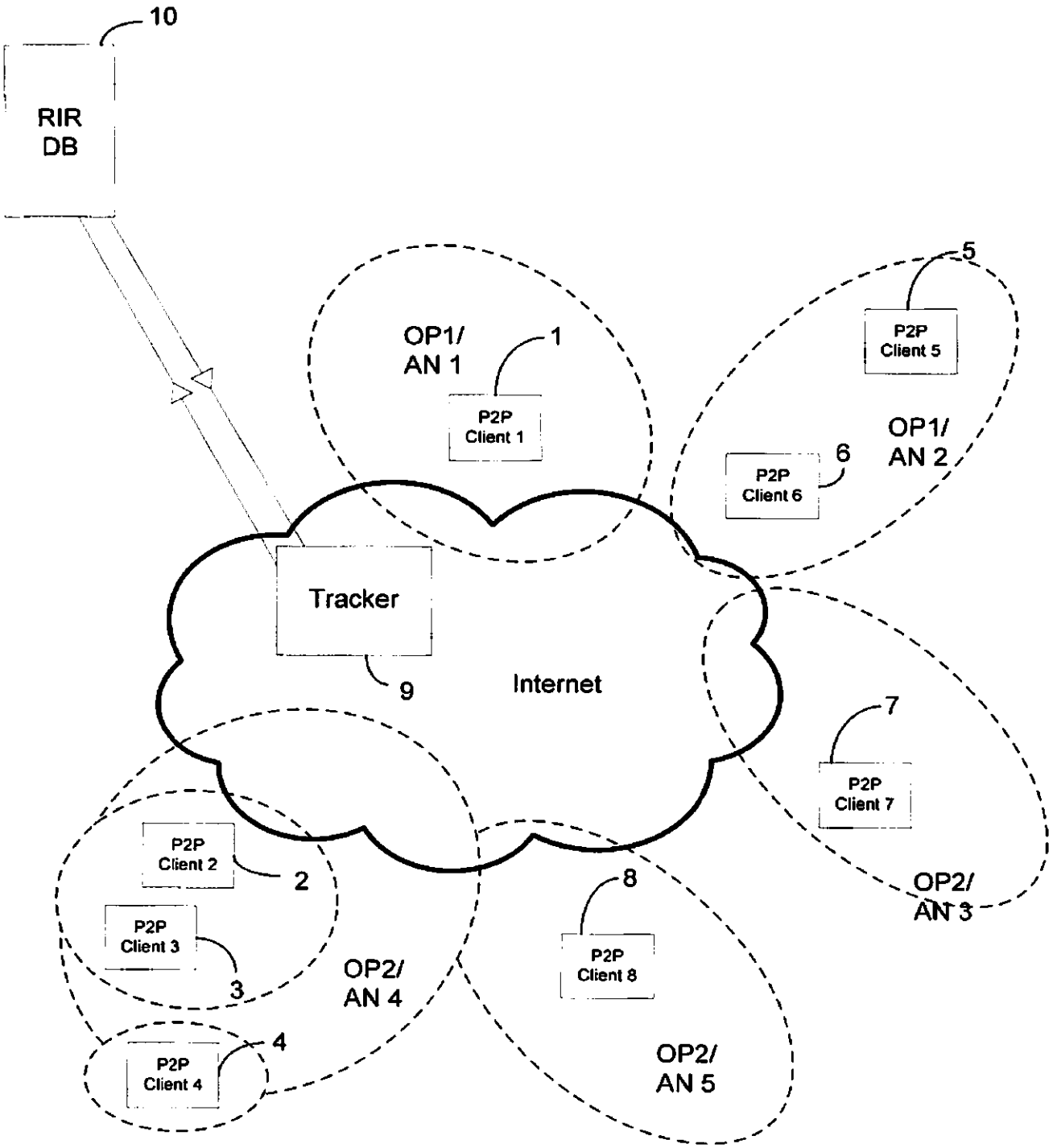

10
RIR DB
OP1/ AN 1
1
P2P Client 1
5
P2P Client 5
OP1/ AN 2
6
P2P Client 6
Tracker
9
Internet
7
P2P Client 7
OP2/ AN 3
P2P Client 2
2
P2P Client 3
3
OP2/ AN 4
4
P2P Client 4
8
P2P Client 8
OP2/ AN 5

Fig. 1

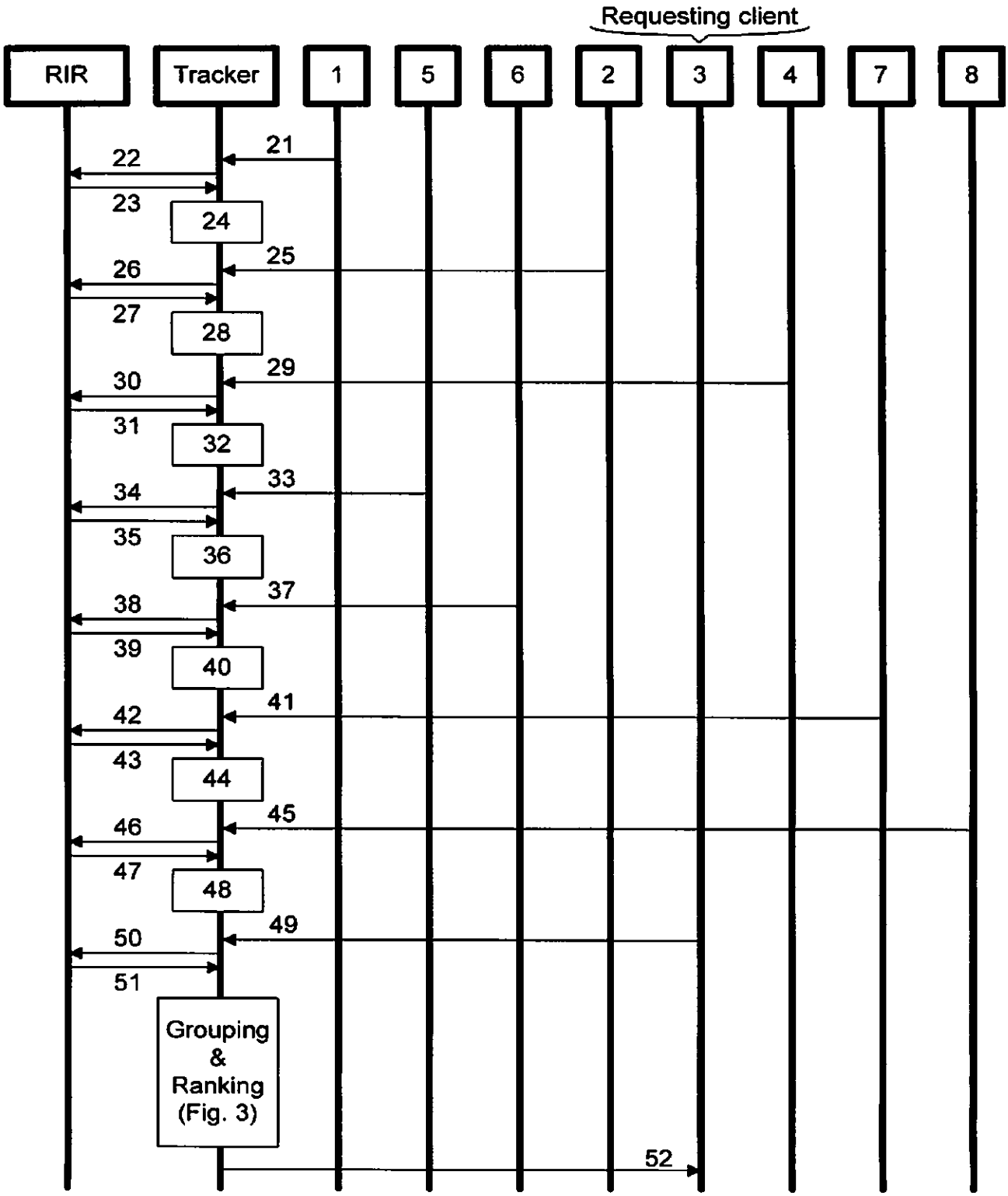

Requesting client
RIR
Tracker
1
5
6
2
3
4
7
8
21
22
23
24
25
26
27
28
29
30
31
32
33
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46
47
48
49
50
51
Grouping & Ranking (Fig. 3)
52

Fig. 2

Grouping list

Client 3	Client 1	Group E
Client 3	Client 2	Group B
Client 3	Client 4	Group C
Client 3	Client 5	Group E
Client 3	Client 6	Group E
Client 3	Client 7	Group F
Client 3	Client 8	Group E

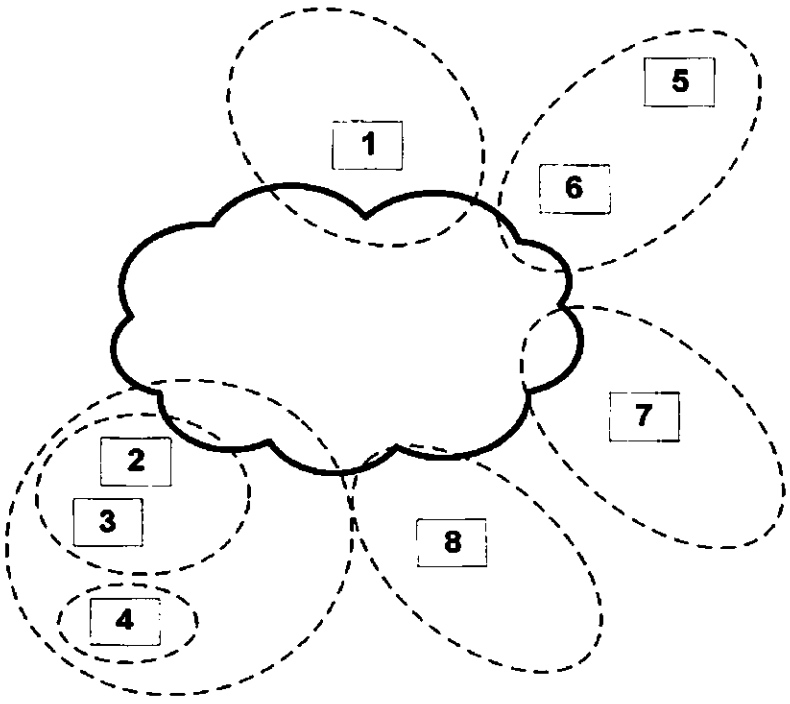


Fig. 3

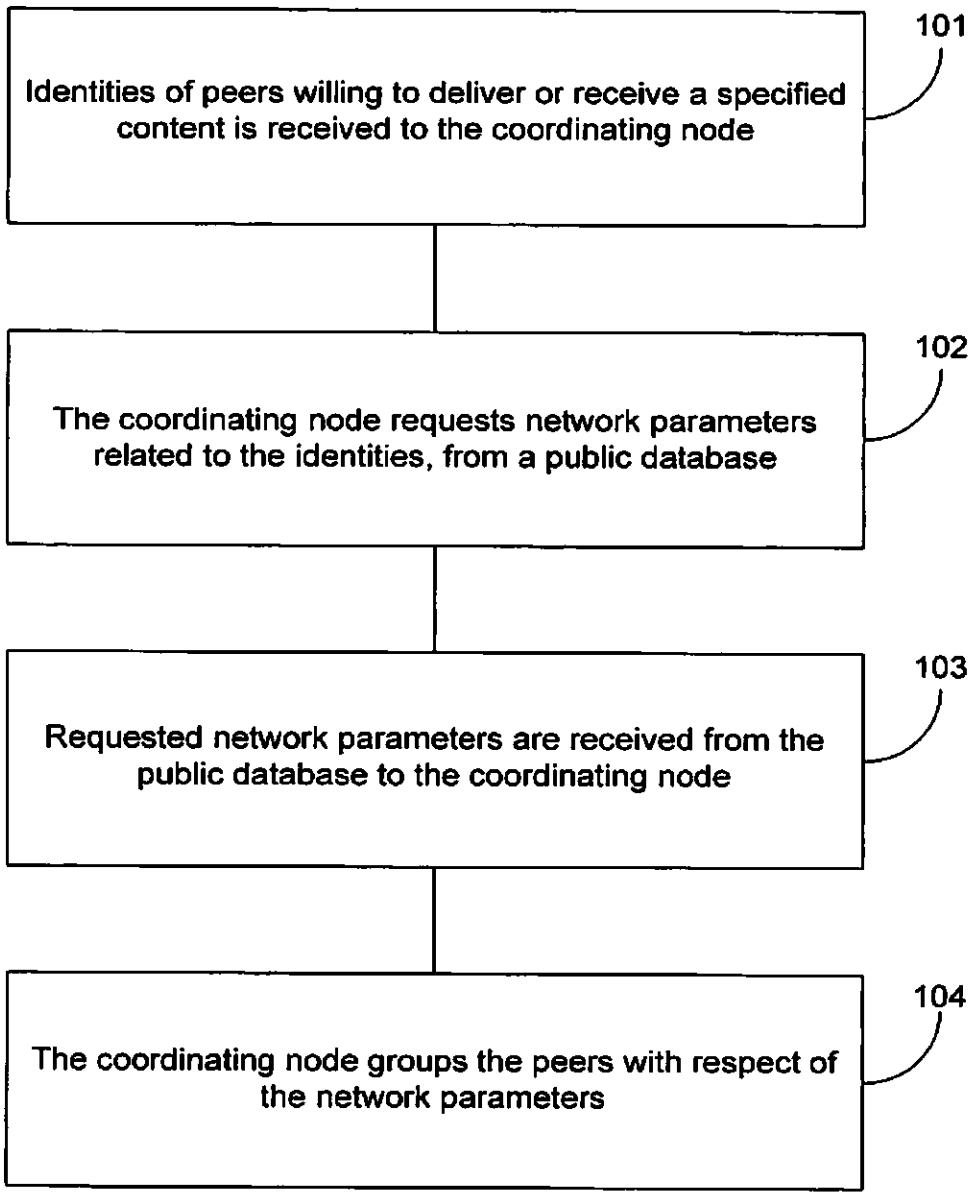

Identities of peers willing to deliver or receive a specified content is received to the coordinating node
101
The coordinating node requests network parameters related to the identities, from a public database
102
Requested network parameters are received from the public database to the coordinating node
103
The coordinating node groups the peers with respect of the network parameters
104

Fig. 4

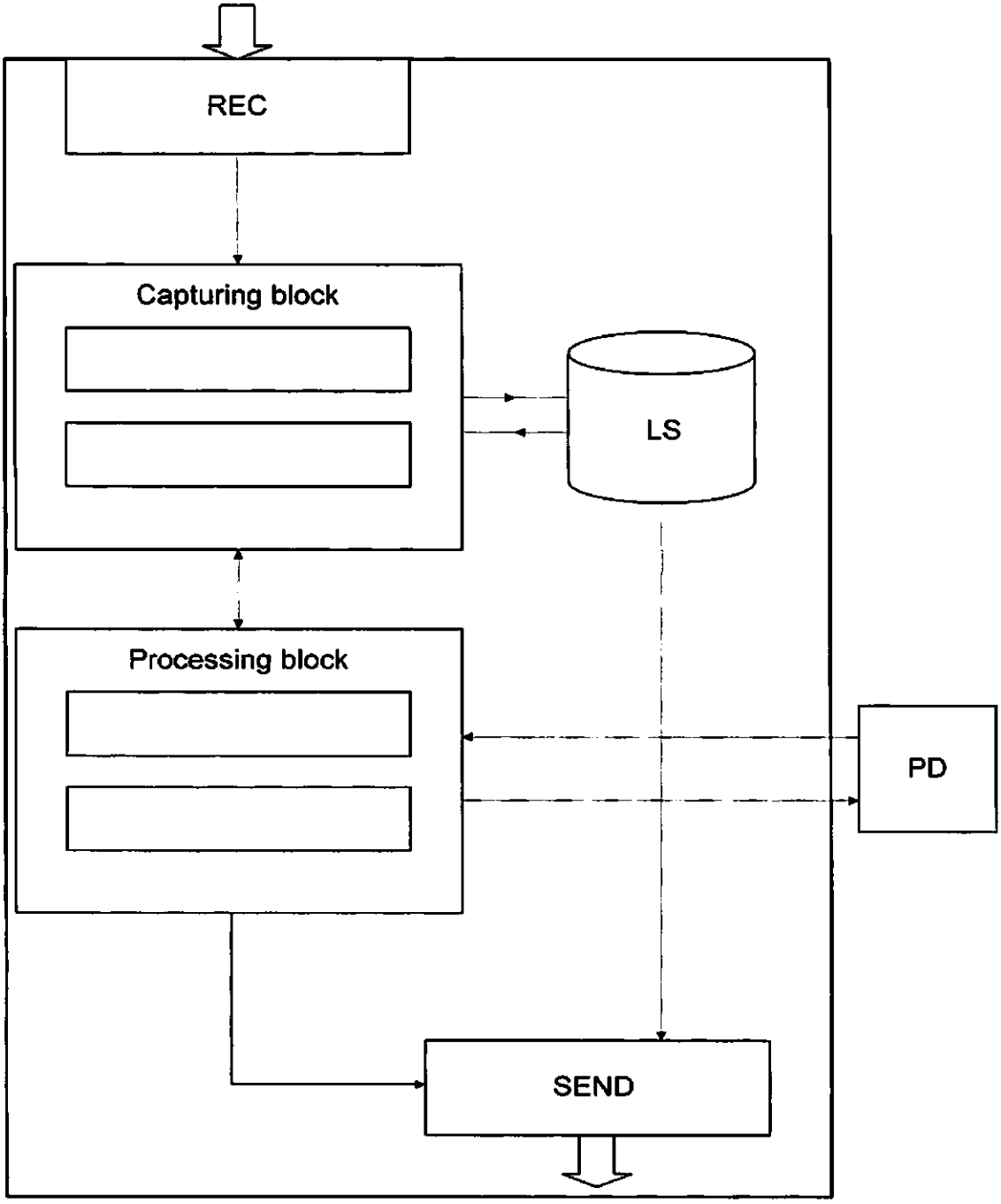


Fig. 5

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/050124

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04W, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ, INSPEC, COMPENDEX, INTERNET

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1821487 A1 (MICROSOFT CORPORATION), 22 August 2007 (22.08.2007), figures 2-5, abstract, paragraphs (0009),(0048)-(0064) --	1-19
A	Designs and Evaluation of a Tracker in P2P Networks, September 2008 [retrieved 2009-10-06]. Retrieved from the Internet:<http://www.p2p08.org/program/sessions/12-short-papers-2/1%20-%20P2P08JIA.pdf/at_download/file>, page 13 --	1-19
A	US 20070064702 A1 (BATES ET AL), 22 March 2007 (22.03.2007), abstract, paragraphs (0001)-(0008) --	1-19

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 October 2009	15-10-2009
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Maikel Youssef / JA A Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/050124

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20080040420 A1 (TWISS ET AL), 14 February 2008 (14.02.2008), abstract, paragraphs (0001)-(0018)	1-19

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

International patent classification (IPC)

H04L 29/06 (2006.01)
H04L 12/24 (2006.01)

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Cited literature, if any, will be enclosed in paper form.

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EP	1821487	A1	22/08/2007	CN	101385280	A	11/03/2009
				KR	20080103535	A	27/11/2008
				WO	2007097877	A	30/08/2007
US	20070064702	A1	22/03/2007	NONE			
US	20080040420	A1	14/02/2008	NONE			

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Electronic Patent Application Fee Transmittal

Application Number:	14025109
Filing Date:	12-Sep-2013
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Filer:	Yehuda Binder
Attorney Docket Number:	HOLA-005-US2

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1st Request	2801	1	600	600
		Total in USD ($)		**600**

Electronic Acknowledgement Receipt

EFS ID:	27644744
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	30-NOV-2016
Filing Date:	12-SEP-2013
Time Stamp:	07:17:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$600
RAM confirmation Number	113016INTEFSW00008068506726
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	sb0030-RCE.pdf	1349896 42dc4707279ee9536db41698e7ddf728204 8e61d	no	3
Warnings:					
Information:					
2		RCE-Reply.pdf	249328 d1a1d65464285eede307dd9a75b65be4c7 2d297c	yes	13
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	11	
	Applicant Arguments/Remarks Made in an Amendment		12	13	
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	IDS-36-001-003.pdf	1036806 e8b623ab1916bac3a3e38ad4933633e4dd 5c2bea	no	7
Warnings:					
Information:					
4	Foreign Reference	EP0948176B1.pdf	167448 80d591de9aecb285f05ecbde406c48a2dab 3cf2a	no	13
Warnings:					
Information:					
5	Foreign Reference	WO2000018078.pdf	1029859 73c79b7e97ca1a058530b5d2968a722c624 d06cf	no	32

Warnings:					
Information:					
6	Foreign Reference	WO2015034752.pdf	1664782 70f6fd8a46e97b0abfb4ccaeac4c04cbad5920a6	no	39
Warnings:					
Information:					
7	Foreign Reference	EP2597869A1.pdf	1757169 3520c6de351862622007673c085c87f14f4a1237	no	108
Warnings:					
Information:					
8	Foreign Reference	WO2010090562.pdf	1041138 c695da72c1333e15edb1cb6852b39f32c38cd06e	no	33
Warnings:					
Information:					
9	Non Patent Literature	RFC2616.pdf	8322530 8c69114cbe3f31388a4a0ee823462d70e8344050	no	114
Warnings:					
Information:					
10	Non Patent Literature	ON-THE-LEAKAGE.pdf	625900 06cf5f2cdf5d6770f1a498cadf61ab9f0def7bfa	no	6
Warnings:					
Information:					
11	Fee Worksheet (SB06)	fee-info.pdf	30486 a1ab8b4d3e2e3ef66904bf58397ab1071c986185	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	17275342		

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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/025,109	Filing Date 09/12/2013	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **11/30/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 40	Minus	** 40	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 3	Minus	***4	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/GAIL WOOTEN/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/08/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 14/025,109	Applicant(s) SHRIBMAN ET AL.	
	Examiner MINH-CHAU NGUYEN	Art Unit 2459	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06/01/2016*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *26-66* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *26-66* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *08/02/2016*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

Remarks

Applicant's amendment dated June 1, 2016 responding to the March 17, 2016 Non-final Office Action provided in the rejection of claims 26-66. **Claims 26-66** remain pending in the application and which have been fully considered by the examiner.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 26-66 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves et al. (US 2002/0007413) hereinafter "**Garcia**", and in view of **Samuels** et al. (US 7,865,585).

Claim 26

Garcia teaches a method for data communication between a web server storing a content and a client via one or more devices, for use with a first server, and where the web server, the client, the first server, and the devices are communicatively coupled via

the Internet and each is identified in the internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server (Garcia, 0102, 0113);

(b) the first server storing the identifiers of the devices (Garcia, 0102, 0113);

(c) the client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) the first server selecting one of tile devices based on associating the identifiers of the devices with the web server identifier (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device.

However, in an analogous art, **Samuels** teaches (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device (Samuels, col. 41, lines 9-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of (f) the

selected device receiving the content from the web server; and (g) the client receiving the content from the selected device, as disclosed by Samuels, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 27

Garcia in combination with Samuels teach the method according to claim 26 wherein the steps are sequentially executed (Samuels, col. 41, lines 5-29; col. 84, lines 30-43).

Claim 28

Garcia in combination with Samuels teach the method according to claim 26 wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected device (Garcia, 0010).

Claim 29

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server is HTTP server and responds to HTTP requests from the client, or the devices (Garcia, 0010).

Claim 30

Garcia in combination with Samuels teach the method according to claim 26 wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 31

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server is a TCI / IP server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 32

Garcia in combination with Samuels teach the method according to claim 26 wherein the content includes web-page, audio, or video content (Garcia, 0113, 0153).

Claim 33

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server selecting one of the devices is based on the web server IP address or URL (Garcia, 0010).

Claim 34

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server selecting one of the devices is based on the selected device IP address (Garcia, 0102-0103, 0121, 0153).

Claim 35

Garcia in combination with Samuels teach the method according to claim 26 wherein the selected device fresher storing the content received from the web server (Garcia, 0102-0103, 0121, 0153).

Claim 36

Garcia in combination with Samuels teach the method according to claim 26 wherein the client sending its identifier and the web server identifier to the first server as part of browser or email application execution (Garcia, 0010, 0102-0103).

Claim 37

Garcia in combination with Samuels teach the method according to claim 26 further comprising the step of the client sending its identifier to the first server, and the first server storing the client identifier (Samuels, col. 51, lines 37-40).

Claim 38

Garcia in combination with Samuels teach the method according to claim 37 further for data communication between a second, web server storing a second content and having an identifier in the Internet and a one of the devices via the client, the method further comprising the steps of:

(h) one of the devices sending the second web server identifier to the first server (Garcia, 0102, 0113);

(i) the first server sending the identifier of the client to the one of the devices (Garcia, 0113-0114, 0119-0121, 0153);

(j) the client receiving the second content from the second web server (Garcia, 0113-0114, 0119-0121, 0153); and

(k) the one of the devices receiving the second content from the client (Garcia, 0113-0114, 0119-0121, 0153),

Claim 39

Garcia in combination with Samuels teach the method according to claim 26 wherein the communication with the web server or the first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126),

Claim 40

Garcia in combination with Samuels teach the method according to claim 26 wherein the communication with the client or the selected device is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126).

Claim 41

Garcia in combination with Samuels teach the method according to claim 26 wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL) (Garcia, 0010).

Claim 42

Garcia in combination with Samuels teach the method according to claim 2.6 wherein the web server identifier, the first server identifier, the client identifier, or any of the device's identifier is using Internet Protocol (IP) address (Garcia, 0102, 0113).

Claim 43

Garcia in combination with Samuels teach the method according to claim 26 wherein in step (d) the first server selecting two or more of the devices based on associating the identifiers of the devices with the web server identifier [i.e. selecting a best cache server based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0114, 0121, 0153). Even though the best cache server is selected, but besides this, Samuels does disclose the selected device receives the content [i.e. "the appliance may select a source to use for receiving the object…the appliance may select the source that responded first..."] (Samuels, col. 41, lines 5-29; col. 84, lines 30-

43); and in step (e) the first server sending the identifiers of the selected two or more devices to the client (Garcia, 0113-0114, 0119-0121, 0153).

Claim 44

Garcia in combination with Samuels teach the method according to claim 43 further comprising the step of the client selecting one of the devices as the selected device [i.e. selecting a best cache server based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0114, 0121, 0153). Even though the best cache server is selected, but besides this, Samuels does disclose the selected device receives the content [i.e. "the appliance may select a source to use for receiving the object…the appliance may select the source that responded first..."] (Samuels, col. 41, lines 5-29; col. 84, lines 30-43).

Claim 45

Garcia in combination with Samuels teach the method according to claim 26 farther comprising the steps of the client sending a communication address to the selected device, followed by communication between the client and the selected device using the communication address [i.e. sending the IP address of the client 300 to a Web router 304] (Garcia, 0113, 0119-0120). Besides this, Samuels does disclose the feature

of communication port number [i.e." the appliance 200 operate transparently that the appliance does not change any of the source and/or destination address information or port information of a network packet…", thus the appliance should have or keep the port number of the client] (Samuels, col. 40, lines 48-52).

Claim 46

Garcia in combination with Samuels teach the method according to claim 26 further comprising the step of the client sending the web server identifier to the selected device (Garcia, 0113-0114, 0119-0121).

Claim 47

Garcia in combination with Samuels teach the method according to claim 46 further comprising the step of the selected device communicating with the web server (Garcia, 0113-0114, 0119-0121).

Claim 48

Garcia in combination with Samuels teach the method according to claim 26 wherein step (d) the first server selecting one of the devices based on the geographical location of the devices (Garcia, 0102).

Claim 49

Garcia teaches a method for data communication between a web server storing a content and a client via one or more devices, for use with a first server, and where the web server, the client, the first server, and the devices are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server (Garcia, 0102, 0113);

(b) the first server storing the identifiers of the devices (Garcia, 0102, 0113);

(c) the client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) selecting one of the devices based on the geographical location of the devices (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device.

However, in an analogous art, **Samuels** teaches (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device (Samuels, col. 41, lines 9-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device, as disclosed by Samuels, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 50

Garcia in combination with Samuels teach the method according to claim 49 wherein in step (d) the first server is selecting one of the devices (Garcia, 0102-0103, 0121, 0153).

Claim 51

Garcia in combination with Samuels teach the method according to claim 49 wherein in step (d) the client is selecting one of the devices (Garcia, 0102-0103, 0121, 0153).

Claim 53

Garcia teaches a method for data communication between a client and a web server storing a contempt via a device, for use with a first server and a device, and where the web server, the client, the first server, and the device are communicatively coupled via the Internet mid each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) sending its identifier and the web server identifier to the first server (Garcia, 0102, 0113, 0119-0121, 0153);

(b) receiving from the first server the identifier of the device (Garcia, 0113-0114, 0119-0121, 0153);

(c) sending the web server identifier to the device (Garcia, 0113, 0119-0120).

Garcia fails to teach (d) receiving the content associated with the web server from the device.

However, in an analogous art, **Samuels** teaches receiving the content associated with the web server from the device (Samuels, col. 41, lines 9-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of receiving the content associated with the web server from the device, as disclosed by Samuels, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 59

Garcia in combination with Samuels teach the method according to claim 53 further for data communication with a second web server storing a second content and having an identifier in the Internet and the devices via the client, the method further comprising the steps of: (e) receiving the second content from the second web server (Garcia, 0113-0114, 0119-0121, 0153); and (f) sending the second content to the device (Samuels, col. 41, lines 9-29).

Claim 52 does not teach or define any new limitation other than above claim 38. Therefore, claim 52 is rejected for similar reasons.

Claims 54-58, 60-66 do not teach or define any new limitation other than above claims 27, 29, 31-32, 36, 39-43, 45-46. Therefore, claims 54-58, 60-66 are rejected for similar reasons.

Response to Arguments

Applicant's arguments filed June 1, 2016 have been fully considered but they are not persuasive. Specifically, Applicants made the following arguments:

1. Rejection under 35 U.S.C. 103 – Garcia and Samuels

Argument 1

Regarding to independent claim 26; Applicant submits that *"Garcia and Samuels references are directed towards respectively different purposes and are based on respectively different structures, and thus are not analogous and cannot logically be combined"* [see Remarks, page 11].

In response to applicant's argument that "*references are directed towards respectively different purposes and are based on respectively different structures"* is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

Argument 2

Regarding to independent claim 26; Applicant submits that *"Based on Figure 3A in Garcia, while not detailed in the Action…A clarification is required if this assumption is not proper or accurate…"* [see Remarks, pages 4-5].

In response to applicant's argument, the Examiner provides interpretations below:

(c) the client sending its identifier and the web server identifier to the first server [i.e. the Web server 302 sends the IP address of the client 300 to a Web router 304. Moreover, when the web server communicates with the web router (by sending client's address), it implies that web server identifier should be included in the communication, thus the web router could identify which web server that have communicated with it] (Garcia, 0113, 0119-0120);

(d) the first server selecting one of tile devices based on associating the identifiers of the devices with the web server identifier [i.e. selecting a best cache server based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0114, 0121, 0153);

(e) the first server sending the identifier of the selected device to the client [i.e. the web router sends the IP address of the best cache server to the client] (Garcia, 0113-0114, 0119-0121, 0153).

Even though **Garcia** does not disclose the features of (f) the selected device receiving the content from the web server; and (g) the client receiving the content from

the selected device. However, **Samuels** does disclose those features, such as (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device [i.e. "the appliance 200 is deployed in line with a WAN link of a router"; and "the appliance 200 behaves as a transparent proxy, by intercepting and forwarding requests and responses transparently to a client and/or server", thus the appliance/transparent proxy is considered as web server which forwards the request to the server (e.g. it is considered as the selected device receives the content from the web server) and forwards the response to the client (i.e. the client receives the content from the server via the proxy)] (Samuels, col. 41, lines 5-29).

Therefore, the combination of Garcia and Samuels has not failed to disclose or suggest the limitations recited in claim 26.

Argument 3

Regarding to independent claim 27; Applicant submits that *"the selected device receives the content ONLY AFTER and ONLY AS A RESULT of the selection and the identifying the content requested by the client. In contrast, the cache mechanisms disclosed by both Samuels and Garcia refers to receiving and storing information BEFORE the content is required by any client"* [see Remarks, page 5].

In response to applicant's argument, the Examiner disagrees. First, Garcia does disclose the selection a device based on client's identifier (see response to above); and Samuels does disclose the selected device receives the content [i.e. "the appliance may

select a source to use for receiving the object…the appliance may select the source that responded first..."] (Samuels, col. 41, lines 5-29; col. 84, lines 30-43).

Therefore, the combination of Garcia and Samuels has not failed to disclose or suggest the limitations recited in claim 27.

Argument 4

Regarding to independent claim 29; Applicant submits that *"Garcia is silent regarding the Web Router 304/404 that is equated to the claimed first server being an HTTP Server…DNS server which is typically not an HTTP Server"* [see Remarks, page 5].

In response to applicant's argument, the Examiner disagrees. Garcia does disclose the feature of ***the first server is HTTP server and responds to HTTP requests from the client, or the devices*** [i.e. "The client (web browser) obtains the required information objects from a server (web server) using a request-response dialogue as part of the Hypertext Transfer Protocol (HTTP)"; and "The redirecting Web router then redirects the client (e.g. via an http redirect) to a topologically close information object…"] (Garcia, 0010, 0058).

Therefore, the combination of Garcia and Samuels has not failed to disclose or suggest the limitations recited in claim 29.

Argument 5

Regarding to independent claim 33; Applicant submits that *"Garcia is silent regarding selecting a device based on identification of the web server, and is in particular silent regarding selecting a device based on the web server IP address or URL as recited in the claim"* [see Remarks, pages 5-6].

In response to applicant's argument, the Examiner disagrees. Again, Garcia does disclose the feature of ***the first server selecting one of the devices is based on the web server IP address or URL*** [i.e. when the web server communicates with the web router (by sending client's address), it implies that web server identifier should be included in the communication, thus the web router could identify which web server that have communicated with it] (Garcia, 0113, 0119-0120).

Argument 6

Regarding to independent claim 37; Applicant submits that *"Garcia is silent regarding generally any server, and in particular regarding the first server, storing the client identifier as recited in the claim"* [see Remarks, page 6].

In response to applicant's argument, the Examiner disagrees. Samuels does disclose the feature of the first server storing the client identifier [i.e. "The appliance may store nay information relating the TCP connection, including…source and destination addresses"] (Samuels, col. 51, lines 37-40).

Argument 7

Regarding to independent claim 38; Applicant submits that *"Garcia is silent regarding the limitations recited in the claim. In particular, both Garcia and Samuels teaches ONLY cache devices receiving content from web servers, and ONLY providing stored content to client devices. Both Garcia and Samuels are silent, and actually teaches away, from receiving any content from a client device, as recited in element (k) in the claim"* [see Remarks, page 6].

In response to applicant's argument, the Examiner disagrees. Garcia does disclose the feature of the one of the devices receiving the content from the client [i.e. according to broadly claim language of "content", thus the request and/or IP address may include in the request, which is being sent to the server, is considered as the content] (Garcia, 0113-0114, 0119-0121, 0153),

Argument 8

Regarding to independent claims 43-44; Applicant submits that *"Garcia explicitly discloses selecting a SINGLE cache server (best cache server' in the cited paragraph 0114). Garcia is silent selecting multiple devices as recited in the claim. The selection of any devices is performed by the in the Garcia reference by the Web Router 304/404 and NOT by the client device as recited in claim 44"* [see Remarks, page 6].

In response to applicant's argument, the Examiner disagrees. Garcia does disclose the selection step [i.e. selecting a best cache server based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0114, 0121, 0153). Even though the best cache server is selected, but besides this, Samuels does disclose the selected device receives the content [i.e. "the appliance may select a source to use for

receiving the object…the appliance may select the source that responded first..."]

(Samuels, col. 41, lines 5-29; col. 84, lines 30-43)

Argument 9

Regarding to independent claim 45; Applicant submits that *"Garcia is silent generally regarding any port number, and in particular regarding the client device sending a port number as recited in the claim"* [see Remarks, page 6].

In response to applicant's argument, the Examiner disagrees. Garcia does disclose the feature of the client sending a communication address to the selected device [i.e. sending the IP address of the client 300 to a Web router 304] (Garcia, 0113, 0119-0120). Besides this, Samuels does disclose the feature of communication port number [i.e." the appliance 200 operate transparently that the appliance does not change any of the source and/or destination address information or port information of a network packet…", thus the appliance should have or keep the port number of the client] (Samuels, col. 40, lines 48-52)

Argument 10

Regarding to independent claim 46; Applicant submits that *"Garcia is silent generally regarding sending the web server identifier to any device, and in particular regarding the client device sending the web server identifier to the selected device"* [see Remarks, page 7].

In response to applicant's argument, the Examiner disagrees. Please see the response to argument 2 above for details.

Argument 11

Regarding to independent claim 48; Applicant submits that *"Garcia is silent generally regarding selecting any device using any criterion other than the client identification, and in particular regarding any selection that is based on any geographical location"* [see Remarks, page 7].

In response to applicant's argument, the Examiner disagrees. Garcia does disclose the selection step (please see the response to argument 1 above for detail); and Garcia also does disclose the selecting web cache is based on client's IP address and WILD table which is used for mapping the client's IP address. The mapping also require the location of information of objects to addresses of Web caches which is considered as geographical location of the devices (Garcia, 0102).

Argument 12

Regarding to independent claim 49; Applicant submits that *"Garcia is silent generally* regarding selecting any device using other than the client identification, Garcia is silent regarding any physical location of any network apparatus, and in particular regarding any selection that is based on any geographical location, as recited in element (d)" [see Remarks, page 7].

In response to applicant's argument, the Examiner disagrees. Garcia does disclose the selection step (please see the response to argument 1 above for detail); and Garcia also does disclose the selecting web cache is based on client's IP address and WILD table which is used for mapping the client's IP address. The mapping also

require the location of information of objects to addresses of Web caches which is considered as geographical location of the devices (Garcia, 0102).

Argument 13

Regarding to independent claim 51; Applicant submits that *"Garcia is silent generally regarding any selecting of any device other than in a server in general, and in particular regarding any selection of device by the client device"* [see Remarks, page 7].

In response to applicant's argument, the Examiner disagrees. Garcia does disclose the feature of the client is selecting one of the devices [i.e. selecting a best cache server (e.g. it implies the best cache server must be selected/determined from a plurality of cache servers) based the received IP address of client with using WILD table] (Garcia, 0102-0103, 0121, 0153).

In addition, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., *selecting of any device other than in a server*) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Conclusion

Applicant's amendment necessitated the ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MINH-CHAU NGUYEN whose telephone number is (571)272-4242. The examiner can normally be reached on 9AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JEFFREY L. NICKERSON can be reached on (571) 270-3631. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/MINH-CHAU NGUYEN/
Primary Examiner, Art Unit 2459

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	NGUYEN, MINH CHAU

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Attorney Docket Number	NGUYEN, MINH CHAU

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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	Attorney Docket Number	NGUYEN, MINH CHAU

CERTIFICATION STATEMENT

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See attached certification statement.

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Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2016-08-01
Name/Print	Yehuda BINDER	Registration Number	73612

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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Oxylabs LT, UAB v. Bright Data Ltd.
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14025109	SHRIBMAN ET AL.
	Examiner	**Art Unit**
	MINH-CHAU NGUYEN	2459

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016	09/02/2016							
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	35	✓	✓							
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	37	✓	✓							
	38	✓	✓							
	39	✓	✓							
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	66	✓	✓							

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Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	NGUYEN, MINH CHAU

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Name/Print	Yehuda BINDER	Registration Number	73612

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特開2007-280388
(P2007-280388A)
(43)公開日　平成19年10月25日(2007.10.25)

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G06F 13/00	(2006.01)	G06F	13/00	351A	5B082
G06F 12/00	(2006.01)	G06F	12/00	545Z	5B089
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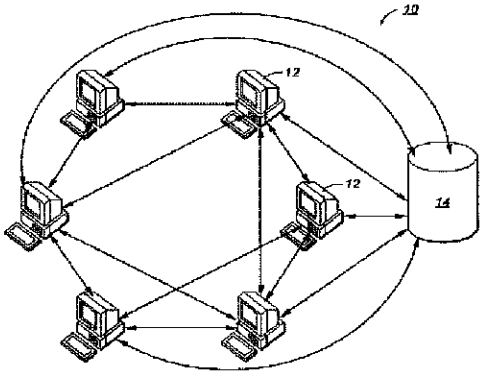
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(54)【発明の名称】ダウンロード可能データセグメントを使用するピアツーピアファイル共有システムおよび方法



[0001]　本発明は、ピアツーピアファイル共有システムおよび方法に関する。

[0002]　ピアツーピア（Ｐ２Ｐ）ネットワークシステムにおいて、ファイルの完全コピーを有する１つ以上のピア（提供者）およびダウンロードすることによってファイルを取得することを望むその他のピア（利用者）の間でファイル

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を共有する方法がある。利用者は、ファイルの全体または一部をダウンロードしてしまうと、ファイルを他の利用者に提供し始めることもある。このようにして、ピアは、ファイルをダウンロードおよびアップロードする「作業」をＰ２Ｐネットワークシステムにわたって分散する。ファイルのダウンロードは、最初のバイトから始まり、ファイル全体がダウンロードされるまで、最終バイトまで順次に進む。

[0003] 前述のピアツーピアファイル共有方法の主要な問題は、利用者が誰もファイルの完全なコピーを持たないことにある。したがって、提供者が使用できなくなった場合、利用者は、ダウンロードを続行するために、完全なファイルが利用できるようになるのを無期限に待ち続けなければならない。ファイルが再び使用可能になった場合、ダウンロードは、前回正常に取り出されたバイトのオフセットから開始する。

[0004] 問題は特に、全ファイルの完全なコピーを有するピアツーピアファイル共有システムのピアがほとんどいない場合に生じる。ファイルが大型ファイルである場合、問題はさらに悪化する。問題は、以下の例によって説明される。

[0035] １．ピアＡがピアツーピア（Ｐ２Ｐ）ネットワークシステムに接続し、Ｆｉｌｅ１．ｔｘｔ（１０２４バイト）をネットワークで使用できるようにする。

２．ピアＢは、第１バイトから始めてファイルをピアＡからダウンロードし始め、５１２バイトのデータを正常にダウンロードし、データの提供を開始する（この時点でピアは提供者でもあり利用者でもある）。

３．ピアＣは、第１バイトから始めてファイルをピアＡからダウンロードし始め、２５６バイトのデータを正常にダウンロードする。

４．ピアＡはネットワークから切断する（あるいは、Ｆｉｌｅ１．ｔｘｔの提供を中断する）。

５．ピアＣは、ピアＢからのデータのダウンロードを続行し、さらに２５６バイトのデータを正常にダウンロードする（合計５１２バイト）。

[0005] この時点において、ピアＢは、ピアＡがネットワークから切断する前に最初の５１２バイトをダウンロードすることしかできないので、Ｆｉｌｅ１．ｔｘｔの後半の５１２バイトのコピーを有する提供者はＰ２Ｐネットワークシステム上にいないことになる。ピアＢおよびピアＣはいずれも、完全なファイルが使用可能になるのを無期限に待つ必要がある。他の利用者がＰ２Ｐネットワークに接続してファイルを要求した場合、ピアＢおよびピアＣは、ダウンロードされたファイルの部分コピーを他のピアに提供することができるが、ファイルの完全コピーを持つ提供者がＰ２Ｐネットワークに接続するまでは、利用者は誰もファイルをダウンロードすることができなくなり、データ転送の進行を事実上停止させる。

[0006] ピアは多くの場合、ファイルの完全コピーが可能な限り長時間Ｐ２Ｐネットワークシステム上に確実にとどまるようにするため、ファイルのダウンロード後に「厚意」としてしばらくの間ファイルを引き続き提供することが期待される。多くの場合、Ｐ２Ｐネットワークシステム上で使用可能なファイルの完全コピーはほとんどない、これはつまり、提供者が切断した場合、Ｐ２Ｐネットワークシステム全体のファイルの可用性を損なうということである。

[0037] 以上のことから、先行技術のＰ２Ｐネットワークシステムに関連する問題を克服するピアツーピアファイル共有のシステムおよび方法の必要性がある。

[0008] 本開示によれば、Ｐ２Ｐネットワークシステム内のピアが不確定の順序で大型ファイルのセグメントをダウンロードして、それらをデータベースに格納し、それらのセグメントをＰ２Ｐネットワークシステム内の他のピアが使用できるようにする、ピアツーピアファイリング共有のシステムおよび方法が提供される。Ｐ２Ｐネットワークシステム内の少数のピアのみがいつでもファイルの完全コピーを有することができる可能性を考慮すれば、完全なファイルからの異なるセグメントのサブセットをそれぞれ有する潜在的に多数のピアは、即座にセグメントを他のピアが使用できるようにすることができる。

[0038] 十分な数のピア、および適度な時間を与えられれば、たとえ元の提供者がＰ２Ｐネットワークシステムから切断するか、または何らかの他の理由により使用不可能になったとしても、ファイルの完全コピーが存在し、Ｐ２Ｐネットワーク全体を通じて配布される可能性は極めて高い。これにより、それぞれファイルの不完全なコピーを持つ残りのピアは、ファイルのさらに完全なコピーを作成するためにファイルのセグメントを引き続き交換することができる。たとえ使用可能なセグメントのスーパーセットが完全なファイルではない場合であっても、さまざまなピアは、元のファイルのソースが利用できなくなった後に引き続きデータを交換することができ、（最終的にすべてのピアがセグメントの同一セットを有するまで）各ピアでファイルのさらに完全なコピーを作成することができるようになる。

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[0039] 本開示によれば、ピアツーピアファイル共有システムは、Ｐ２Ｐネットワークシステム向けに提供される。ファイル共有システムは、ピアツーピアファイリング共有方法を実行するためのプログラマブル命令のセットを実行する複数のピアを有するネットワークおよびプロセッサを含む。方法は、ネットワークの複数のピアのうちの少なくとも１つのピアにファイルの少なくとも１つのセグメントを要求するステップと、少なくとも１つの要求されたセグメントの少なくとも一部を少なくとも１つのピアに提供するステップとを含む。システムはさらに、ファイルの少なくとも１つのセグメントを格納するデータベースを含む。

[0040] 本開示はさらに、ピアツーピアファイリング共有の方法を提供する。方法は、ピアによってネットワーク上の複数のピアのうちの少なくとも１つのピアにファイルのセグメントを要求するステップと、要求されたセグメントの少なくとも一部をネットワーク上の複数のピアのうちの少なくとも１つのピアによってピアに提供するステップとを含む。方法はさらに、ピアによって要求されたセグメントの少なくとも一部をダウンロードするステップと、ダウンロードされたセグメントの少なくとも一部をデータベースに格納するステップとを含む。要求されたセグメントは、要求されたセグメントの長さを指定する表記によって識別される。表記は（ｘ，ｙ）であり、ここでｘは要求されたセグメントが開始するオフセットを指定し、ｙは要求されたセグメントの長さを指定する。

[0012] 方法はさらに、元のソースからまだ取り出されていないセグメントを判別するためにデータベースをスキャンすることによりピアによって要求されたセグメントを選択するステップと、判別されたセグメント内からのランダムオフセット、およびランダムオフセットと判別されたセグメントの終点との間のランダム長さを選択するステップとを含む。

[0013] 本開示によれば、データセグメントが、ファイル、特に大型ファイルのさらに完全なコピーを作成するためにＰ２Ｐネットワークシステムの２つ以上のピア間で共有または交換できるようにする、ダウンロード可能なデータセグメントを使用するピアツーピアファイル共有のシステムおよび方法が提供される。

[0014] ここで、図１および図３を参照すると、本開示による模範的なＰ２Ｐネットワークシステムおよび方法のブロック図がそれぞれ示される。全体を通して参照番号１０によって指定されている本開示のＰ２Ｐネットワークシステムは、６つのピア１２、および６つのピア１２の各々と通信するデータベース１４を含む。各ピア１２は、本開示による方法を実行するための少なくとも１つのプロセッサを含む。

[0015] 少なくとも１つのプロセッサは、本開示による方法を実行するための本明細書で以下に説明される機能およびステップを実行する。特に、少なくとも１つのプロセッサは、本開示によるシステムおよび方法の機能を実行するための一連のプログラマブル命令を有するアプリケーションソフトウェアを実行する。アプリケーションソフトウェアは、ＣＤ－ＲＯＭ、ＤＶＤ、ハードドライブ、およびディスケットなどのコンピュータ可読媒体に格納されうる。

本開示によるピアツーピアファイル共有のシステムおよび方法は、ファイルの完全コピーを有する別のピア１２が使用不可になるか、または使用不可状態にある場合、ファイルのダウンロードを試みて別のピア１２を無期限に待たなければならないというピア１２の問題を解決するか、または少なくとも問題を大幅に軽減する。本開示によるシステムおよび方法は、ファイルがＰ２Ｐネットワークシステム１０のピア１２間で共有または転送される方法を変える。

本開示によれば、ピア１２（利用者）は、望ましいファイル内のさまざまなオフセットから選択されたセグメントを要求する（セグメントを選択するメカニズム（たとえば、ファイル内のオフセット、および各セグメントの長さ）は本明細書において以下で詳細に説明される）。セグメントは、各ピア１２にローカルなデータベース１４に保存され、ピア１２（提供者）は直ちに、これらのセグメントを関心のある利用者に提供し始める。セグメントはファイル全体にわたるオフセットから選択されるので、たとえ元の提供者がＰ２Ｐネットワークシステム１０から切断した場合であっても、ファイルの完全（またはほぼ完全な）コピーが残りの利用者間に存在する可能性がはるかに高くなる。利用者は、各利用者が使用可能なセグメントのスーパーセットのコピーを持つまで、ファイルのセグメントを引き続き交換することができる。たとえ各利用者がファイルの完全コピーを有していない場合であっても、ダウンロードの順次的な特性を考慮すれば、従来のＰ２Ｐネットワークシステムで可能となるよりもはるかに多くのファイルの部分を有する可能性が高い。

セグメントは、表記（オフセット、長さ）を使用して例に示される。たとえば、（２５６、５１２）はオフセット２５６で開始してオフセット５１２で終了するセグメントではなく、オフセット２５６で開始して長さが５１２単位のセグメントを示す。最も一般的に使用されるデータ転送の測定単位はバイトであるが、本明細書に説明されるメカニズムは、任意の測定単位に適用されうる（たとえば、ビット、バイト、ワードなど）。

[0019] 以下の例は、本開示によるシステムおよび方法の動作を説明する。

１．ピアＡがＰ２Ｐネットワークシステム１０に接続し、Ｆｉｌｅ２．ｔｘｔ（１０２４バイト）をＰ２Ｐネット

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ワークシステム１０で使用できるようにする。

２．ピアＢは、ピアＡからファイルをダウンロードし始め、（５１２、５１２）のセグメントを正常に取得する。

３．ピアＣは、ピアＡからファイルをダウンロードし始め、（０、２５６）のセグメントを正常に取得する。

４．ピアＡはＰ２Ｐネットワークシステム１０から切断する（あるいは、Ｆｉｌｅ２．ｔｘｔの提供を中断する）。

５．ピアＢは、ピアＣからファイルをダウンロードし始め、（０、２５６）のセグメントを正常に取得する（ここでピアＢはファイルの２つのセグメント（０、２５６）および（５１２、５１２）を有する）。

６．ピアＣは、ピアＢからファイルをダウンロードし始め、（５１２、５１２）のセグメントを正常に取得する（ここでピアＣはファイルの２つのセグメント（０、２５６）および（５１２、５１２）を有する）。

[0020] この時点で、Ｐ２Ｐネットワークシステム１０にファイルの完全なコピーを有する提供者はいないので（セグメント（２５６、２５６）が欠落）、この例は理想的なシナリオを提供しないが、ピアＢおよびピアＣは他の場合に比べてファイルの大きい部分を有し、背景技術のセクションに示されている例における同等のピアと全く同じバイト数を各々ピアＡから転送されているにもかかわらず、各ピアに使用可能なファイルの７５％をもたらす。

[0042] 本開示によるシステムおよび方法を使用すれば、前述の例によって分かるように、元の提供者がＰ２Ｐネットワークシステム１０から切断された後にピア１２がファイルのセグメントを引き続き交換し、ピア１２がそれぞれデータの異なるセグメントを有するので、Ｆｉｌｅ１．ｔｘｔの全体的な配布は改善されている。さらに重要なことに、任意の提供者がセグメントを欠落した状態でＰ２Ｐネットワークシステム１０に接続した場合（必ずしも完全なファイルでなくてもよい）、すべてのピア１２は欠落したセグメントを交換して、各ピア１２においてファイルの完全コピーを作成することができる。Ｐ２Ｐネットワークシステム１０のすべての使用可能なセグメントのスーパーセットがファイルの完全コピーを含む限り、すべてのピア１２が作業を続行するため、いずれのピア１２もファイル全体を有する必要はない。このことは、すべてのピアがファイルにアクセスするために、ファイルの完全コピーがＰ２Ｐネットワークシステム上のどこかに存在する必要があるという点において、従来のＰ２Ｐネットワークシステムとは異なる。

[0022] これは、ほんの（比較的）短期間のみ（各セグメントが少なくとも１つのピアによってダウンロードされるまで）完全なファイルを使用可能にするために、各ピアがダウンロードするファイルのセグメントがインテリジェントに選択され、元の提供者が切断できるようにするか、またはＰ２Ｐネットワークシステム１０に悪影響を及ぼすことなくファイルの提供を停止できるようにする場合に可能である。ピア１２の数が増加すれば、それに応じて、ファイルの完全コピーを含むことが必要とされる提供者の数は減少する。

[0023] データセグメントは、オフセットおよび長さを使用して定義されたファイルまたはドキュメントのコンテンツの順次的サブセットである。オフセットは、セグメントの開始するファイル内の位置を示す（たとえば、「０」のオフセットはファイル内の１番目のバイトを参照し、「９９」のオフセットはファイル内の１００番目のバイトを参照する）。長さは、オフセットから開始するセグメント内のデータの量を示す（たとえば、「０」のオフセットおよび「５」の長さは、ファイル内のバイト０、１、２、３、および４を参照する）。前述のように、セグメントは本明細書において、表記（オフセット、長さ）を使用して表される。

[0046] 図１に示されるように、「純粋な」Ｐ２Ｐネットワークシステムにおいて、システムおよび使用可能なリソースに関する情報を収集する中央データリポジトリまたはサーバーはない。そのようなシステムにおいて、ピアは、要求をネットワークに同報通信して応答を待つことにより通信する必要がある。利用者はそのような同報通信メッセージを使用して、望ましいリソースのＰ２Ｐネットワークシステムに要求を発行し、提供者は、要求されたリソース内のデータの少なくとも一部を提供できるとき、かつそのときに限り応答する。提供者は、同様のメカニズムを使用して使用可能なリソースを通知し、利用者は、リソース内のデータの少なくとも一部を要求するとき、かつそのときに限り応答する。

[0048] その他のＰ２Ｐネットワークシステムは、サーバーを使用する（ローカルリソースを追跡してその他のリソースの要求をドメインネームシステムが機能する方法と同様の階層まで転送する中央に位置する「トラッカー」または分散サーバー）。そのようなシステムにおいて、ピアは、Ｐ２Ｐネットワークシステム１０に接続する際に同報通信要求を発行してトラッカーを発見することができる。そのような要求には、トラッカーのみが応答する（その他のピアは要求を完全に無視する）。提供者は、トラッカーを発見すると、使用可能なリソースをトラッカーに通知する。利用者は、リソースの要求をトラッカーに直接発行し、トラッカーは、要求されたリソースを転送することのできる１つ以上の提供者で応答する。

[0026] Ｐ２Ｐネットワークシステム１０上の任意のピアがトラッカーの役割を引き受けるように選択することが可能で

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あるが、トラッカー、提供者、および利用者の役割は論理的に別個であると見なされる。

[0027] 利用者は、多くの方法でセグメントを選択することができるが、そのうちのいくつかが本明細書において説明される。どのような場合でも、利用者が一度に大量のデータをダウンロードしようと試みることを防ぐため、セグメントの最大長は比較的小さい数値に制限することが推奨される。セグメントが小さくなれば、それに応じて、提供者が利用できなくなる前に利用者がセグメント全体を取り出すことができる可能性も高くなる（ただし、以下に次のサブセクションで説明されるように、利用者は部分的セグメントを容易に処理することができる）。

[0050] 利用者は、完全にランダムなセグメントを選択することができる。利用者は、まだ取り出されていない任意のセグメントをランダムに選択することによって（これはローカルデータベースをスキャンすることにより行うことができる）、これを行う。欠落しているセグメントは、すでに取り出されているセグメント間のバイトの全範囲であると見なされ、利用者がまだセグメントを取り出していない場合にはファイル全体を含むことができる。欠落セグメントが見つけ出されると、利用者はセグメント内からのランダムオフセット、オフセットとセグメントの終点との間のランダム長さを選択する。

利用者は、固定長のランダムなセグメントを選択することができる。利用者は、固定長を選択することにより（これは転送を開始する前、または構成可能プロパティを通じてランダムに決定されうる）、これを行う。次に利用者は、以下の計算を行う。

セグメントの数＝合計長／セグメント長

オフセット＝ランダム（セグメントの数）*セグメント長

もちろん、利用者は、まだ取り出されていないセグメントに対するオフセットが見い出されるまでランダムオフセット選択を繰り返す必要がある。提供者はセグメントの一部のみを自由に転送することができ、利用者はセグメント全体を提供しない提供者を自由に選択できることに留意することは重要である。この場合、固定長のランダムセグメントを選択する利用者は、部分的セグメントを一時的にバッファに入れ、セグメントをローカルデータベースに格納する前に、全セグメントが転送されるまで残りのセグメントの後続の要求を発行する必要がある。

[0031] 最後に、利用者は、受け入れ可能なセグメントを示すフィルタを使用して、セグメントを要求することができる。フィルタは、まだ利用者に転送されていないセグメントを表すバイト範囲のサブセットを指定すべきであり、通常はセグメントのリスト［（オフセット、長さ）、（オフセット、長さ）、．．．］によって表される。提供者は、リスト内の任意のセグメントのサブセグメントを記述する任意のオフセットおよび長さを自由に選択することができ、それを利用者に提供するよう提案する。これについては、以下で詳細に説明される。

[0032] セグメントが利用者によって転送するように選択されると、クエリーが同報通信の形式でＰ２Ｐネットワークシステム１０に発行されるか（「純粋な」Ｐ２Ｐネットワークシステムにおいて）、またはトラッカーへの要求が発行される必要がある。同報通信は、セグメントのパラメータ（オフセットおよび長さ、または受け入れ可能なデータセグメントを記述するフィルタ）を含む必要がある。Ｐ２Ｐネットワークシステム１０上のピア１２は、セグメント内のデータの少なくとも一部を提供できるとき、かつそのときに限り応答する。応答は、セグメントのオフセット、および使用可能な長さ（利用者によって要求された長さより小さいかまたはそれと等しい）を含む。

[0033] 利用者は、最初に応答する提供者を選択することも、または短期間待機して最善の提供者を選択するように選択することもできる。論理的には、最善の提供者は、要求されたセグメント全体を提供できる、最初に応答する提供者である。最初に応答する提供者は、要求を処理するための最多のリソースおよび／または最小のネットワーク待ち時間を備える可能性が高い。提供者のいずれもセグメント全体を提供することができない場合、利用者は、セグメントの多くを提供できる最初の提供者を論理的に選択する。どの提供者も応答しない場合、利用者は、同じセグメントまたは新しく選択されたセグメントに対する新しい要求をサブミットする前に、ある期間待機するように選択することもできる。

[0034] 利用者が提供者を選択すると、利用者は、オフセットおよび長さを含む望ましいセグメントの提供者に要求を直接送信する。ピア間の接続が確立されると、利用者はセグメントをダウンロードし、それを一時バッファに流し込む。転送が完了すると、利用者はセグメントをローカルデータベースに書き込む。

[0035] 転送が失敗した場合、利用者は要求を再発行することができる。高い失敗率を持つ提供者は、利用者によって（一時的または恒久的に）ブラックリストに掲載され、ある期間にわたりその提供者からの応答を完全に無視する、または可能であればいつでも単に他の提供者を使用するように、利用者が選択できるようになっている。利用者は、部分的に正常な転送を、より小さいデータセグメントの正常な転送として処理し、部分的セグメントをローカルデータベースに格納して、セグメントの残り（または全く新しいセグメント）に対する新しい要求を発行すること

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ができる。

[0036] 利用者がセグメント（全体または部分）を正常に転送し、（チェックサムまたは他の何らかの検証のメカニズムを介して）随意的にセグメントの保全性を検証すると、セグメントはデータベース１４に格納される。データベース１４の実装については確定していないが、単に、各ファイルに格納されたセグメントを識別するために使用されるフラットファイルのセットおよびマニフェストを含むディレクトリであってもよい。これはまた、より堅固であってもよい（各セグメントを表す行、および各行内にＢＬＯＢとして格納されたバイナリセグメント自体を備えるテーブル含むＯｒａｃｌｅ（商標）データベースなど）。利用者は、セグメントの提供をより容易にするため、順次セグメントが格納されるときにこれらを連結する必要がある。利用者は、（セグメントが取り出される際に）同期的または非同期的に連結を実行するように選択することができる。連結が非同期的に実行される場合、（連結が実行中であることを示すために）セグメントはデータベース内でマーク付けされる必要があり、マーク付けされたセグメント内のデータの要求は、連結が完了するまで遅延される必要がある。そのような遅延された要求は、利用者に別の提供者を選択させる場合もあるが、これは利用者が連結にリソースを浪費している場合に適切である。

[0037] 少なくともデータの一部がローカルに使用可能な特定のセグメントに関するクエリーを受け取る提供者は、オフセット、および要求されたセグメントの長さまでの（ただしこれを超えない）長さを含むメッセージで応答する必要がある。利用者がデータセグメントの要求で応答した場合、提供者は、利用者との接続を確立して、セグメント内のデータのアップロードを開始する必要がある。提供者は、どのセグメントがどの利用者に転送されたかに関する別個のデータベースを保持するように選択することもできる。特定の利用者への複数の転送が失敗した場合、提供者はその利用者を一時的にブラックリストに掲載し、他のより信頼できるピアによりよく対応できるときに、信頼できないピアへのデータ転送を試みてリソースを無駄にしないようにすることができる。

[0038] 提供者はまた、利用者が必要とするデータセグメントを記述するフィルタを含むクエリーを受け取ることもできる。提供者は、フィルタによって受け入れられる要求されたリソースから現在使用可能である任意のセグメントの任意の長さでクエリーに自由に応答することができる。提供者は、Ｐ２Ｐネットワークシステム１０で使用可能なセグメントのスーパーセットがファイル全体のコピーを含む可能性を高めるためにあまり頻繁にはアップロードされていないセグメントを選択するため、提供者または他の利用者に送信されたセグメントに関する統計を使用することができるが、これは必須ではない。提供者はまた、ランダムにセグメントを選択することも、または単にセグメントを順次アップロードすることもできる。提供者は、フィルタによって受け入れられる任意のセグメントを全く自由に選択することができる。

[0039] 標準的なＰ２Ｐファイル転送システムにおいて、リソースから最初のデータがクライアントに正常にダウンロードされたら直ちにリソースの提供を開始することは、利用者の礼儀であると見なされる。この期待は、本開示によるＰ２Ｐネットワークシステム１０にまで及ぶ。多くのそのようなＰ２Ｐネットワークシステムにおいて、リソース全体が利用者に転送された後に一定の時間リソースを引き続き提供することも、礼儀であると見なされる。このことは、リソースの１つ以上の完全コピーがいつでもＰ２Ｐネットワークシステム１０において使用可能なセグメントのスーパーセット内に存在する可能性がより高いため、本開示によるＰ２Ｐネットワークシステム１０においてはさほど重要ではない。

[0040] これ以降、ランダムに選択された固定長のセグメントを使用してデータを交換する少数のピア１２を含む流れの例について説明される。この例示のために、すべてのデータは、完全バイトの単位で転送される。セグメントは、表記（オフセット、長さ）を使用して定義される（たとえば、（０、２５６）はオフセット０で始まり、２５６バイトのデータを含むセグメントである）。フィルタは、セグメントのリストとして指定される（たとえば［（０、２５６）、（５１２、２５６）］、フィルタによって指定されているセグメント内のデータのサブセットを含む任意のセグメントはフィルタによって受け入れられる）。

１．ピアＡはＰ２Ｐネットワークシステム１０に接続し、１０２４バイトのデータを含むファイルであるＦｉｌｅ１．ｔｘｔの提供を開始する。ピアＡは、Ｆｉｌｅ１．ｔｘｔの送信元ソースである。

２．ピアＢはＰ２Ｐネットワークシステム１０に接続し、Ｆｉｌｅ１．ｔｘｔのセグメント（０、２５６）に対する同報通信クエリーを発行する。

３．ピアＡは、全セグメントを提供できることを示してクエリーに応答する。

４．ピアＢは、セグメント（０、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。

５．ピアＣがＰ２Ｐネットワークシステム１０に接続し、Ｆｉｌｅ１．ｔｘｔのセグメント（５１２、２５６）に対する同報通信クエリーを発行する。

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６．ピアＢはクエリーを無視する。セグメント（５１２、２５６）は使用可能ではない。ピアＡは、全セグメントを提供できることを示してクエリーに応答する。

７．ピアＣは、セグメント（５１２、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。

８．ピアＢは、フィルタ［（２５６、７６８）］と一致する任意のセグメントに対するクエリーを同報通信する。

９．ピアＡは、セグメント（２５６、２５６）を提供できることを示してクエリーに応答する。ピアＣは、セグメント（５１２、２５６）を提供できることを示して要求に応答する。

１０．ピアＢは、セグメント（５１２、２５６）の要求を直接ピアＣに発行する。ピアＣは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。

１１．ピアＣは、フィルタ［（０、５１２）、（７６８、２５６）］と一致する任意のセグメントに対するクエリーを同報通信する。

１２．ピアＡは、セグメント（７６８、２５６）を提供できることを示してクエリーに応答する。ピアＢは、セグメント（０、２５６）を提供できることを示してクエリーに応答する。

１３．ピアＣは、セグメント（７６８、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。ピアＣは、セグメント（５１２、２５６）および（７６８、２５６）の単一のセグメント（５１２、５１２）への連結を開始する。

１４．ピアＢは、フィルタ［（２５６、２５６）、（７６８、２５６）］と一致する任意のセグメントに対するクエリーを同報通信する。

１５．ピアＡは、セグメント（２５６、２５６）を提供できることを示してクエリーに応答する。ピアＣは、セグメント（７６８、２５６）を提供できることを示して応答する。

１６．ピアＢは、セグメント（２５６、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。ピアＢは、セグメント（０、２５６）、（２５６、２５６）、および（５１２、２５６）の単一のセグメント（０、７６８）への連結を開始する。

１７．ピアＡはＰ２Ｐネットワークシステム１０から切断する。ここで、Ｆｉｌｅ１．ｔｘｔの完全コピーを提供するピア１２はない。

１８．ピアＣは、フィルタ［（０、５１２）］と一致する任意のセグメントに対するクエリーを同報通信する。

１９．ピアＢは、セグメント（２５６、２５６）を提供できることを示してクエリーに応答する。

２０．ピアＣは、セグメント（２５６、２５６）の要求を直接ピアＢに発行する。ピアＢは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。ピアＣは、セグメント（２５６、２５６）および（５１２、５１２）の単一のセグメント（２５６、７６８）への連結を開始する。

２１．ピアＢは、セグメント（７６８、２５６）に対するクエリーを同報通信する。

２２．ピアＣは、セグメント（７６８、２５６）を提供できることを示してクエリーに応答する。

２３．ピアＢは、セグメント（７６８、２５６）の要求を直接ピアＣに発行する。ピアＣは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。ピアＢは、セグメント（０、７６８）および（７６８、２５６）の、完全なＦｉｌｅ１．ｔｘｔ（１０２４バイトのデータを含むファイル）への連結を開始する。

２４．ピアＣは、セグメント（０、２５６）に対するクエリーを同報通信する。

２５．ピアＢは、セグメント（０、２５６）を提供できることを示してクエリーに応答する。

２６．ピアＣは、セグメント（０、２５６）の要求を直接ピアＢに発行する。ピアＢは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。ピアＣは、セグメント（０、２５６）および（２５６、７６８）の、完全なＦｉｌｅ１．ｔｘｔ（１０２４バイトのデータを含むファイル）への連結を開始する。

[0041]　この時点において、ピアＢまたはピアＣのいずれか一方がファイルの完全コピーをダウンロードする前に、ステ

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ップ１８においてピアＡがＰ２Ｐネットワークシステム１０から切断したという事実にもかかわらず、ピアＢおよびピアＣはいずれもＦｉｌｅ１．ｔｘｔの完全コピーを有する。この例は、リソースの完全コピーがＰ２Ｐネットワークシステム１０から除去された後にファイル転送が続行し、すべてのピア１２が完全コピーを取得することができるという理想的な状況を示している。図２は、データ転送を説明する。セグメントは最初、セグメントが転送されたピア１２を表すために網掛けされる。

[0042] この例は、本開示によるダウンロード可能データセグメントを使用するＰ２Ｐファイル転送のシステムおよび方法の利点を説明する。ピアＡがネットワーク１０から切断すると、ピアＢおよびピアＣは引き続き情報を交換し、断片をまとめてネットワーク１０上で使用可能なセグメントのスーパーセットからのファイルの完全コピーを作成することができる。

[0043] 従来のＰ２Ｐネットワークシステムにおいて、ピアＡがシステムからＦｉｌｅ１．ｔｘｔを削除すると、残りのピアは、ピアＡまたは別の提供者がリソースの提供を続行するのを（無期限に）待つことを強いられる。一部の従来のＰ２Ｐネットワークシステムにおいて、この待機は数日、数週間に及ぶ可能性もあり、（最悪の場合）リソース全体が２度と使用可能にならないこともある。

[0044] 現在説明されているシステムおよび方法には、他にも利点がある。前述の例において、ピアＡは、他のすべてのピアが取得する必要のある極めて重要なリソースを取得する最初のピアである。Ｐ２Ｐネットワークシステム内の複数のピアが大容量のソフトウェアパッチを取得する必要があるシナリオを想定されたい。単一のピアが、ファイアウォール経由で接続してインターネットからパッチをダウンロードすることを許可される。パッチはここで、Ｐ２Ｐネットワークシステム上の残りのピアに配布される必要がある。このダウンロードはネットワーク内のピアごとに１回しか発生しない。それはつまり、ピア間の今後の配布は最小限となり、このため利用者間でパッチを配布できる従来のＰ２Ｐシステムの能力を活用することは最低限に抑えられるということである。

[0045] そのような従来のＰ２Ｐネットワークシステムにおいて、データ転送はデータの第１バイトから開始し、ファイルの終わりまで順次進行する。ごく少数の提供者が完全なファイルにアクセスすることができ、大多数の利用者すべてがほぼ同じ速度でほとんど同時に開始してファイルをダウンロードしている場合、提供者に膨大なストレスをもたらす結果になる（印刷装置の状態の監視または診断の実行など、ピアが厳密にはファイル処理に関連しない作業を実行するためにリソースを使用することが予期される場合、潜在的に破滅的なシナリオ）。利用者がすべて、同時間にファイルのほぼ同じ部分をダウンロードしたということはつまり、利用者間の共有はほとんど発生しえない、またはほとんど発生しないということである。

[0046] しかし、本開示によるシステムおよび方法において、利用者はそれぞれファイルの異なる部分をダウンロードし、それぞれのピアとの別個のセグメントの交換を直ちに開始して、元のコンテンツ提供者のストレスを取り除くことができる。

[0047] 図３は、前述の流れの例と類似した単一の利用者のイベントの流れを概説する。図３によって示される流れにおいて、利用者は、接続し、単一のファイル（または以前開始されたファイルの残り）をダウンロードし、次いでＰ２Ｐネットワークシステム１０から切断する。ステップ３００において、利用者はＰ２Ｐネットワークシステム１０に接続し、ステップ３０２においてダウンロードするセグメントを選択する。ステップ３０４において、利用者は、選択したセグメントを要求してＰ２Ｐネットワークシステム１０内の他のピアにクエリーを同報通信する。

[0048] ステップ３０６において、提供者がクエリーに応答するかどうかが判別される。応答しない場合、利用者はステップ３０８において短時間待機してから、ステップ３０２において、同じセグメントまたはダウンロードする別のセグメントを選択する。応答する場合、利用者は、クエリーに応答した少なくとも１つの提供者に要求を送信する。ステップ３１２において、利用者は提供者からの着信接続を受け入れ、ステップ３１４において、利用者はセグメントをバッファにダウンロードする。ダウンロードされたセグメントは次に、ステップ３１６において利用者によってデータベース１４に保存される。

[0049] ステップ３１８において、ダウンロードされたセグメントに隣接するセグメントがデータベース１４内に存在するかどうかが判別される。存在しない場合、ステップ３２０において、ファイルが利用者に完全に転送またはダウンロードされたかどうかが判別される。応答する場合、利用者は、ステップ３２２において、Ｐ２Ｐネットワークシステムから切断する。ステップ３１８においてダウンロードされたセグメントに隣接するセグメントがあると判別された場合、ファイルが利用者に完全に転送されたかどうかがステップ３２０において判別される前に、利用者はステップ３２４においてセグメントを連結する。ステップ３２０において、ファイルが利用者に完全に転送されていないことが判別された場合、プロセスは、ファイルの別のセグメントが転送またはダウンロードされるように利用者が選択するステップ３０２に戻る。

[0050] 上記で開示されているさまざまな特徴および機能、あるいはそれらの代替は、他の多くのさまざまなシステムま

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たはアプリケーションに望ましく組み合わされうることが理解されよう。さまざまな現在予測または予期されない代替、変形、変異、または改善は、付属の特許請求の範囲によって網羅されることも意図され、当業者によって引き続き行われうる。

[0052] １０　ネットワーク、１２　ピア、１４　データベース、１８，３００，３０２，３０４，３０６，３０８，３１０，３１２，３１４，３１６，３１８，３２０，３２２，３２４　ステップ。

【請求項 1】
ピアによってネットワーク上の複数のピアのうちの少なくとも１つのピアにファイルのセグメントを要求するステップと、

前記ネットワーク上の前記複数のピアのうちの前記少なくとも１つのピアによって要求されたセグメントの少なくとも一部を前記ピアに提供するステップと、

を含むことを特徴とするピアツーピアファイリング共有の方法。

【請求項 2】
請求項１に記載の方法であって、さらに、

前記ピアによって要求されたセグメントの少なくとも一部をダウンロードするステップと、

前記ダウンロードされたセグメントの少なくとも一部をデータベースに格納するステップと、

前記複数のピアの別のピアに、前記ピアによって要求されたセグメントの少なくとも一部を提供するステップと、

前記複数のピアの別のピアにより別のセグメントの少なくとも一部を同時にダウンロードするステップと、

を含むことを特徴とする方法。

【請求項 3】
複数のピアを有するネットワークと、

ネットワークの複数のピアのうちの少なくとも１つのピアにファイルの少なくとも１つのセグメントを要求するステップと、前記少なくとも１つの要求されたセグメントの少なくとも一部を少なくとも１つのピアに提供するステップと、を含むピアツーピアファイリング共有の方法を実行するためのプログラマブル命令のセットを実行するプロセッサと、

を備えることを特徴とするピアツーピアファイリング共有システム。

【請求項 4】
請求項３に記載のシステムであって、

前記方法は、

クエリーを前記複数のピアに同報通信するステップと、

前記同報通信されたクエリーに応答して前記複数のピアから少なくとも１つの応答を受け取るステップと、

前記要求されたセグメントの少なくとも一部を提供するように応答するピアを選択するステップであって、前記クエリーは前記要求されたセグメントのパラメータの１つおよび要求されたデータセグメントを記述するフィルタとを含み、前記少なくとも１つの応答はオフセットおよび前記要求されたセグメントの長さを超えない長さを指定するメッセージを含むステップと、

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をさらに含むことを特徴とする、システム。

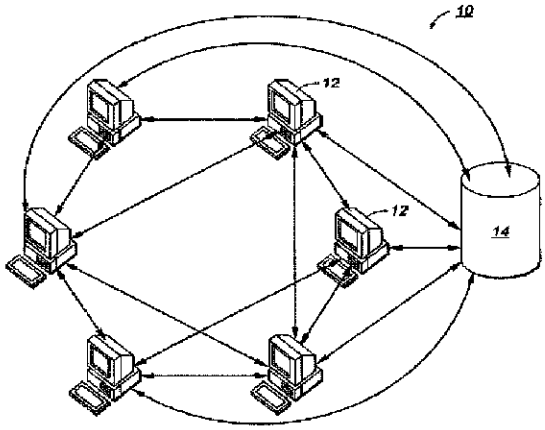
(57)【要約】

【課題】先行技術のＰ２Ｐネットワークシステムに関連する問題を克服するピアツーピアファイル共有のシステムおよび方法の必要性がある。

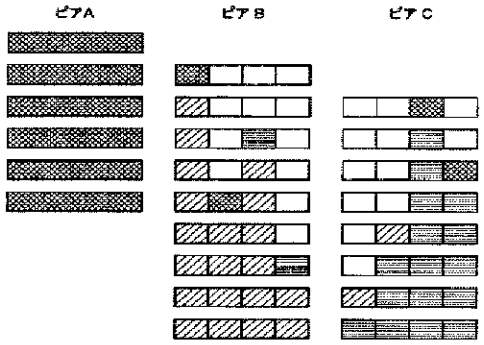
【解決手段】ピアツーピアファイリング共有システムは、複数のピア１２を有するネットワーク１０を備える。また、ピア１２は、ネットワークの複数のピア１２のうちの少なくとも１つのピア１２にファイルの少なくとも１つのセグメントを要求するステップと、少なくとも１つの要求されたセグメントの少なくとも一部を少なくとも１つのピア１２に提供するステップと、を含むピアツーピアファイリング共有の方法を実行するためのプログラマブル命令のセットを実行するプロセッサを備える。

【選択図】図１

【圖 1】

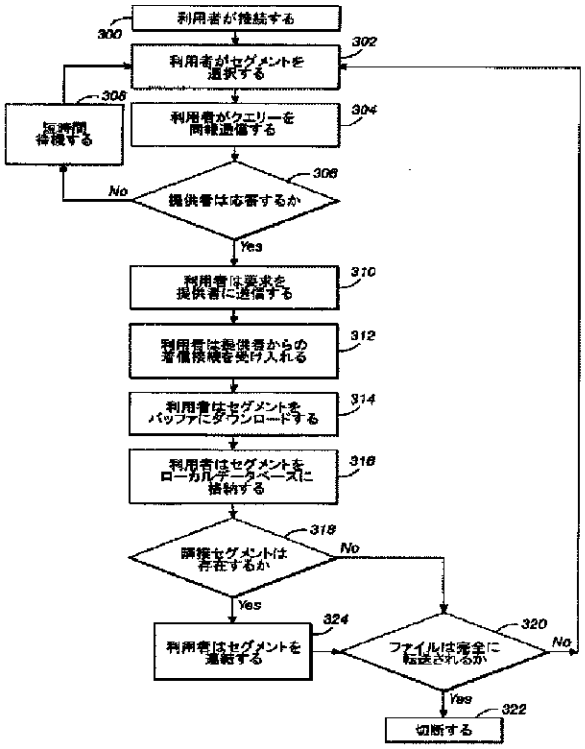


【圖 2】



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【図 3】



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(54) 발명의 명칭 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템

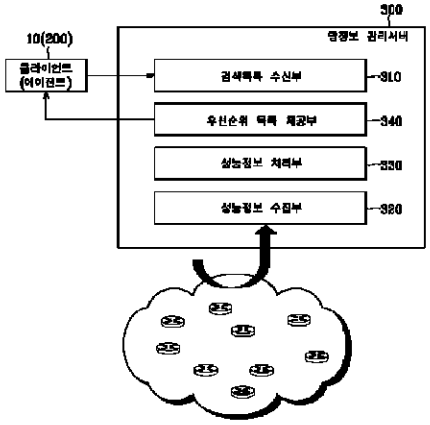
(57) 요 약

본 발명은 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템에 관한 것이다.

이러한 본 발명에 따르면 네트워크의 토폴로지정보와 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버가 클라이언트로부터 소정 정보를 갖는 다수의 피어들에 대한 우선순위 목록 요청을 수신하면, 상기 우선순위 목록 요청을 분석하여 클라이언트의 IP 주소와 상기 다수의 피어들의 IP주소를 추출한다. 그리고 상기 클라이언트로부터의 소정 기준에 따라 선정된 피어 순으로 우선순위 목록을 생성하여 상기 클라이언트로 전송한다.

이로써 망정보 관리서버를 통하여 클라이언트에 대한 최적 피어들을 선정하고, 이를 상기 클라이언트에 제공함으로써 네트워크내 P2P 트래픽과 네트워크 사업자간을 통과하는 P2P 트래픽량을 줄일 수 있으며, 이를 통하여 효율적으로 망 자원을 활용하는 효과가 있다.

대 표 도 - 도2



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특허청구의 범위

청구항 1

서비스 서버로부터 분할된 데이터를 다수의 피어들에게 중복하여 배포하고, 상기 다수의 피어들에게 저장된 분할된 데이터를 관리하며, 클라이언트로부터 소정 정보의 요청시 상기 소정 정보의 분할된 데이터를 가지는 피어 목록을 생성하는 에이전트; 및

네트워크의 토폴로지정보와 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하며,

상기 망정보 관리서버는,

상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 제공하는 것을 특징으로 하는 피어 선정 시스템.

청구항 2

제 1 항에 있어서,

상기 망정보 관리서버는,

상기 클라이언트 혹은 에이전트로부터 상기 우선순위 목록 요청을 수신하는 검색 목록 수신부;

상기 클라이언트와 피어 목록에 저장된 피어들 간의 소정 기준에 따른 홉 카운트 정보, 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 성능정보 수집부;

상기 성능정보에 기초하여 상기 클라이언트로부터의 우선 피어를 선정하고, 상기 선정 결과에 따라 우선순위 목록을 생성하는 성능정보 처리부; 및

상기 생성된 우선순위 목록을 상기 클라이언트 혹은 에이전트로 전송하는 우선순위 목록 제공부

를 포함하는 피어 선정 시스템.

청구항 3

제 2 항에 있어서,

우선순위 목록 요청은,

상기 클라이언트의 IP 주소와 상기 피어 목록을 포함하며, 상기 피어 목록에는 상기 클라이언트가 요청한 정보를 갖는 상기 피어들의 IP 주소들이 저장된 것을 특징으로 하는 피어 선정 시스템.

청구항 4

제 3 항에 있어서,

상기 성능정보 처리부는,

상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 비교하여 상기 클라이언트로부터 인접한 피어를 선정하는 것을 특징으로 하는 피어 선정 시스템.

청구항 5

제 4 항에 있어서,

상기 성능정보 처리부는,

상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 측정하여 소정 홉 수를 초과하는 피어를 상기 우선순위 목록에서 제외하는 것을 특징으로 하는 피어 선정 시스템.

청구항 6

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네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버가 피어를 선정하는 방법에 있어서,

a) 클라이언트로부터 소정 정보를 갖는 다수의 피어들에 대한 우선순위 목록 요청을 수신하는 단계;

b) 상기 우선순위 목록 요청을 분석하여 클라이언트의 IP 주소와 상기 다수의 피어들의 IP주소를 추출하는 단계; 및

c) 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 전송하는 단계

를 포함하는 피어 선정 방법.

청구항 7

제 6 항에 있어서,

상기 a)단계 이전에,

상기 클라이언트가 다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트로부터 자신이 요구한 소정 정보를 저장하고 있는 피어 목록을 수신하는 단계를 더 포함하는 피어 선정 방법.

청구항 8

제 6 항 또는 제 7 항에 있어서,

상기 b) 단계는,

상기 클라이언트의 IP 주소와 피어들의 IP 주소를 토대로 상기 클라이언트와 각 피어 간의 홉 카운트 정보, 링크 속도 정보, 전송 지연 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 단계를 포함하는 피어 선정 방법.

청구항 9

제 8 항에 있어서,

상기 우선순위 목록은,

상기 성능정보의 각 가중치의 합에 기초하여 선정되는 것을 특징으로 하는 피어 선정 방법.

청구항 10

다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트와 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하는 피어 투 피어 통신 시스템이 클라이언트에 대한 피어를 선정하는 방법에 있어서,

a) 상기 에이전트가 클라이언트로부터 소정 정보의 요청을 수신하고, 상기 소정 정보를 저장하고 있는 피어들을 검색함으로써 생성된 피어 목록을 상기 클라이언트로 송신하는 단계;

b) 상기 망정보 관리서버가 상기 에이전트로부터 상기 피어 목록에 따른 우선순위 목록 요청을 수신하는 단계; 및

c) 상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 에이전트를 통하여 상기 클라이언트로 전송하는 단계

를 포함하는 피어 선정 방법.

청구항 11

제 10 항에 있어서,

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상기 c) 단계는,

상기 클라이언트로부터 홉 수가 적은 피어를 인접한 피어로 선정하는 것을 특징으로 하는 피어 선정 방법.

청구항 12

제 11 항에 있어서,

상기 c) 단계는,

소정 홉 수를 초과하는 피어를 상기 우선순위 목록에서 제외하는 단계를 포함하는 피어 선정 방법.

명 세 서

발명의 상세한 설명

기 술 분 야

[0001] 본 발명은 피어 투 피어 통신 방식으로 인해 유발되는 인터넷 서비스 사업자(ISP) 혹은 네트워크 사업자의 네트워크 부하(load)를 경감하기 위하여 클라이언트로부터의 최적 피어를 선정하여 제공하는 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템에 관한 것이다.

배 경 기 술

[0002] 일반적으로 네트워크를 통한 소프트웨어 배포, 파일 공유 또는 스트리밍 서비스를 위해서는 정보를 요구하는 클라이언트와 이를 제공하는 서버 및 이들간의 전달 경로를 구성하는 네트워크가 존재하여야 한다. 그런데 다수의 클라이언트들이 서버에 동시에 접속하여 정보 전달을 요구하는 경우 상기 서버 및 네트워크에서는 병목현상이 발생할 수 있다. 이러한 서버와 네트워크의 병목 문제를 해결하기 위한 방법 중의 하나로 일반 사용자의 PC(Personal Computer)간에 데이터 전송이 가능한 피어 투 피어(Peer to Peer, 이하 P2P라 명명함) 통신 기법이 이용되고 있다.

[0003] P2P 통신 기법은 파일 등의 단위로 구분된 한 단위의 정보(예; avi, mp4 등) 혹은 여러 단위의 데이터로 이루어진 정보(예; 다수의 GIF 파일로 구성된 웹 페이지 등)를 원래의 크기보다 작은 데이터로 나누어 이를 복수의 컴퓨터로부터 클라이언트로 병렬적으로 전달하는 방식이다. 이러한 P2P 통신 방식에서는 일반 사용자의 컴퓨터가 클라이언트의 역할과 서버의 역할을 동시에 수행한다.

[0004] 종래의 클라이언트와 서버의 구조하에서는 서버의 자원이 한정되어 있으므로 클라이언트의 수가 증가하면 데이터 전달이 느려지는데 비해, P2P 통신 방식에서는 참여하는 모든 클라이언트들이 자원을 공유하므로 클라이언트의 수가 증가될수록 P2P 시스템의 용량 또한 증가하는 장점이 있다.

[0005] 그러나, 네트워크 상의 전체 트래픽 중에서 P2P 통신으로 유발되는 네트워크 트래픽의 비중이 구간별 및 시간별 차이가 있으나, 최대 90% 정도로 알려져 있다. 이로 인하여 P2P 네트워크 트래픽은 전체적인 네트워크 품질 저하의 원인이 되고, 그 구간을 지나가는 여러 응용 트래픽에 영향을 주는 문제점이 있다. 특히 P2P 통신 방식에 있어서 클라이언트들이 피어를 랜덤하게 선택하는 경우 P2P 트래픽으로 인한 네트워크에 큰 부하를 가하게 된다. 따라서, 적절한 피어의 선정 방법을 통해 P2P 트래픽이 네트워크에 미치는 영향을 최소화 하는 방법이 요구되고 있다.

[0006] 한편, 종래 기술로서, 한국공개특허공보 2003-0019900(2003년 3월 7일 공개)에는 분산 처리 및 피어 대 피어 통신을 이용한 네트워크 상의정보 전송 병렬화 방법 및 시스템을 게시한다. 이는 네트워크 상에서 분산 처리 및 P2P 통신 기법을 이용하여 정보를 전달하는 것으로, 클라이언트의 피어 선정시 클라이언트 및 피어의 IP 주소(Address)에 기초하여 네트워크상에서 양자의 인접성을 추정하였다. 그러나 종래 기술의 인접성 정보에 대한 추정은 네트워크 장애 및 트래픽 상황에 따라 실제 인접성과는 다를 수 있다. 따라서 최선의 P2P 성능을 낼 수 없으며, 인접하지 않은 피어를 선정할 가능성으로 인해 네트워크에 많은 부하를 유발함으로써 타 인터넷 응용에도 영향을 미치게 되며, 네트워크사업자는 이러한 P2P 트래픽으로 인해 과도한 투자 부담을 갖게 되는 문제점이 있다.

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해결 하고자하는 과제

[0007] 따라서 본 발명은 상기 문제점을 해결하기 위한 것으로 클라이언트의 최적 피어 선정을 지원함으로써 P2P 통신으로 유발되는 네트워크 부하를 경감하고, 클라이언트의 전송 효율을 향상시키는 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템을 제공하는 것이다.

과제 해결수단

[0008] 전술한 기술 과제를 해결하기 위한, 본 발명의 실시 예에 따른 피어 선정 시스템은,

[0009] 서비스 서버로부터 분할된 데이터를 다수의 피어들에게 중복하여 배포하고, 상기 다수의 피어들에게 저장된 분할된 데이터를 관리하며, 클라이언트로부터 소정 정보의 요청시 상기 소정 정보의 분할된 데이터를 가지는 피어 목록을 생성하는 에이전트; 및 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하며,

[0010] 상기 망정보 관리서버는 상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 제공한다.

[0011] 또한 상기 망정보 관리서버는 상기 클라이언트 혹은 에이전트로부터 상기 우선순위 목록 요청을 수신하는 검색목록 수신부; 상기 클라이언트와 피어 목록에 저장된 피어들 간의 소정 기준에 따른 홉 카운트 정보, 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 성능정보 수집부; 상기 성능정보에 기초하여 상기 클라이언트로부터의 우선 피어를 선정하고, 상기 선정 결과에 따라 우선순위 목록을 생성하는 성능정보 처리부; 및 상기 생성된 우선순위 목록을 상기 클라이언트 혹은 에이전트로 전송하는 우선순위 목록 제공부를 포함한다. 여기서 우선순위 목록 요청은 상기 클라이언트의 IP 주소와 상기 피어 목록을 포함하며, 상기 피어 목록에는 상기 클라이언트가 요청한 정보를 갖는 상기 피어들의 IP 주소들이 저장된다.

[0012] 그리고 상기 성능정보 처리부는 상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 비교하여 상기 클라이언트로부터 인접한 피어를 선정하고, 상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 측정하여 소정 홉 수를 초과하는 피어를 상기 우선순위 목록에서 제외한다.

[0013] 한편, 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버가 피어를 선정하는 방법은,

[0014] a) 클라이언트로부터 소정 정보를 갖는 다수의 피어들에 대한 우선순위 목록 요청을 수신하는 단계; b) 상기 우선순위 목록 요청을 분석하여 클라이언트의 IP 주소와 상기 다수의 피어들의 IP주소를 추출하는 단계; 및 c) 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 전송하는 단계를 포함한다.

[0015] 그리고 상기 a)단계 이전에 상기 클라이언트가 다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트로부터 자신이 요구한 소정 정보를 저장하고 있는 피어 목록을 수신하는 단계를 더 포함한다.

[0016] 또한 상기 b) 단계는 상기 클라이언트의 IP 주소와 피어들의 IP 주소를 토대로 상기 클라이언트와 각 피어 간의 홉 카운트 정보, 링크 속도 정보, 전송 지연 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 단계를 포함한다. 여기서 상기 우선순위 목록은 상기 성능정보의 각 가중치의 합에 기초하여 선정된다.

[0017] 한편, 다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트와 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하는 피어 투 피어 통신 시스템이 클라이언트에 대한 피어를 선정하는 방법은,

[0018] a) 상기 에이전트가 클라이언트로부터 소정 정보의 요청을 수신하고, 상기 소정 정보를 저장하고 있는 피어들을 검색함으로써 생성된 피어 목록을 상기 클라이언트로 송신하는 단계; b) 상기 망정보 관리서버가 상기 에이전트로부터 상기 피어 목록에 따른 우선순위 목록 요청을 수신하는 단계; 및 c) 상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보

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중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 에이전트를 통하여 상기 클라이언트로 전송하는 단계를 포함한다.

효 과

[0019] 전술한 구성에 의하여 본 발명의 실시 예에 따른 P2P 통신 시스템은 망정보 관리서버를 통하여 클라이언트에 대한 최적 피어들을 선정하고, 상기 클라이언트에 제공함으로써 네트워크내에서의 P2P 트래픽량뿐만 아니라 네트워크 사업자간을 통과하는 P2P 트래픽량을 줄일 수 있으며, 이를 통하여 효율적으로 망 자원을 활용하는 효과가 있다. 그리고 상기 최적 피어들을 선정시 네트워크 링크 또는 노드의 실제 부하 상황을 반영함으로써, 네트워크상의 타 애플리케이션에 P2P 트래픽이 미치는 영향을 최소화하는 효과가 있다.

[0020] 또한, 네트워크 사업자가 관리하고 있는 신뢰성 있는 성능정보에 기초하여 선정된 최적 피어들에 대한 정보를 클라이언트에게 제공함으로써 전송효율의 극대화에 따른 서비스의 질을 향상시키는 효과를 기대할 수 있다.

발명의 실시를 위한 구체적인 내용

[0021] 아래에서는 첨부한 도면을 참고로 하여 본 발명의 실시 예에 대하여 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있도록 상세히 설명한다. 그러나 본 발명은 여러 가지 상이한 형태로 구현될 수 있으며 여기에서 설명하는 실시 예에 한정되지 않는다. 그리고 도면에서 본 발명을 명확하게 설명하기 위해서 설명과 관계없는 부분은 생략하였으며, 명세서 전체를 통하여 유사한 부분에 대해서는 유사한 도면 부호를 붙였다.

[0022] 명세서 전체에서, 어떤 부분이 어떤 구성요소를 "포함"한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다. 또한, 명세서에 기재된 "…부", "…기", "모듈" 등의 용어는 적어도 하나의 기능이나 동작을 처리하는 단위를 의미하며, 이는 하드웨어나 소프트웨어 또는 하드웨어 및 소프트웨어의 결합으로 구현될 수 있다.

[0023] 이제 본 발명의 실시 예에 따른 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템에 대하여 도면을 참조로 하여 상세하게 설명한다.

[0024] 도 1은 본 발명의 실시 예에 따른 P2P 통신 시스템을 개략적으로 나타낸 네트워크 구성도이다.

[0025] 첨부된 도 1을 참조하면, 본 발명의 실시 예에 따른 P2P 통신 시스템은 서비스 서버(100), 클라이언트(10), 피어(20), 에이전트(200) 및 망정보 관리서버(300)를 포함한다.

[0026] 서비스 서버(100)는 네트워크를 통한 소프트웨어 배포, 파일 공유 혹은 스트리밍 서비스 등을 위한 정보를 분할하여 소정 크기의 데이터로 저장한다.

[0027] 클라이언트(10)는 에이전트(200)를 통하여 소정의 정보를 요청하는 사용자의 컴퓨터이다.

[0028] 피어(20)는 상기 네트워크 내에 다수로 존재할 수 있으며, 서비스 서버(100)를 대신하여 상기 클라이언트(10)의 정보 요청에 따른 상기 소정 크기의 데이터를 병렬적으로 전송하는 역할을 한다.

[0029] 에이전트(200)는 서비스 서버(100)에 저장되어 있는 분할된 데이터를 다수의 피어(20)에게 중복하여 배포하는 역할과, 각 피어(20)에 저장된 상기 분할된 데이터에 관한 정보를 관리함으로써 특정 데이터들이 어느 피어(20)에 저장되어 있는 지를 감시한다.

[0030] 에이전트(200)는 클라이언트(10)로부터 수신된 상기 정보 요청을 분석하고, 상기 클라이언트(10)가 피어 검색을 요청한 경우 서비스 서버(100)를 대신하여 상기 소정 크기의 데이터를 저장하고 있는 피어(20)들을 검색한다. 그리고 상기 검색된 피어(20)들의 IP 주소와 각 피어(20)들이 가지고 있는 데이터 정보 등을 토대로 피어 목록을 작성한다.

[0031] 망정보 관리서버(300)는 네트워크내 노드가 위치한 지리적인 정보, 노드에 연결된 링크의 대역폭/속도, 라우팅 정책, 피어까지의 거리(Distance), 트래픽 부하가 높은 노드 및 링크 정보등 망에 대한 정보를 관리한다. 특히, 망정보 관리서버(300)는 네트워크의 토폴로지(Topology)정보 및 네트워크 내 각 링크별 트래픽 상황을 관리하며, 이를 반영하여 클라이언트(10)로부터의 최적 피어(20)들을 선정하는 역할을 한다. 여기서 최적 피어(20)는 망정보 관리서버(300)가 클라이언트(10)로부터 파일전송 효율이 가장 좋은 것으로 판단한 특정 피어(20)를 의미한다.

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[0032] 다음, 도 2를 통하여 본 발명의 실시 예에 따른 망정보 관리서버(300)에 대해 설명한다.

[0033] 도 2는 본 발명의 실시 예에 따른 P2P 시스템의 망정보 관리서버를 개략적으로 나타낸 블록도이다.

[0034] 첨부된 도 2를 참조하면, 본 발명의 실시 예에 따른 P2P 통신 시스템의 망정보 관리서버(300)는 인터넷 서비스 사업자(ISP) 혹은 네트워크 사업자가 운용하는 NMS(Network Management System)일 수 있으며, 검색목록 수신부(310), 성능정보 수집부(320), 성능정보 처리부(330) 및 우선순위 목록 제공부(340)를 포함한다.

[0035] 검색목록 수신부(310)는 클라이언트(10) 혹은 에이전트(200)로부터 상기 클라이언트(10)에 대한 최적 피어(20)의 우선순위 목록을 요청 받으면, 에이전트(200)에서 생성된 검색목록을 수신하고, 클라이언트(10)의 IP 주소와 피어(20)들의 IP 주소를 분석한다.

[0036] 성능정보 수집부(320)는 클라이언트(10)의 IP 주소와 피어(20)들의 IP 주소를 토대로 클라이언트(10)와 각 피어(20)간의 홉 카운트, 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등의 성능정보를 수집한다.

[0037] 성능정보 처리부(330)는 상기 성능정보에서 클라이언트(10)로부터 각 피어(20)들의 홉 카운트(거리)를 고려하여 인접성을 결정 할 수 있으며, 그 결과에 상기 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등을 고려하여 각 피어(20)의 우선순위를 선정할 수 있다. 또한, 성능정보 처리부(330)는 각 성능정보 가중치의 합에 기초하여 각 피어(20)의 우선순위를 선정할 수 있으며, 상기 선정결과를 토대로 우선순위 목록을 생성한다.

[0038] 우선순위 목록 제공부(340)는 성능정보 처리부(330)에서 생성된 우선순위 목록을 클라이언트(10)로 송신한다. 여기서, 우선순위 목록 제공부(340)는 상기 검색목록을 에이전트(200)로부터 수신한 경우 에이전트(200)를 통하여 클라이언트(10)에 제공할 수 있다.

[0039] 한편, 도 3을 통하여 본 발명의 제1 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 설명한다.

[0040] 도 3은 본 발명의 제1 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 나타낸 흐름도이다.

[0041] 첨부된 도 3을 참조하면, 본 발명의 제1 실시 예에 따른 P2P 통신 방법을 상기 도 1의 구성을 통하여 설명하면, 에이전트(200)가 서비스 서버(100, 미도시)에 의해 분할된 소정의 데이터를 다수의 피어(20, 미도시)로 중복하여 배포하고 이를 관리한다(S301). 그리고 에이전트(200)가 클라이언트(10)로부터 피어 검색 요청을 수신하면(S302), 클라이언트로부터 요청된 정보를 저장하고 있는 피어(20)들을 검색하여 피어 목록을 생성하고(S303), 상기 피어 목록을 클라이언트(10)로 송신한다(S304).

[0042] 망정보 관리서버(300)는 상기 피어 목록을 수신한 클라이언트(10)로부터 클라이언트(10) 자신과 최적 피어의 선정을 요구하는 우선순위 목록 요청을 수신한다(S305). 이 때 상기 우선순위 목록 요청에는 클라이언트(10)의 IP 주소(발신지 주소)와 상기 피어 목록에 있는 피어(20)들에 대한 IP 주소(목적지 주소)가 포함된다.

[0043] 다음, 망정보 관리서버(300)는 클라이언트(10) 의 IP 주소와 피어(20)들의 IP 주소를 토대로 클라이언트(10)와 각 피어(20)간의 홉 카운트, 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등의 성능정보를 수집한다(S306). 그리고, 상기 수집된 성능정보에 기초하여 클라이언트로부터 최적의 전송 성능을 가지는 피어(20)들을 선정하여 우선순위 목록을 생성한다(S307). 상기 우선순위 목록은 상기 수집된 성능정보에 따른 가중치의 합에 기초하여 판단될 수 있다.

[0044] 망정보 관리서버(300)는 상기 생성된 우선순위 목록을 클라이언트(10)로 전송함으로써 클라이언트(10)의 우선순위 목록 요청에 대한 응답을 완료한다(S308).

[0045] 다음, 망정보 관리서버(300)로부터 우선순위 목록을 수신한 클라이언트(10)는 최적 피어(20)들에게 데이터의 전송을 요청한다(S309). 이 때 클라이언트(10)는 상기 데이터 전송 요청을 수신한 해당 피어(20)들로부터의 데이터 전송이 원활하여(S310), 희망하는 정보를 구성하기 위해 요구되는 다수의 분할된 데이터를 모두 수신하면(S311), 이를 조합하여 원하는 정보로 복원한다(S312).

[0046] 만약에 상기 S310 단계에서 해당 피어(20)들로부터의 데이터 전송이 원활하지 않다고 클라이언트(10)가 판단하면, 클라이언트(10)는 망정보 관리서버(300)로부터 수신된 상기 우선순위 목록에서 차선의 이웃 피어(20)들에게 데이터 전송을 요구한다(S309).

[0047] 한편, 도 4를 통하여 본 발명의 제2 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 설명한다.

[0048] 도 4는 본 발명의 제2 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 나타낸 흐름도이다.

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[0049] 본 발명의 제1 실시 예에서는 에이전트(200)가 클라이언트(10)로부터 피어 검색 요청을 수신하면, 피어 목록을 생성하여 클라이언트(10)로 송신하였으나, 제2 실시 예에서는 에이전트(200)가 망정보 관리서버(300)와 직접 연동되는 점이 다르다.

[0050] 첨부된 도 4를 참조하면, 본 발명의 제2 실시 예에 따른 P2P 시스템의 에이전트(200)가 서비스 서버(100, 미도시)에 의해 분할된 소정의 데이터를 다수의 피어(20, 미도시)로 중복하여 배포하고 이를 관리한다(S401). 그리고 에이전트(200)는 클라이언트(10)로부터 피어 검색 요청을 수신하면(S402), 클라이언트로부터 요청된 정보를 저장하고 있는 피어(20)들을 검색하여 피어 목록을 생성한다(S403).

[0051] 그런 다음 에이전트(200)는 상기 클라이언트(10)와 최적 피어의 선정을 요구하는 우선순위 목록 요청을 망정보 관리서버(300)로 송신한다(S404). 이 때 상기 우선순위 목록 요청에는 상기 클라이언트(10)의 IP 주소(발신자 주소)와 상기 피어 목록에 있는 피어(20)들에 대한 IP 주소(목적지 주소)가 포함된다.

[0052] 다음, 망정보 관리서버(300)는 클라이언트(10)의 IP 주소와 피어(20)들의 IP 주소를 토대로 클라이언트(10)와 각 피어(20)간의 홉 카운트, 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등의 성능정보를 수집한다(S405). 그리고, 상기 수집된 성능정보에 기초하여 클라이언트로부터 최적 피어(20)들을 선정하여 우선순위 목록을 생성한다(S406). 상기 우선순위 목록은 상기 수집된 성능정보에 따른 가중치의 합에 기초하여 판단될 수 있다. 망정보 관리서버(300)는 생성된 우선순위 목록을 에이전트(200)를 통하여 클라이언트(10)로 전송한다(S407).

[0053] 망정보 관리서버(300)는 상기 생성된 우선순위 목록을 에이전트(200)를 통해클라이언트(10)로 전송함으로써 에이전트(200)의 우선순위 목록 요청에 대한 응답을 완료한다(S408). 이후, S409 단계 내지 S412 단계는 상기 도 3의 S309 단계 내지 S312 단계와 동일함으로 그 설명을 생략한다.

[0054] 이와 같은 본 발명의 실시 예에 따른 P2P 통신 시스템은 망정보 관리서버(300)를 통하여 클라이언트(10)로부터의 최적 피어(20)들을 선정하여 제공함으로써 네트워크내에서의 P2P 트래픽량뿐만 아니라 네트워크 사업자간을 통과하는 P2P 트래픽량을 줄일 수 있으며, 이를 통하여 효율적으로 망 자원을 활용하는 효과가 있다. 또한, 망정보 관리서버(300)가 상기 클라이언트(10)에 대한 최적 피어(20)들을 선정시 네트워크 링크 또는 노드의 실제 부하 상황을 반영함으로써, 네트워크내 타 애플리케이션에 P2P 트래픽이 미치는 영향을 최소화 할 수 있다.

[0055] 한편, 클라이언트(10) 혹은 P2P 서비스 서버(100)의 관점에서는 네트워크 사업자가 관리하고 있는 신뢰성 있는 성능정보에 기초하여 최적 피어(20)들에 대한 정보를 제공받음으로써 전송효율의 극대화에 따른 서비스의 질이 향상되는 효과가 있다. 또한 P2P 어플리케이션에서 피어 선정을 위한 오버헤드를 제거할 수 있는 효과를 기대할 수 있다.

[0056] 본 발명의 실시 예는 이상에서 설명한 장치 및/또는 방법을 통해서만 구현이 되는 것은 아니며, 본 발명의 실시 예의 구성에 대응하는 기능을 실현하기 위한 프로그램, 그 프로그램이 기록된 기록 매체 등을 통해 구현될 수도 있으며, 이러한 구현은 앞서 설명한 실시 예의 기재로부터 본 발명이 속하는 기술분야의 전문가라면 쉽게 구현할 수 있는 것이다.

[0057] 이상에서 본 발명의 실시 예에 대하여 상세하게 설명하였지만 본 발명의 권리범위는 이에 한정되는 것은 아니고 다음의 청구범위에서 정의하고 있는 본 발명의 기본 개념을 이용한 당업자의 여러 변형 및 개량 형태 또한 본 발명의 권리범위에 속하는 것이다.

도면의 간단한 설명

[0058] 도 1은 본 발명의 실시 예에 따른 P2P 통신 시스템을 개략적으로 나타낸 네트워크 구성도이다.

[0059] 도 2는 본 발명의 실시 예에 따른 P2P 시스템의 망정보 관리서버를 개략적으로 나타낸 블록도이다.

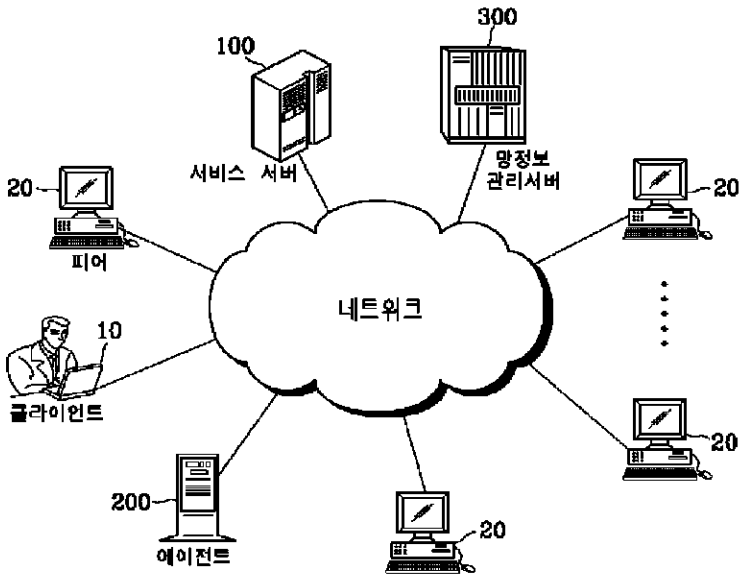
[0060] 도 3은 본 발명의 제1 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 나타낸 흐름도이다.

[0061] 도 4는 본 발명의 제2 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 나타낸 흐름도이다.

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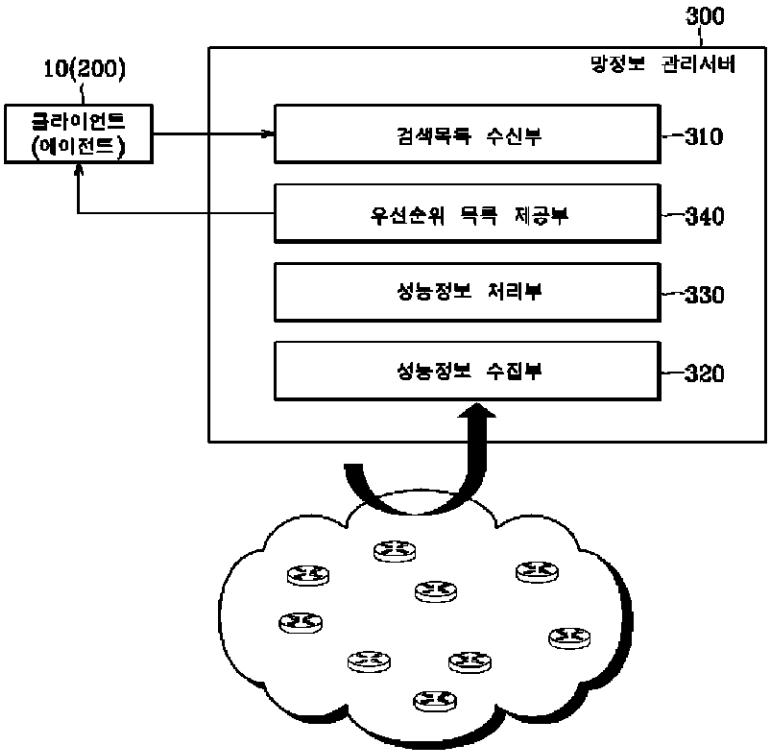
도면

도면1



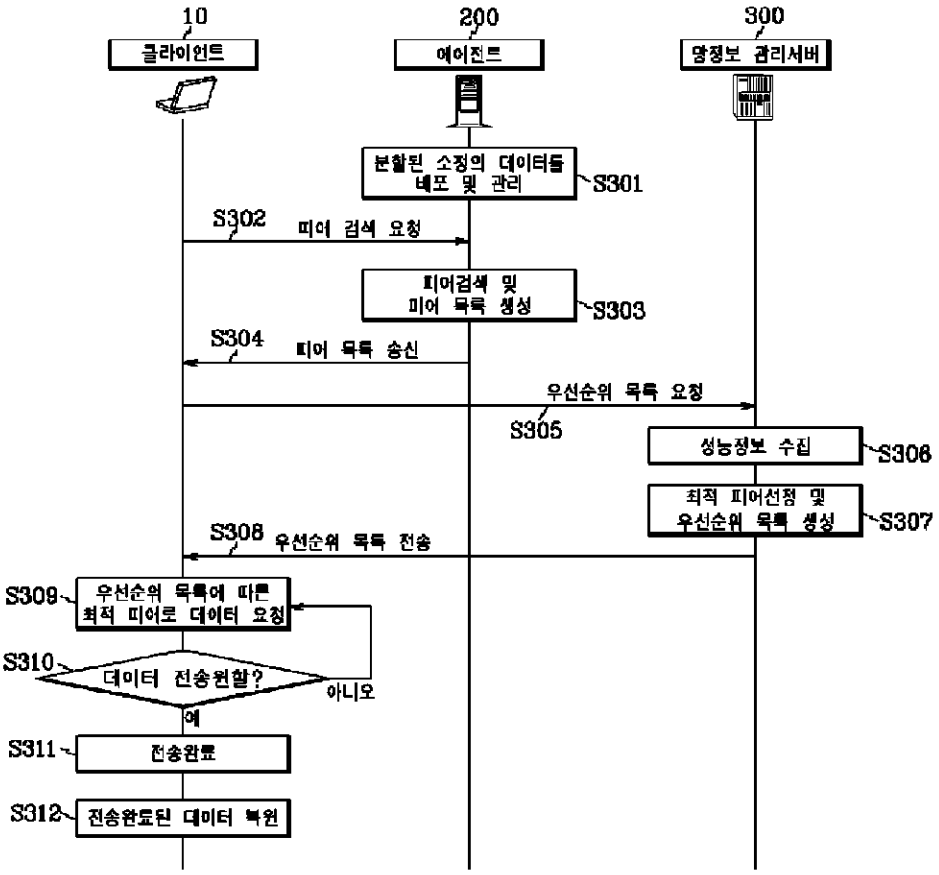
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도면2



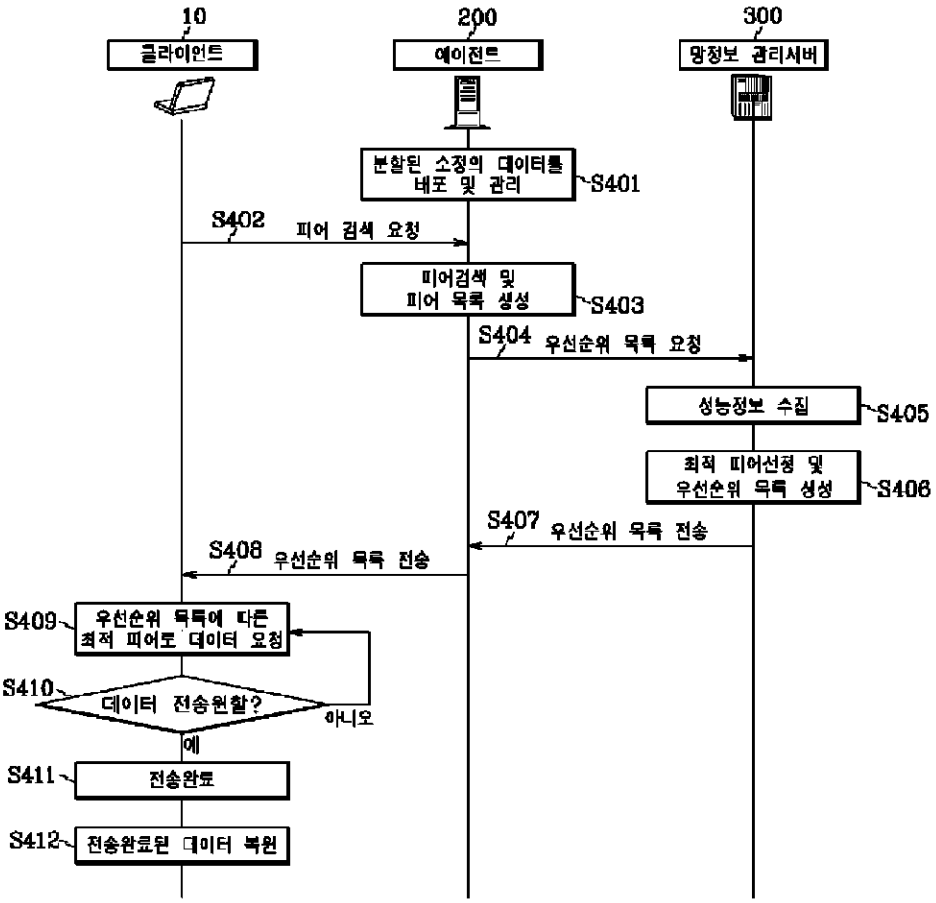
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도면3



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도면4



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발명의 명칭

피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템

Title of Invention

The method for choosing at the peer-to-peer communication and system it spreads.

요약

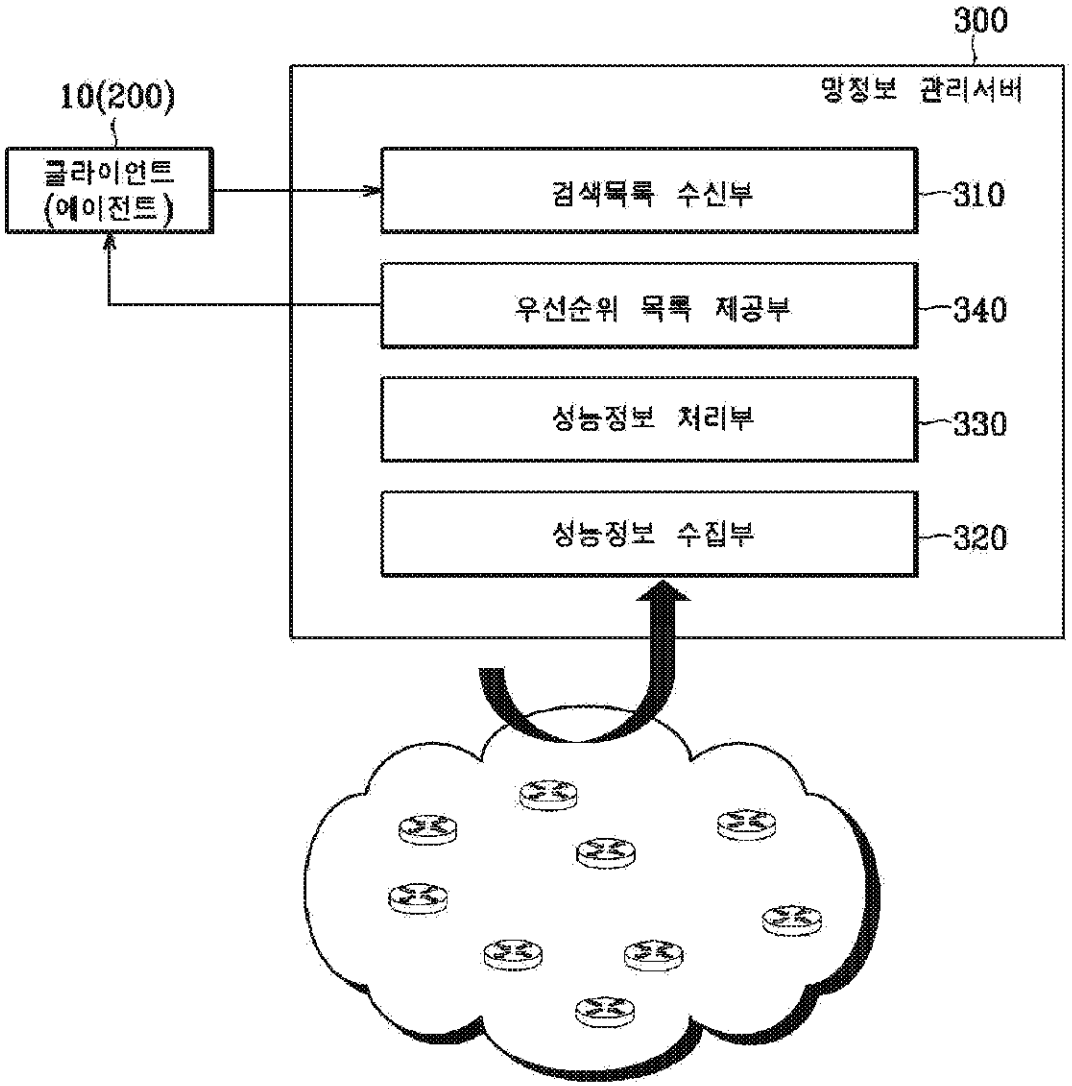
본 발명은 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템에 관한 것이다.
이러한 본 발명에 따르면 네트워크의 토폴로지정보와 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버가 클라이언트로부터 소정 정보를 갖는 다수의 피어들에 대한 우선순위 목록 요청을 수신하면, 상기 우선순위 목록 요청을 분석하여 클라이언트의 IP 주소와 상기 다수의 피어들의 IP주소를 추출한다. 그리고 상기 클라이언트로부터의 소정 기준에 따라 선정된 피어 순으로 우선순위 목록을 생성하여 상기 클라이언트로 전송한다.
이로써 망정보 관리서버를 통하여 클라이언트에 대한 최적 피어들을 선정하고, 이를 상기 클라이언트에 제공함으로써 네트워크내 P2P 트래픽과 네트워크 사업자간을 통과하는 P2P 트래픽량을 줄일 수 있으며, 이를 통하여 효율적으로 망 자원을 활용하는 효과가 있다.
피어 투 피어, 클라이언트, 망정보 관리서버, 에이전트

Abstract

The present invention relates to the method for choosing at the peer-to-peer communication and system it spreads.
According to the invention, if the network information management server managing the toplogy information of the network and each per link traffic condition of the network receives the priority list request about the multiple peers having the predetermined information from the client the priority list request is analyzed and the IP address of the client and IP address of the multiple peers are extracted. And it is chosen according to the criteria from the client the priority list is produced to the net and it transmits with the client.
Therefore, it has the effect that optimal peers about the client are selected through the network information management server and the P2P traffic volume which passes the in-network P2P traffic and network operator liver by providing this to the client can be reduced and through this, the network resource is efficiently utilized.
The peer-to-peer, the client, the network information management server, the agent .

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대표도면(Representative drawing)



청구의 범위

청구 1항:

서비스 서버로부터 분할된 데이터를 다수의 피어들에게 중복하여 배포하고, 상기 다수의 피어들에게 저장된 분할된 데이터를 관리하며, 클라이언트로부터 소정 정보의 요청시 상기 소정 정보의 분할된 데이터를 가지는 피어 목록을 생성하는 에이전트; 및네트워크의 토폴로지정보와 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하며,상기 망정보 관리서버는,상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 제공하는 것을 특징으로 하는 피어 선정 시스템.

Scope of Claims

Claim 1:

The select system which it overlaps data divided from the service server to multiple peers and it distributes ; it manages stored and divided data to multiple peers ; it spreads divided data of on demand predetermined information of the predetermined information from the client to go and it includes the agent producing the list, and the network information management server managing the topology information of the network and each per link traffic condition of the network ; and above net information management server produces the priority list of peers spreading and in which the hop count information from the client and link speed information, the propagation delay time information , and the congestion of the link additionally consider a at least one information among the list among the information and failure information and which are chosen and it provides to the client. It spreads.

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청구 **2**항:

제 1 항에 있어서,상기 망정보 관리서버는,상기 클라이언트 혹은 에이전트로부터 상기 우선순위 목록 요청을 수신하는 검색 목록 수신부;상기 클라이언트와 피어 목록에 저장된 피어들 간의 소정 기준에 따른 홉 카운트 정보, 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 성능정보 수집부;상기 성능정보에 기초하여 상기 클라이언트로부터의 우선 피어를 선정하고, 상기 선정 결과에 따라 우선순위 목록을 생성하는 성능정보 처리부; 및상기 생성된 우선순위 목록을 상기 클라이언트 혹은 에이전트로 전송하는 우선순위 목록 제공부를 포함하는 피어 선정 시스템.

Claim 2:

As for claim 1, the select system including the priority list providing unit it spreads wherein above net information management server transmits to the client or the agent the priority list that is created with the capability information processing unit: and above produces the prlority list according to the result of selection firstly the congestion of the hop count information, the link speed information, the propagation delay time information, the link according to the criteria between the peer stored in the list selects the peer based on the information and the efficiency information collection lifter capability information collecting a at least one capability information among the failure information from the client spreading with the search listing receiving unit: client which receives the priority list request from the client or the agent.

청구 **3**항:

제 2 항에 있어서,우선순위 목록 요청은,상기 클라이언트의 IP 주소와 상기 피어 목록을 포함하며, 상기 피어 목록에는 상기 클라이언트가 요청한 정보를 갖는 상기 피어들의 IP 주소들이 저장된 것을 특징으로 하는 피어 선정 시스템.

Claim 3:

As for claim 2, the priority list request, is the IP address of the client and the select system which the above spreads and it contains the list ; and is stored. Spreads and has the information which the client requests in the list it spreads.

청구 **4**항:

제 3 항에 있어서,상기 성능정보 처리부는,상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 비교하여 상기 클라이언트로부터 인접한 피어를 선정하는 것을 특징으로 하는 피어 선정 시스템.

Claim 4:

As for claim 3, the select system it spreads wherein the capability information processing unit selects the peer that is adjacent from the client the hop count between each peers and the client are compared.

청구 **5**항:

제 4 항에 있어서,상기 성능정보 처리부는,상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 측정하여 소정 홉 수를 초과하는 피어를 상기 우선순위 목록에서 제외하는 것을 특징으로 하는 피어 선정 시스템.

Claim 5:

As for claim 4, the select system it spreads wherein the capability information processing unit excludes from the priority list the peer that exceeds the predetermined hop count the hop count between each peers and the client are measured.

청구 **6**항:

네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버가 피어를 선정하는 방법에 있어서,**a)** 클라이언트로부터 소정 정보를 갖는 다수의 피어들에 대한 우선순위 목록 요청을 수신하는 단계;**b)** 상기 우선순위 목록 요청을 분석하여 클라이언트의 **IP** 주소와 상기 다수의 피어들의 IP주소를 추출하는 단계; 및**c)** 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 전송하는 단계를 포함하는 피어 선정 방법.

Claim 6:

A plurality of method for choosing including the step of receiving the priority list request about the peers, the step of analyzing the b) priority list request and extracting the IP address of the client and IP address of the multiple peers, and the step of the hop count information from the client and link speed information, the propagation delay time information , and the congestion of the link producing the priority list of the peers it spreads es in which the network information management server managing each per link traffic condition of the topology information of the network or the network as to the method for selecting the peer, it has the predetermined information from the client, and the step of the hop count information from the client and link speed information, the propagation delay time information , and the congestion of the link producing the priority list of the peers additionally consider a at least one information among the failure information and are chosen and information and transmitting with the client.

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청구 **7**항:

제 6 항에 있어서,상기 a)단계 이전에,상기 클라이언트가 다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트로부터 자신이 요구한 소정 정보를 저장하고 있는 피어 목록을 수신하는 단계를 더 포함하는 피어 선정 방법.

Claim 7:

As for claim 6, the method for choosing it spreads further including spreading stores the predetermined information which oneself asks the a) before step from the agent in which the client manages divided data which are stored in multiple peers to receive the list.

청구 **8**항:

제 6 항 또는 제 7 항에 있어서,상기 b) 단계는,상기 클라이언트의 IP 주소와 피어들의 IP 주소를 토대로 상기 클라이언트와 각 피어 간의 홉 카운트 정보, 링크 속도 정보, 전송 지연 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 단계를 포함하는 피어 선정 방법.

Claim 8:

As for claim 6 or 7, the method for choosing it spreads which comprises the b) step, is the hop count information of the client based upon the IP address of the IP address of the client and peers and each liver it spreads, the link speed information, the transit delay information, and the congestion of the link is the information, and the step of collecting a at least one capability information among the failure information.

청구 **9**항:

제 8 항에 있어서,상기 우선순위 목록은,상기 성능정보의 각 가중치의 합에 기초하여 선정되는 것을 특징으로 하는 피어 선정 방법.

Claim 9:

As for claim 8, the method for choosing which the priority list is chosen based on the sum total of each weighted value of the capability information it spreads.

청구 **10**항:

다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트와 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하는 피어 투 피어 통신 시스템이 클라이언트에 대한 피어를 선정하는 방법에 있어서,a) 상기 에이전트가 클라이언트로부터 소정 정보의 요청을 수신하고, 상기 소정 정보를 저장하고 있는 피어들을 검색함으로써 생성된 피어 목록을 상기 클라이언트로 송신하는 단계;b) 상기 망정보 관리서버가 상기 에이전트로부터 상기 피어 목록에 따른 우선순위 목록 요청을 수신하는 단계; 및c) 상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 에이전트를 통하여 상기 클라이언트로 전송하는 단계를 포함하는 피어 선정 방법.

Claim 10:

The method for choosing it spreads which comprises the step: b) above net information management server of transmitting the list to the client it spreads that is generated it searches peers which the predetermined information is stored the a) agent receives the request of the predetermined information as to the method in which the peer-to-peer mode communication system including the network information management server managing each per link traffic condition of the toplogy information of the agent managing divided data which are stored in multiple peers and network or the network selects the peer about the client from the client is the hop count information from the client among the step: of spreading and receiving the priority list request according to the list from the agent and c) list and link speed information it spreads, the propagation delay time information, and the congestion of the link is the information, and the step of producing the priority list of the peers which additionally consider a at least one information among the failure information and are chosen and transmitting with the client through the agent.

청구 **11**항:

제 10 항에 있어서,상기 c) 단계는,상기 클라이언트로부터 홉 수가 적은 피어를 인접한 피어로 선정하는 것을 특징으로 하는 피어 선정 방법.

Claim 11:

As for claim 10, the method for choosing for selecting as the peer in which the c) step is the peer in which the hop count is less adjacent from the client it spreads.

청구 **12**항:

제 11 항에 있어서,상기 c) 단계는,소정 홉 수를 초과하는 피어를 상기 우선순위 목록에서 제외하는 단계를 포함하는 피어 선정 방법.

Claim 12:

As for claim 11, the method for choosing including the step it spreads wherein the c) step excludes from the priority list the peer that exceeds the predetermined hop count.

기술분야

Technical Field

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본 발명은 피어 투 피어 통신 방식으로 인해 유발되는 인터넷 서비스 사업자(ISP) 혹은 네트워크 사업자의 네트워크 부하(load)를 경감하기 위하여 클라이언트로부터의 최적 피어를 선정하여 제공하는 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템에 관한 것이다.

The present invention relates to the method for choosing at the peer-to-peer communication which it s elects the optimal peer from the client in order to redu ce and provides the network overhead (load) of the int ernet service business carrier (ISP) caused due to the peer-to-peer communication mode or the network oper ator and system it spreads.

배경기술

Background Art

일반적으로 네트워크를 통한 소프트웨어 배포, 파일 공유 또는 스트리밍 서비스를 위해서는 정보를 요구하는 클라이언트와 이를 제공하는 서버 및 이들간의 전달 경로를 구성하는 네트워크가 존재하여야 한다. 그런데 다수의 클라이언트들이 서버에 동시에 접속하여 정보 전달을 요구하는 경우 상기 서버 및 네트워크에서는 병목현상이 발생할 수 있다. 이러한 서버와 네트워크의 병목 문제를 해결하기 위한 방법 중의 하나로 일반 사용자의 PC(Personal Computer)간에 데이터 전송이 가능한 피어 투 피어(Peer to Peer, 이하 P2P라 명명함) 통신 기법이 이용되고 있다.

Generally, the software distribution through the network, and the client, which is for the file sharing or the streaming service and demands the information the server providing this and the network comprising the tr ansmission path between them have to exist. But multi ple clients simultaneously connect to the server and th e bottleneck phenomenon can be generated the inform ation transfer in case the demand in the server and net work. The peer-to-peer (it hereinafter names with the Peer to Peer because of being the P2P) communication mechanism in which the data transmission is possible is used as one of method for solving the bottleneck of th e network and such servers between the PC (Personal Computer) of the general user.

P2P 통신 기법은 파일 등의 단위로 구분된 한 단위의 정보(예; avi, mp4 등) 혹은 여러 단위의 데이터로 이루어진 정보(예; 다수의 GIF 파일로 구성된 웹 페이지 등)를 원래의 크기보다 작은 데이터로 나누어 이를 복수의 컴퓨터로부터 클라이언트로 병렬적으로 전달하는 방식이다. 이러한 P2P 통신 방식에서는 일반 사용자의 컴퓨터가 클라이언트의 역할과 서버의 역할을 동시에 수행한다.

It is the mode which divides information (the web page etc. consisting of example, and the multiple GIF files) c onsisting of data of the information (the example: avi, the mp4 etc) of the unit or the some unit into data sm aller than the original magnitude as long as the P2P co mmunication mechanism is classified into the unit includ ing the file etc. and parallely delivers this to the client from multiple computers. In such P2P communication m ethod, the computer of the general user simultaneously performs the role and server role of the client.

종래의 클라이언트와 서버의 구조하에서는 서버의 자원이 한정되어 있으므로 클라이언트의 수가 증가하면 데이터 전달이 느려지는데 비해, P2P 통신 방식에서는 참여하는 모든 클라이언트들이 자원을 공유하므로 클라이언트의 수가 증가될수록 P2P 시스템의 용량 또한 증가하는 장점이 있다.

It has the advantage that the number of client the resources of the server is restricted under the structur e of the server and conventional clients moreover incre ase with the capacity of the P2P system as the numbe r of client all clients participating in the P2P communica tion method share the resources data transfer become slow if it increaseses are increased.

그러나, 네트워크 상의 전체 트래픽 중에서 P2P 통신으로 유발되는 네트워크 트래픽의 비중이 구간별 및 시간별 차이가 있으나, 최대 90% 정도로 알려져 있다. 이로 인하여 P2P 네트워크 트래픽은 전체적인 네트워크 품질 저하의 원인이 되고, 그 구간을 지나가는 여러 응용 트래픽에 영향을 주는 문제점이 있다. 특히 P2P 통신 방식에 있어서 클라이언트들이 피어를 랜덤하게 선택하는 경우 P2P 트래픽으로 인한 네트워크에 큰 부하를 가하게 된다. 따라서, 적절한 피어의 선정 방법을 통해 P2P 트래픽이 네트워크에 미치는 영향을 최소화 하는 방법이 요구되고 있다.

But each section and hourly difference have the specific gravity of the caused network traffic among th e total traffic on the network to the peer-to-peer com munication. But it is known as about maximum 90%. Du e to this, there is a problem that it is caused by of the network poor quality in which the P2P network traffic is whole and it affects the some application traffic passin g by the section. Particularly, the large load is added t o the network due to the P2P traffic in case the selecti on so that clients randomize the peer as to the P2P co mmunication method. Therefore, the method for minimiz ing the influence that the P2P traffic reaches the netw ork through the method for choosing of the proper peer is required.

한편, 종래 기술로서, 한국공개특허공보 2003-0019900 (2003년 3월 7일 공개)에는 분산 처리 및 피어 대 피어 통신을 이용한 네트워크 상의정보 전송 병렬화 방법 및 시스템을 게시한다. 이는 네트워크 상에서 분산 처리 및 P2P 통신 기법을 이용하여 정보를 전달하는 것으로, 클라이언트의 피어 선정시 클

In the meantime, as the prior art, decentralized processing and network top cloth information transmissi on parallel method and system spreading and spread an d use the communication are notified in KR2003-001990 0 A (2003 year March 7 disclosure). This delivered the i

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라이언트 및 피어의 IP 주소(Address)에 기초하여 네트워크상에서 양자의 인접성을 추정하였다. 그러나 종래 기술의 인접성 정보에 대한 추정은 네트워크 장애 및 트래픽 상황에 따라 실제 인접성과는 다를 수 있다. 따라서 최선의 P2P 성능을 낼 수 없으며, 인접하지 않은 피어를 선정할 가능성으로 인해 네트워크에 많은 부하를 유발함으로써 타 인터넷 응용에도 영향을 미치게 되며, 네트워크사업자는 이러한 P2P 트래픽으로 인해 과도한 투자 부담을 갖게 되는 문제점이 있다.

nformation on the network using the decentralized processing and P2P communication mechanism. It spread of the client and the adjacency of both sides was estimated at on a network in the selection based on the IP address of the peer and client. But according to the estl mation about the adjacency information of the prior art is the network failure and traffic condition, it can be actually different from the adjacency. Therefore, there is a problem that the best P2P performance cannot be made and it affects the internet application by inducing the overload due to the possibility of selecting the peer which is not adjacent in the network and the network operator has the excessive investment burden due to such P2P traffic.

발명의 내용

Summary of Invention

해결하고자 하는 과제

Problem to be solved

따라서 본 발명은 상기 문제점을 해결하기 위한 것으로 클라이언트의 최적 피어 선정을 지원함으로써 P2P 통신으로 유발되는 네트워크 부하를 경감하고, 클라이언트의 전송 효율을 향상시키는 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템을 제공하는 것이다.

Therefore, the present invention is to provide the method for choosing at the peer-to-peer communication which reduces the network overhead caused by the peer-to-peer communication by spreading to and for solving the problem supporting the good government and improves the transfer efficiency of the client. And system it spreads.

과제해결 수단

Means to solve the problem

전술한 기술 과제를 해결하기 위한, 본 발명의 실시 예에 따른 피어 선정 시스템은,

The select system for solving the above-described technology tasks according to the embodiment of the invention it spreads.

서비스 서버로부터 분할된 데이터를 다수의 피어들에게 중복하여 배포하고, 상기 다수의 피어들에게 저장된 분할된 데이터를 관리하며, 클라이언트로부터 소정 정보의 요청시 상기 소정 정보의 분할된 데이터를 가지는 피어 목록을 생성하는 에이전트; 및 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하며,

Data divided from the service server are overlapped to multiple peers and it distributes and stored and divided data are managed to multiple peers and divided data of on demand predetermined information of the predetermined information is spread from the client to go and the agent producing the list, and the network information management server managing each per link traffic condition of the topology information of the network or the network are included.

상기 망정보 관리서버는 상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 제공한다.

The above above net information management server gets on well and the hop count information from the client and link speed information, the propagation delay time information , and the congestion of the link produce the priority list of the peers which additionally consider a at least one information among the failure information and are chosen and information among the list and the above provides to the client.

또한 상기 망정보 관리서버는 상기 클라이언트 혹은 에이전트로부터 상기 우선순위 목록 요청을 수신하는 검색 목록 수신부; 상기 클라이언트와 피어 목록에 저장된 피어들 간의 소정 기준에 따른 홉 카운트 정보, 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 성능정보 수집부; 상기 성능정보에 기초하여 상기 클라이언트로부터의 우선 피어를 선정하고, 상기 선정 결과에 따라 우선순위 목록을 생성하는 성능정보 처리부; 및 상기 생성된 우선순위 목록을 상기 클라이언트 혹은 에이전트로 전송하는 우선순위 목록 제공부를 포함한다. 여기서 우선순위 목록 요청은 상기 클라이언트의 IP 주소와 상기 피어 목록을 포함하며, 상기 피어 목록에는 상기 클라이언트가 요청한 정보

Moreover, above net information management server comprises the hop count information according to the criteria between search listing receiving unit: peers spreading with the client and are stored in the list receives the priority list request from the client or the agent, the link speed information, the client the capability information processing unit: which firstly the propagation delay time information , and the congestion of the link select the peer based on the information and the efficiency information collection lifter capability information collecting a at least one capability information among the failure information

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를 갖는 상기 피어들의 IP 주소들이 저장된다.

from the client and produces the priority list according to the result of selection. And above-mentioned generated priority list, or the priority list providing unit transmitted to the agent. Here, the IP address and above of the client the priority list request gets on well and the list is contained and the list is stored. Spreads and has the information which the client requests in the list.

그리고 상기 성능정보 처리부는 상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 비교하여 상기 클라이언트로부터 인접한 피어를 선정하고, 상기 클라이언트와 상기 각 피어들 간의 홉 카운트를 측정하여 소정 홉 수를 초과하는 피어를 상기 우선순위 목록에서 제외한다.

And comparing the capability information processing unit is the client with the hop count between each peers, the adjacent peer is selected from the client and the peer measuring the hop count between each peers and the client and exceeds the predetermined hop count is excluded from the priority list.

한편, 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버가 피어를 선정하는 방법은,

In the meantime, the method in which the network information management server managing each per link traffic condition of the toplogy information of the network or the network selects the peer

a) 클라이언트로부터 소정 정보를 갖는 다수의 피어들에 대한 우선순위 목록 요청을 수신하는 단계; b) 상기 우선순위 목록 요청을 분석하여 클라이언트의 IP 주소와 상기 다수의 피어들의 IP주소를 추출하는 단계; 및 c) 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 클라이언트로 전송하는 단계를 포함한다.

a) The step of receiving the priority list request about the multiple peers having the predetermined information from the client, the step of analyzing the b) priority list request and extracting the IP address of the client and IP address of the multiple peers, and the step of the hop count information from the c) client and link speed information, the propagation delay time information , and the congestion of the link producing the priority list of the peers are included. The step of the hop count information from the c) client and link speed information, the propagation delay time information , and the congestion of the link producing the priority list of the peers additionally consider a at least one information among the failure information and are chosen and information and transmitting with the client.

그리고 상기 a)단계 이전에 상기 클라이언트가 다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트로부터 자신이 요구한 소정 정보를 저장하고 있는 피어 목록을 수신하는 단계를 더 포함한다.

And the step of spreading and receiving the list of the predetermined information which oneself requires from the agent in which the client manages divided data which are stored in multiple peers in the a) before step being stored further is included.

또한 상기 b) 단계는 상기 클라이언트의 IP 주소와 피어들의 IP 주소를 토대로 상기 클라이언트와 각 피어 간의 홉 카운트 정보, 링크 속도 정보, 전송 지연 정보, 링크의 혼잡도 정보 및 장애여부 정보 중 어느 하나 이상의 성능정보를 수집하는 단계를 포함한다. 여기서 상기 우선순위 목록은 상기 성능정보의 각 가중치의 합에 기초하여 선정된다.

Moreover, the b) step comprises the step of collecting the congestion of the hop count information, the link speed information, the transit delay information, the link of the client based upon the IP address of the IP address of the client and peers and each liver is a at least one capability information among the information and failure information it spreads. Here, the priority list is chosen based on the sum total of each weighted value of the capability information.

한편, 다수의 피어들에 저장된 분할된 데이터를 관리하는 에이전트와 네트워크의 토폴로지정보 혹은 네트워크의 각 링크별 트래픽 상황을 관리하는 망정보 관리서버를 포함하는 피어 투 피어 통신 시스템이 클라이언트에 대한 피어를 선정하는 방법은,

In the meantime, the agent managing divided data which are stored in multiple peers and the method in which the peer-to-peer mode communication system including the network information management server managing each per link traffic condition of the toplogy information of the network or the network selects the peer about the client

a) 상기 에이전트가 클라이언트로부터 소정 정보의 요청을 수신하고, 상기 소정 정보를 저장하고 있는 피어들을 검색함으로

a) The agent receives the request of the predetermined information from the client and by

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써 생성된 피어 목록을 상기 클라이언트로 송신하는 단계; b) 상기 망정보 관리서버가 상기 에이전트로부터 상기 피어 목록에 따른 우선순위 목록 요청을 수신하는 단계; 및 c) 상기 피어 목록 중에서 상기 클라이언트로부터의 홉 카운트 정보와 링크 속도 정보, 전송 지연 시간 정보, 링크의 혼잡도 정보 및 장애 여부 정보 중 어느 하나 이상의 정보를 추가로 고려하여 선정된 피어들의 우선순위 목록을 생성하여 상기 에이전트를 통하여 상기 클라이언트로 전송하는 단계를 포함한다.

searching peers which the predetermined information is stored the step of transmitting the list to the client, the b) above net information management server is the step of spreading and receiving the priority list request according to the list from the agent, and the step of the c) the above getting on well and the hop count information from the client and link speed information, the propagation delay time information , and the congestion of the link producing the priority list of the peers are included. The step of the c) the above getting on well and the hop count information from the client and link speed information, the propagation delay time information , and the congestion of the link producing the priority list of the peers additionally consider a at least one information among the failure information and are chosen and information among the list and transmitting through the agent with the client.

발명의 효과

Effects of the Invention

전술한 구성에 의하여 본 발명의 실시 예에 따른 **P2P** 통신 시스템은 망정보 관리서버를 통하여 클라이언트에 대한 최적 피어들을 선정하고, 상기 클라이언트에 제공함으로써 네트워크 내에서의 **P2P** 트래픽량뿐만 아니라 네트워크 사업자간을 통과하는 **P2P** 트래픽량을 줄일 수 있으며, 이를 통하여 효율적으로 망 자원을 활용하는 효과가 있다. 그리고 상기 최적 피어들을 선정시 네트워크 링크 또는 노드의 실제 부하 상황을 반영함으로써, 네트워크상의 타 애플리케이션에 **P2P** 트래픽이 미치는 영향을 최소화하는 효과가 있다.

The P2P communication system according to a preferred embodiment of the present invention by the above-described configuration has the effect that optimal peers about the client are selected through the network information management server and the P2P traffic volume which passes not only the P2P traffic volume at the in-network but also the network operator liver by providing to the client can be reduced and through this, the network resource is efficiently utilized. And it has the effect that optimal peers the actual load situation of the network link or the node are reflected in the selection. In that way the influence that the P2P traffic reaches the application of on a network is minimized.

또한, 네트워크 사업자가 관리하고 있는 신뢰성 있는 성능정보에 기초하여 선정된 최적 피어들에 대한 정보를 클라이언트에게 제공함으로써 전송효율의 극대화에 따른 서비스의 질을 향상시키는 효과를 기대할 수 있다.

Moreover, the effect that improves the service quality according to the optimization of the transfer efficiency by providing the information about chosen optimal peers based on the capability information having reliability which the network operator manages to the client can be expected.

상세설명

Detailed Description

아래에서는 첨부한 도면을 참고로 하여 본 발명의 실시 예에 대하여 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있도록 상세히 설명한다. 그러나 본 발명은 여러 가지 상이한 형태로 구현될 수 있으며 여기에서 설명하는 실시 예에 한정되지 않는다. 그리고 도면에서 본 발명을 명확하게 설명하기 위해서 설명과 관계없는 부분은 생략하였으며, 명세서 전체를 통하여 유사한 부분에 대해서는 유사한 도면 부호를 붙였다.

In the lower part, it particularly illustrates for the embodiment of the invention with reference to the atta ched drawing in the technical field in which the inventi on belongs so that a person skilled in the art easily perf orms. But it is not restricted to the embodiment which here it illustrates while the invention can be implement ed as the form which the various disagrees. And in dra wing, the part which had no concern with the descripti on it specifically illustrated the invention omitted and t he reference numeral which was similar was adhered th rough the specification whole about the part which wa s similar.

명세서 전체에서, 어떤 부분이 어떤 구성요소를 **#34#**포함**#34#**한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다. 또한, 명세서에 기재된 **#34#**...부**#34#**, **#34#**...기**#34#**, **#34#**모듈**#34#** 등의 용어는 적어도 하나의 기능이나 동작을 처리하는 단위를 의미하며, 이는 하드웨어나 소프트웨어 또는 하드웨어 및 소프트웨어의 결합으로

In the specification whole, when any kind of part any kind of element the " inclusion " it means the other ele ment without the material in which this is specially opp osed nots being excluded but maying further include th e other element. Moreover, the term including the "... p art ", the "... ", the " module " etc. filled in the specifica tion means the unit processing at least one function or

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구현될 수 있다.

the operation and this can be implemented as the com bination of hardware or software or hardware and soft ware.

이제 본 발명의 실시 예에 따른 피어 투 피어 통신에서의 피어 선정 방법 및 그 시스템에 대하여 도면을 참조로 하여 상세하게 설명한다.

Now, it spreads of the peer-to-peer communication according to a preferred embodiment of the present inv ention and it does about the method for choosing and system with reference to drawing and it illustrates.

도 1은 본 발명의 실시 예에 따른 P2P 통신 시스템을 개략적으로 나타낸 네트워크 구성도이다.

Figure 1 is a network configuration which schematically shows the P2P communication system according to the embodiment of the invention.

첨부된 도 1을 참조하면, 본 발명의 실시 예에 따른 P2P 통신 시스템은 서비스 서버(100), 클라이언트(10), 피어(20), 에이전트(200) 및 망정보 관리서버(300)를 포함한다.

Referring to Figure 1, it is attached. And the P2P communication system according to the embodiment of the present invention comprises the service server (10 0), the client (10), and the peer (20), and the agent (200) and network information management server (30 0).

서비스 서버(100)는 네트워크를 통한 소프트웨어 배포, 파일 공유 혹은 스트리밍 서비스 등을 위한 정보를 분할하여 소정 크기의 데이터로 저장한다.

The service server (100) divides the information including the software distribution through the networ k, the file sharing or the streaming service etc. and it s tores to predetermined size data.

클라이언트(10)는 에이전트(200)를 통하여 소정의 정보를 요청하는 사용자의 컴퓨터이다.

It is the computer of the user in which the client (10) requests the predetermined information through the ag ent (200).

피어(20)는 상기 네트워크 내에 다수로 존재할 수 있으며, 서비스 서버(100)를 대신하여 상기 클라이언트(10)의 정보 요청에 따른 상기 소정 크기의 데이터를 병렬적으로 전송하는 역할을 한다.

The peer (20) can exist as the numerously within the network and predetermined size data according to the i nformation request of the client (10) serves to be paral lely transmitted instead of the service server (100).

에이전트(200)는 서비스 서버(100)에 저장되어 있는 분할된 데이터를 다수의 피어(20)에게 중복하여 배포하는 역할과, 각 피어(20)에 저장된 상기 분할된 데이터에 관한 정보를 관리함으로써 특정 데이터들이 어느 피어(20)에 저장되어 있는 지를 감시한다.

By controlling the information about the role, of overlapping divided data in which the agent (200) is st ored in the service server (100) to multiple peers (20) and distributing and above-mentioned divided data stor ed in each peer (20) it watches whether specific datas are stored in a peer (20) or not.

에이전트(200)는 클라이언트(10)로부터 수신된 상기 정보 요청을 분석하고, 상기 클라이언트(10)가 피어 검색을 요청한 경우 서비스 서버(100)를 대신하여 상기 소정 크기의 데이터를 저장하고 있는 피어(20)들을 검색한다. 그리고 상기 검색된 피어(20)들의 IP 주소와 각 피어(20)들이 가지고 있는 데이터 정보 등을 토대로 피어 목록을 작성한다.

The agent (200) analyzes the information request received from the client (10) and in case of the client (10) spreading and requesting the search peer (20) sto ring predetermined size data instead of the service ser ver (100) are searched. And it spreads on data informa tion etc. and of the IP address and each peer (20) of t he above-mentioned searched peer (20) the list is prep ared.

망정보 관리서버(300)는 네트워크내 노드가 위치한 지리적인 정보, 노드에 연결된 링크의 대역폭/속도, 라우팅 정책, 피어까지의 거리(Distance), 트래픽 부하가 높은 노드 및 링크 정보등 망에 대한 정보를 관리한다. 특히, 망정보 관리서버(300)는 네트워크의 토폴로지(Topology)정보 및 네트워크 내 각 링크별 트래픽 상황을 관리하며, 이를 반영하여 클라이언트(10)로부터의 최적 피어(20)들을 선정하는 역할을 한다. 여기서 최적 피어(20)는 망정보 관리서버(300)가 클라이언트(10)로부터 파일전송 효율이 가장 좋은 것으로 판단한 특정 피어(20)를 의미한다.

The geographical information, in which the network information management server (300) the in-network n ode is positioned the bandwidth / speed of the link, co nnected to the node the routing policy, the distance to the peer, and the traffic load manage the information a bout the net including the high node and link informatio n etc. Particularly, the network information managemen t server (300) manages the topology information and i n-network each link traffic condition of the network an d this is reflected and optimal peer (20) from the client (10) serve to be selected. Here, the optimal peer (20) means the specified fear (20) in which the file transfer efficiency is most good and which the network informat ion management server (300) determines from the clien

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t (10).

다음, 도 2를 통하여 본 발명의 실시 예에 따른 망정보 관리서버(300)에 대해 설명한다.

It illustrates for the network information management server (300) according to a preferred embodiment of th e present invention through the next fig. 2.

도 2는 본 발명의 실시 예에 따른 P2P 시스템의 망정보 관리서버를 개략적으로 나타낸 블록도이다.

Figure 2 is a block diagram which schematically shows the network information management server of the P2P system according to the embodiment of the invention.

첨부된 도 2를 참조하면, 본 발명의 실시 예에 따른 P2P 통신 시스템의 망정보 관리서버(300)는 인터넷 서비스 사업자(ISP) 혹은 네트워크 사업자가 운용하는 NMS(Network Manageme nt System)일 수 있으며, 검색목록 수신부(310), 성능정보 수집부(320), 성능정보 처리부(330) 및 우선순위 목록 제공부(340)를 포함한다.

Referring to Figure 2, it is attached. And the network information management server (300) of the P2P comm unication system followed the embodiment example of t he present invention comprises the search listing receiv ing unit (310) it can be the internet service business c arrier (ISP) or the NMS (Network Management System) which the network operator uses, the efficiency inform ation collection part (320), and the capability informati on processing unit (330) and the priority list providing u nit (340).

검색목록 수신부(310)는 클라이언트(10) 혹은 에이전트(200)로부터 상기 클라이언트(10)에 대한 최적 피어(20)의 우선순위 목록을 요청 받으면, 에이전트(200)에서 생성된 검색목록을 수신하고, 클라이언트(10)의 IP 주소와 피어(20)들의 IP 주소를 분석한다.

If the search listing receiving unit (310) is requested for the priority list of the optimal peer (20) about the cl ient (10) from the client (10) or the agent (200) , the search listing generated in the agent (200) is received and the IP address and IP address of the client (10) ar e analyzed. It spread (20)s.

성능정보 수집부(320)는 클라이언트(10)의 IP 주소와 피어(20)들의 IP 주소를 토대로 클라이언트(10)와 각 피어(20)간의 홉 카운트, 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등의 성능정보를 수집한다.

The efficiency information collection part (320) collects the capability information including the entropy of the hop count, link speed, propagation delay time, link bet ween the client (10) and each peer (20) and failure et c. on the IP address and IP address of the client (10) i t spread (20)s.

성능정보 처리부(330)는 상기 성능정보에서 클라이언트(10)로부터 각 피어(20)들의 홉 카운트(거리)를 고려하여 인접성을 결정 할 수 있으며, 그 결과에 상기 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등을 고려하여 각 피어(20)의 우선순위를 선정할 수 있다. 또한, 성능정보 처리부(330)는 각 성능정보 가중치의 합에 기초하여 각 피어(20)의 우선순위를 선정할 수 있으며, 상기 선정결과를 토대로 우선순위 목록을 생성한다.

In the capability information processing unit (330) is the capability information, the adjacency can be deter mined from the client (10) in consideration of the hop c ount (distance) of each peer (20) and the priority of e ach peer (20) can be selected for the result in consider ation of the link speed, the propagation delay time, ent ropy and failure of the link etc. Moreover, the capabilit y information processing unit (330) can select the priori ty of each peer (20) based on the sum total of each c apability information weighted value and the priority list is produced on the result of selection.

우선순위 목록 제공부(340)는 성능정보 처리부(330)에서 생성된 우선순위 목록을 클라이언트(10)로 송신한다. 여기서, 우선순위 목록 제공부(340)는 상기 검색목록을 에이전트(200)로부터 수신한 경우 에이전트(200)를 통하여 클라이언트(10)에 제공할 수 있다.

The priority list providing unit (340) transmits the priority list generated in the capability information proc essing unit (330) to the client (10). Here, it can provid e to the client (10) through the agent (200) in case th e priority list providing unit (340) receives the search li sting from the agent (200).

한편, 도 3을 통하여 본 발명의 제1 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 설명한다.

In the meantime, the P2P communication method at the P2P communication system according to the first pr eferred embodiment of the invention is illustrated throu gh fig. 3.

도 3은 본 발명의 제1 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 나타낸 흐름도이다.

Figure 3 is a flowchart showing the P2P communication method at the P2P communication system according to the first preferred embodiment of the invention.

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첨부된 도 3을 참조하면, 본 발명의 제1 실시 예에 따른 P2P 통신 방법을 상기 도 1의 구성을 통하여 설명하면, 에이전트(200)가 서비스 서버(100, 미도시)에 의해 분할된 소정의 데이터를 다수의 피어(20, 미도시)로 중복하여 배포하고 이를 관리한다(S301). 그리고 에이전트(200)가 클라이언트(10)로부터 피어 검색 요청을 수신하면(S302), 클라이언트로부터 요청된 정보를 저장하고 있는 피어(20)들을 검색하여 피어 목록을 생성하고(S303), 상기 피어 목록을 클라이언트(10)로 송신한다(S304).

If the above illustrates the P2P communication method according to the attached first preferred embodiment of the invention through the configuration of 1 the agent (200) overlaps predetermined data divided with service server (100, and not illustrated) to multiple peer (20, and not illustrated) and it distributes and this is managed (S301). And if it spreads from the client (10) and the agent (200) receives the search request (S302) peer (20) which the information requested from the client is stored are searched and it spreads and the list is produced (S303) and the above spreads and the list is transmitted to the client (10) (S304).

망정보 관리서버(300)는 상기 피어 목록을 수신한 클라이언트(10)로부터 클라이언트(10) 자신과 최적 피어의 선정을 요구하는 우선순위 목록 요청을 수신한다(S305). 이 때 상기 우선순위 목록 요청에는 클라이언트(10)의 IP 주소(발신지 주소)와 상기 피어 목록에 있는 피어(20)들에 대한 IP 주소(목적지 주소)가 포함된다.

The network information management server (300) receives the priority list request requiring the selection of the optimal peer and client (10) oneself from the client (10) spreading and receives the list (S305). At this time, the priority list request includes the IP address (source address) of the client (10) and the IP address (destination address) about the peer (20) in the list it spreads.

다음, 망정보 관리서버(300)는 클라이언트(10) 의 IP 주소와 피어(20)들의 IP 주소를 토대로 클라이언트(10)와 각 피어(20)간의 홉 카운트, 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등의 성능정보를 수집한다(S306). 그리고, 상기 수집된 성능정보에 기초하여 클라이언트로부터 최적의 전송 성능을 가지는 피어(20)들을 선정하여 우선순위 목록을 생성한다(S307). 상기 우선순위 목록은 상기 수집된 성능정보에 따른 가중치의 합에 기초하여 판단될 수 있다.

The next network information management server (300) collects the capability information including the entropy of the hop count, link speed, propagation delay time, link between the client (10) and each peer (20) and failure etc. on the IP address and IP address of the client (10) it spread (20)s (S306). And peer (20) having the optimal transmission performance are selected based on the above-mentioned collected capability information from the client and the priority list is produced (S307). The priority list can be determined based on the sum total of the weighted value according to the above-mentioned collected capability information.

망정보 관리서버(300)는 상기 생성된 우선순위 목록을 클라이언트(10)로 전송함으로써 클라이언트(10)의 우선순위 목록 요청에 대한 응답을 완료한다(S308).

The response toward the priority list request of the client (10) is completed since the network information management server (300) transmits the above-mentioned generated priority list with the client (10) (S308).

다음, 망정보 관리서버(300)로부터 우선순위 목록을 수신한 클라이언트(10)는 최적 피어(20)들에게 데이터의 전송을 요청한다(S309). 이 때 클라이언트(10)는 상기 데이터 전송 요청을 수신한 해당 피어(20)들로부터의 데이터 전송이 원활하여(S310), 희망하는 정보를 구성하기 위해 요구되는 다수의 분할된 데이터를 모두 수신하면(S311), 이를 조합하여 원하는 정보로 복원한다(S312).

The client (10) receiving the priority list from the next network information management server (300) requests the electrical transmission of data to optimal peer (20) (S309). Then, the data transmission from correspondence pierre (20) in which the client (10) receives the data transmission request is smooth (S310) and if multiple divided data which are required in order to construct the desired information, are altogether received (S311), it restores to the information assembling this and desires (S312).

만약에 상기 S310 단계에서 해당 피어(20)들로부터의 데이터 전송이 원활하지 않다고 클라이언트(10)가 판단하면, 클라이언트(10)는 망정보 관리서버(300)로부터 수신된 상기 우선순위 목록에서 차선의 이웃 피어(20)들에게 데이터 전송을 요구한다(S309).

Once, in the S310 step, if the client (10) determines because data transmission from correspondence pierre (20) is not smooth the client (10) demands data transmission from neighbor peer (20) of the lane in the priority list received from the network information management server (300) (S309).

한편, 도 4를 통하여 본 발명의 제2 실시 예에 따른 P2P 통신 시스템에서의 P2P 통신 방법을 설명한다.

In the meantime, the P2P communication method at the P2P communication system according to the second preferred embodiment of the present invention is illustrated through fig. 4.

도 4는 본 발명의 제2 실시 예에 따른 P2P 통신 시스템에서의

Figure 4 is a flowchart showing the P2P communication

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P2P 통신 방법을 나타낸 흐름도이다.

method at the P2P communication system according to the second preferred embodiment of the present invention.

본 발명의 제1 실시 예에서는 에이전트(200)가 클라이언트(10)로부터 피어 검색 요청을 수신하면, 피어 목록을 생성하여 클라이언트(10)로 송신하였으나, 제2 실시 예에서는 에이전트(200)가 망정보 관리서버(300)와 직접 연동되는 점이 다르다.

In the first preferred embodiment of the invention, if it spread from the client (10) and the agent (200) received the search request it spread and the list was produced and it transmitted to the client (10). But the direct connected point of of the agent (200) is different on the second preferred embodiment from the network information management server (300).

첨부된 도 4를 참조하면, 본 발명의 제2 실시 예에 따른 P2P 시스템의 에이전트(200)가 서비스 서버(100, 미도시)에 의해 분할된 소정의 데이터를 다수의 피어(20, 미도시)로 중복하여 배포하고 이를 관리한다(S401). 그리고 에이전트(200)는 클라이언트(10)로부터 피어 검색 요청을 수신하면(S402), 클라이언트로부터 요청된 정보를 저장하고 있는 피어(20)들을 검색하여 피어 목록을 생성한다(S403).

The agent (200) of the attached P2P system according to the second preferred embodiment of the present invention overlaps predetermined data divided with service server (100, and not illustrated) to multiple peer (20, and not illustrated) and it distributes and this is managed (S401). And if it spreads from the client (10) and the agent (200) receives the search request (S402) peer (20) which the information requested from the client is stored are searched and it spreads and the list is produced (S403).

그런 다음 에이전트(200)는 상기 클라이언트(10)와 최적 피어의 선정을 요구하는 우선순위 목록 요청을 망정보 관리서버(300)로 송신한다(S404). 이 때 상기 우선순위 목록 요청에는 상기 클라이언트(10)의 IP 주소(발신자 주소)와 상기 피어 목록에 있는 피어(20)들에 대한 IP 주소(목적지 주소)가 포함된다.

Next, the priority list request in which the agent (200) requires the selection of the optimal peer and client (10) is transmitted to the network information management server (300) (S404). At this time, the priority list request includes the IP address (source address) of the client (10) and the IP address (destination address) about the peer (20) in the list it spreads.

다음, 망정보 관리서버(300)는 클라이언트(10)의 IP 주소와 피어(20)들의 IP 주소를 토대로 클라이언트(10)와 각 피어(20)간의 홉 카운트, 링크 속도, 전송 지연 시간, 링크의 혼잡도 및 장애여부 등의 성능정보를 수집한다(S405). 그리고, 상기 수집된 성능정보에 기초하여 클라이언트로부터 최적 피어(20)들을 선정하여 우선순위 목록을 생성한다(S406). 상기 우선순위 목록은 상기 수집된 성능정보에 따른 가중치의 합에 기초하여 판단될 수 있다. 망정보 관리서버(300)는 생성된 우선순위 목록을 에이전트(200)를 통하여 클라이언트(10)로 전송한다(S407).

The next network information management server (300) collects the capability information including the entropy of the hop count, link speed, propagation delay time, link between the client (10) and each peer (20) and failure etc. on the IP address and IP address of the client (10) it spread (20)s (S405). And optimal peer (20) are selected based on the above-mentioned collected capability information from the client and the priority list is produced (S406). The priority list can be determined based on the sum total of the weighted value according to the above-mentioned collected capability information. The network information management server (300) transmits the generated priority list to the client (10) through the agent (200) (S407).

망정보 관리서버(300)는 상기 생성된 우선순위 목록을 에이전트(200)를 통해클라이언트(10)로 전송함으로써 에이전트(200)의 우선순위 목록 요청에 대한 응답을 완료한다(S408). 이후, S409 단계 내지 S412 단계는 상기 도 3의 S309 단계 내지 S312 단계와 동일함으로 그 설명을 생략한다.

The response toward the priority list request of the agent (200) is completed since the network information management server (300) transmits the agent (200) the above-mentioned generated priority list with the cask injury client (10) (S408). Then, the S409 step to the S412 step the above omits the description by being identical with the S309 step of 3 to the S312 step.

이와 같은 본 발명의 실시 예에 따른 P2P 통신 시스템은 망정보 관리서버(300)를 통하여 클라이언트(10)로부터의 최적 피어(20)들을 선정하여 제공함으로써 네트워크내에서의 P2P 트래픽량뿐만 아니라 네트워크 사업자간을 통과하는 P2P 트래픽량을 줄일 수 있으며, 이를 통하여 효율적으로 망 자원을 활용하는 효과가 있다. 또한, 망정보 관리서버(300)가 상기 클라이언트(10)에 대한 최적 피어(20)들을 선정시 네트워크 링크 또는 노드의 실제 부하 상황을 반영함으로써, 네트워크내 타 애플리케이션에 P2P 트래픽이 미치는 영향을 최소화 할 수 있다.

The P2P communication system according to the embodiment of the invention has the effect that the P2P traffic volume which passes not only the P2P traffic volume at the in-network but also the network operator liver by selecting optimal peer (20) from the client (10) through the network information management server (300) and providing can be reduced and through this, the network resource is efficiently utilized. Moreover, the network information management server (300) reflects the actual load situation of the network link or the node optimal peer (20) about the client (10) in the selection.

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In that way the influence that the P2P traffic reaches the in-network application can be minimized.

한편, 클라이언트(10) 혹은 P2P 서비스 서버(100)의 관점에서는 네트워크 사업자가 관리하고 있는 신뢰성 있는 성능정보에 기초하여 최적 피어(20)들에 대한 정보를 제공받음으로써 전송효율의 극대화에 따른 서비스의 질이 향상되는 효과가 있다. 또한 P2P 어플리케이션에서 피어 선정을 위한 오버헤드를 제거할 수 있는 효과를 기대할 수 있다.

In the meantime, it has the effect that in the viewpoint of the client (10) or the P2P service server (100), the service quality according to the optimization of the transfer efficiency is improved based on the cap ability information having reliability which the network o perator manages by receiving the information about op timal peer (20). Moreover, the effect spreading in the P 2P application and can remove the overhead for the sel ection can be expected.

본 발명의 실시 예는 이상에서 설명한 장치 및/또는 방법을 통해서만 구현이 되는 것은 아니며, 본 발명의 실시 예의 구성에 대응하는 기능을 실현하기 위한 프로그램, 그 프로그램이 기록된 기록 매체 등을 통해 구현될 수도 있으며, 이러한 구현은 앞서 설명한 실시 예의 기재로부터 본 발명이 속하는 기술분야의 전문가라면 쉽게 구현할 수 있는 것이다.

It is not implemented through the apparatus and/or the method which in the above, the embodiment of the inv ention illustrates and the method can be implemented i n the configuration of the embodiment of the invention through the program, for realizing the corresponding fu nction the recording medium etc. and the program is re corded it can implement if it is the expert of the techni cal Field of the Invention attributed to the material of t he embodiment which such implementation before illustr ates.

이상에서 본 발명의 실시 예에 대하여 상세하게 설명하였지만 본 발명의 권리범위는 이에 한정되는 것은 아니고 다음의 청구범위에서 정의하고 있는 본 발명의 기본 개념을 이용한 당업자의 여러 변형 및 개량 형태 또한 본 발명의 권리범위에 속하는 것이다.

In the above, specifically it illustrated for the embodiment of the invention but it belongs to the some deformation and improvement form of the person skilled in the art, using the basic concepts of the invention in which the scope of protection of the present invention is not thus restricted and defined in the following claim s moreover, the scope of protection of the present inv ention.

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS.pdf	1035172 6d18e49790177096794bde2a4456820029ee9081	no	4

Warnings:

Information:					
2	Foreign Reference	JP_2007-280388-D2.pdf	499402 c195defe87db4ef9fbe1590c74cceee53113 3e99	no	11
Warnings:					
Information:					
3	Foreign Reference	KR10-2009-0097034-D3.pdf	329618 5ff29298483d81190dea812453ce674906ea 6b88	no	12
Warnings:					
Information:					
4	Foreign Reference	Translation-D3.pdf	526484 0eefb93b465df19889468f52f899565f96fc4 702	no	13
Warnings:					
Information:					
5	Other Reference-Patent/App/Search documents	Preliminary-Rejection.pdf	1396425 6c4b995b7dbe3fd68de40dc29fe02f3d524 8513b	no	6
Warnings:					
Information:					
6	Other Reference-Patent/App/Search documents	Preliminary-Rejection-translation.pdf	105864 f2115f4ffdcef22ed4fa01c85b103b3728457 53b	no	5
Warnings:					
Information:					
		Total Files Size (in bytes):	3892965		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: HOLA-005-US2

In re Application of:	)	Confirmation No. 6194
	)	
Derry Shribman *et al.*	)	Art Unit: 2459
	)	
Appln. No.: 14/025,109	)	Examiner: Nguyen, Minh Chau
	)	
Filed: September 12, 2013	)	Washington, D.C.
	)	
For: System and Method for a Motion Sensing Device which Provides a Visual or Audible Indication	)	May 30, 2016
	)	

RESPONSE / AMENDMENT:

Honorable Commissioner for Patents
U.S. Patent and Trademark Office
Randolph Building, Mail Stop Amendments
401 Dulany Street
Alexandria, VA 22314

Sir:

In response to the Office Action of March 17, 2016 ("Action"):

Remarks/Arguments begin on page 2 of this paper.

REMARKS / ARGUMENTS

The examiner's action dated March 17, 2016 ("Action") has been received and its contents carefully noted.

Regarding pages 2-15

Claims 26-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves *et al.* (US 2002/00074130) hereinafter "Garcia" and in view of Samuels (U.S. Patent 7,865,585) hereinafter "Samuels".

Combining Garcia and Samuels.

It is respectfully submitted that there is no proper basis for combining the disclosures of these references. Applicant submits that the Garcia and Samuels references are directed towards respectively different purposes and are based on respectively different structures, and thus are not analogous and cannot logically be combined.

In one example, the Garcia reference is directed towards cache devices that are **servers, which are end-units** in the network (see Figure 2, elements 218), and the client devices (such as client 105 in Figure 2) are **intentionally approach** these devices (see Figures 3A and 3B) for fetching information therefrom. In contrast, the cache related devices in the Samuels reference are **routing communication appliances** (see Figures 1A-1C) connected along the communication path of the client device 102, so that the communication therethrough is **non-intentional but rather dictated by the connection scheme**. Generally stated, the Garcia reference deals with **adding web caches** and directing client for using these web caches, while the Samuels reference is directed to better utilization and usages of **existing network resources.**

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Modifying the Garcia reference to use existing network resources would change the principle of operation from adding dedicated end-units to utilizing existing routing equipments:

> If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).*

MPEP §2143.01.

Thus, to modify the Garcia system according to the Samuels reference teaching in order to arrive at the claimed invention would not be accordance with recognized principles governing patent application examination.

Moreover, it would not be appropriate to base this rejection on a combination of these references because the systems in Garcia and Samuels are each self-contained and independently operate effectively:

> Because each device independently operates effectively, a person having ordinary skill in the art, who was merely seeking to create a better device to drain fluids from a wound, would have no reason to combine the features of both devices into a single device.

Kinetic Concepts v. Smith and Nephew, 688 F.3d 1342, at 1369 (CAFC, 2012).

Further, the factual and logical basis for the examiner's view that these two references can be combined is not understood, and is not explained in the Office Action itself. The reasoning provided for combining these two references is only that "… *to support content delivery system*". It is not clear what is the meaning here of 'support', and why and how the combination is warranted to 'support' content delivery system. Hence such rationale is detached from the specific references, and is not according to MPEP 2143 teaching

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that: "*Any rationale employed must provide* ***a link*** *between the factual findings and the legal conclusion of obviousness.*" (Emphasis added). Further, clearly 'supporting content delivery system' is a long felt need in any content delivery system, hence serving as a secondary consideration supporting the patentability here.

Regarding claim 26 (Action pages 2-3)

Based on Figure 3A in Garcia, while not detailed in the Action, it is assumed that the claimed client device is equated to client 300 in Figure 3A (or client 400 in Figure 4A), the claimed web server is equated to the web server 302/402, the device is equated to the cache server 306/406, and the claimed first server is equated to the web router 304/404. A clarification is required if this assumption is not proper or accurate.

First, while element (c) in claim 26 teaches that the client device sends its identifier and the web server identifier to **the first server**, Garcia clearly teaches that the client device sends its identifier to **the web server** rather than to the web router (step (1) in Figures 3A/4A). Second, while element (c) in claim 26 teaches that the client device itself sends the identifiers to the first server, Garcia clearly teaches that the web server sends the identifiers to the web router (step (2) in Figures 3A/4A).

Further, while element (d) in claim 26 teaches that devices are selected based on the **web server identifier**, the routing in the Garcia reference is based on (as described in the cited Garcia paragraphs 0102-0103, 0121, and 0153) the identification of the **client device itself**, rather than on any server identifier in general, and the web server identification in particular.

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While element (e) in claim 26 explicitly teaches **selecting** a device, it selection is relevant in the Samuels reference, and in particular in the cited passage (Col. 41 lines 9-29), since the **network structure inherently dictates** the appliance 200 as the proxy.

Further, element (f) in claim 26 explicitly teaches that the selected device, such as in response to the selection, receive the content from the web server. Both Samuels and Garcia disclose cache devices that receive the content before any client requesting it.

Regarding claim 27 (Action page 4)

By sequentially executing the steps as recited in claim 27, the selected device receives the content ONLY AFTER and ONLY AS A RESULT of the selection and the identifying the content requested by the client. In contrast, the cache mechanisms disclosed by both Samuels and Garcia refers to receiving and storing information BEFORE the content is required by any client.

Regarding claim 29 (Action page 4)

While the recited paragraph 0010 in Garcia mentions HTTP, it is only mentioned in the context of web server, Garcia is silent regarding the Web Router 304/404 that is equated to the claimed first server being an HTTP server. Further, paragraph 0113 explicitly disclose DNS server, which is typically not an HTTP server.

Regarding claim 33 (Action page 5)

As explained above, Garcia is silent regarding selecting a device based on identification of the web server,

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and is in particular silent regarding selecting a device based on the web server IP address or URL as recited in the claim.

Regarding claim 37 (Action page 7)

Garcia is silent regarding generally any server, and in particular regarding the first server, storing the client identifier as recited in the claim.

Regarding claim 38 (Action page 7)

Garcia is silent regarding the limitations recited in the claim. In particular, both Garcia and Samuels teaches ONLY cache devices receiving content from web servers, and ONLY providing stored content to client devices. Both Garcia and Samuels are silent, and actually teaches away, from receiving any content from a client device, as recited in element (k) in the claim.

Regarding claims 43-44 (Action page 9)

Garcia explicitly discloses selecting a SINGLE cache server ('best cache server' in the cited paragraph 0114). Garcia is silent selecting multiple devices as recited in the claim. The selection of any devices is performed by the in the Garcia reference by the Web Router 304/404 and NOT by the client device as recited in claim 44.

Regarding claim 45 (Action page 10)

Garcia is silent generally regarding any port number, and in particular regarding the client device sending a port number as recited in the claim.

Regarding claim 46 (Action page 10)

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Garcia is silent generally regarding sending the web server identifier to any device, and in particular regarding the client device sending the web server identifier to the selected device.

Regarding claim 48 (Action page 11)

Garcia is silent generally regarding selecting any device using any criterion other than the client identification, and in particular regarding any selection that is based on any geographical location.

Regarding claim 49 (Action pages 11-12)

In addition to the arguments regarding claim 26 above, Garcia is silent generally regarding selecting any device using other than the client identification, Garcia is silent regarding any physical location of any network apparatus, and in particular regarding any selection that is based on any geographical location, as recited in element (d).

Regarding claim 51 (Action page 13)

Garcia is silent generally regarding any selecting of any device other than in a server in general, and in particular regarding any selection of device by the client device.

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The absence of a reply to a specific rejection, issue, or comment, does not signify agreement with that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims that have not been expressed.

Nothing in this reply should be understood as conceding any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claims does not necessarily signify concession of unpatentability to the claim before its amendment.

In view of the foregoing, it is requested that all of the rejections be reconsidered and withdrawn and that the claims be considered allowable.

If the above arguments should not now place the application in the condition for allowance, the examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

By /Yehuda Binder/
Yehuda Binder
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Electronic Acknowledgement Receipt

EFS ID:	25937940
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	131926
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	HOLA-005-US2
Receipt Date:	01-JUN-2016
Filing Date:	12-SEP-2013
Time Stamp:	14:54:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	Non-Final-OA-reply.pdf	278825 b92d3439d9685c8f58c57719a7a53f5ce992b3f8	no	8

Warnings:	
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Total Files Size (in bytes):	278825

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New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2	6194

131926 7590 03/17/2016

May Patents Ltd. c/o Dorit Shem-Tov
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EXAMINER	
NGUYEN, MINH CHAU	

ART UNIT	PAPER NUMBER
2459	

MAIL DATE	DELIVERY MODE
03/17/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 14/025,109	Applicant(s) SHRIBMAN ET AL.	
	Examiner MINH-CHAU NGUYEN	Art Unit 2459	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09/12/2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *26-66* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *26-66* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *09/12/2013* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *01/20/2015, 01/13/2015, 11/18/2014, 03/28/2014, 09/12/2013*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

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The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

This Office Action is responsive to application 14/025,109 filed on September 12, 2013. **Claims 26-66** are presented for examination.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 26-66 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Garcia-Luna-Aceves et al. (US 2002/0007413) hereinafter "**Garcia**", and in view of **Samuels** et al. (US 7,865,585).

Claim 26

Garcia teaches a method for data communication between a web server storing a content and a client via one or more devices, for use with a first server, and where the web server, the client, the first server, and the devices are communicatively coupled via the Internet and each is identified in the internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server (Garcia, 0102, 0113);

(b) the first server storing the identifiers of the devices (Garcia, 0102, 0113);

(c) the client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) the first server selecting one of tile devices based on associating the identifiers of the devices with the web server identifier (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device.

However, in an analogous art, **Samuels** teaches (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device (Samuels, col. 41, lines 9-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device, as disclosed by Samuels, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 27

Garcia in combination with Samuels teach the method according to claim 26 wherein the steps are sequentially executed (Garcia, 0113-0114).

Claim 28

Garcia in combination with Samuels teach the method according to claim 26 wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected device (Garcia, 0010).

Claim 29

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server is HTTP server and responds to HTTP requests from the client, or the devices (Garcia, 0010).

Claim 30

Garcia in combination with Samuels teach the method according to claim 26 wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 31

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server is a TCI / IP server and communicates based on, or according to, using TCP/IP protocol or connection (Garcia, 0096).

Claim 32

Garcia in combination with Samuels teach the method according to claim 26 wherein the content includes web-page, audio, or video content (Garcia, 0113, 0153).

Claim 33

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server selecting one of the devices is based on the web server IP address or URL (Garcia, 0010).

Claim 34

Garcia in combination with Samuels teach the method according to claim 26 wherein the first server selecting one of the devices is based on the selected device IP address (Garcia, 0102-0103, 0121, 0153).

Claim 35

Garcia in combination with Samuels teach the method according to claim 26 wherein the selected device fresher storing the content received from the web server (Garcia, 0102-0103, 0121, 0153).

Claim 36

Garcia in combination with Samuels teach the method according to claim 26 wherein the client sending its identifier and the web server identifier to the first server as part of browser or email application execution (Garcia, 0010, 0102-0103).

Claim 37

Garcia in combination with Samuels teach the method according to claim 26 further comprising the step of the client sending its identifier to the first server, and the first server storing the client identifier (Garcia, 0102-0103).

Claim 38

Garcia in combination with Samuels teach the method according to claim 37 further for data communication between a second, web server storing a second content and having an identifier in the Internet and a one of the devices via the client, the method further comprising the steps of:

(h) one of the devices sending the second web server identifier to the first server (Garcia, 0102, 0113);

(i) the first server sending the identifier of the client to the one of the devices (Garcia, 0113-0114, 0119-0121, 0153);

(j) the client receiving the second content from the second web server (Garcia, 0113-0114, 0119-0121, 0153); and

(k) the one of the devices receiving the second content from the client (Garcia, 0113-0114, 0119-0121, 0153),

Claim 39

Garcia in combination with Samuels teach the method according to claim 26 wherein the communication with the web server or the first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126),

Claim 40

Garcia in combination with Samuels teach the method according to claim 26 wherein the communication with the client or the selected device is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Garcia, 0126).

Claim 41

Garcia in combination with Samuels teach the method according to claim 26 wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL) (Garcia, 0010).

Claim 42

Garcia in combination with Samuels teach the method according to claim 2.6 wherein the web server identifier, the first server identifier, the client identifier, or any of the device's identifier is using Internet Protocol (IP) address (Garcia, 0102, 0113).

Claim 43

Garcia in combination with Samuels teach the method according to claim 26 wherein in step (d) the first server selecting two or more of the devices based on associating the identifiers of the devices with the web server identifier (Garcia, 0113-0114, 0119-0121, 0153); and in step (e) the first server sending the identifiers of the selected two or more devices to the client (Garcia, 0113-0114, 0119-0121, 0153).

Claim 44

Garcia in combination with Samuels teach the method according to claim 43 further comprising the step of the client selecting one of the devices as the selected device (Garcia, 0113-0114, 0119-0121, 0153).

Claim 45

Garcia in combination with Samuels teach the method according to claim 26 farther comprising the steps of the client sending a communication port number to the selected device, followed by communication between the client and the selected device using the communication port number (Garcia, 0010).

Claim 46

Garcia in combination with Samuels teach the method according to claim 26 further comprising the step of the client sending the web server identifier to the selected device (Garcia, 0113-0114, 0119-0121).

Claim 47

Garcia in combination with Samuels teach the method according to claim 46 further comprising the step of the selected device communicating with the web server (Garcia, 0113-0114, 0119-0121).

Claim 48

Garcia in combination with Samuels teach the method according to claim 26 wherein step (d) the first server selecting one of the devices based on the geographical location of the devices (Garcia, 0102).

Claim 49

Garcia teaches a method for data communication between a web server storing a content and a client via one or more devices, for use with a first server, and where the web server, the client, the first server, and the devices are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server (Garcia, 0102, 0113);

(b) the first server storing the identifiers of the devices (Garcia, 0102, 0113);

(c) the client sending its identifier and the web server identifier to the first server (Garcia, 0113, 0119-0120);

(d) selecting one of the devices based on the geographical location of the devices (Garcia, 0102-0103, 0121, 0153);

(e) the first server sending the identifier of the selected device to the client (Garcia, 0113-0114, 0119-0121, 0153).

Garcia fails to teach (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device.

However, in an analogous art, **Samuels** teaches (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device (Samuels, col. 41, lines 9-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of (f) the selected device receiving the content from the web server; and (g) the client receiving the content from the selected device, as disclosed by Samuels, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 50

Garcia in combination with Samuels teach the method according to claim 49 wherein in step (d) the first server is selecting one of the devices (Garcia, 0102-0103, 0121, 0153).

Claim 51

Garcia in combination with Samuels teach the method according to claim 49 wherein in step (d) the client is selecting one of the devices (Garcia, 0102-0103, 0121, 0153).

Claim 53

Garcia teaches a method for data communication between a client and a web server storing a contempt via a device, for use with a first server and a device, and where the web server, the client, the first server, and the device are communicatively coupled via the Internet mid each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) sending its identifier and the web server identifier to the first server (Garcia, 0102, 0113, 0119-0121, 0153);

(b) receiving from the first server the identifier of the device (Garcia, 0113-0114, 0119-0121, 0153);

(c) sending the web server identifier to the device (Garcia, 0113, 0119-0120).

Garcia fails to teach (d) receiving the content associated with the web server from the device.

However, in an analogous art, **Samuels** teaches receiving the content associated with the web server from the device (Samuels, col. 41, lines 9-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the features of receiving the content associated with the web server from the device, as disclosed by Samuels, into the teachings of Garcia. One would be motivated to support content delivery system.

Claim 59

Garcia in combination with Samuels teach the method according to claim 53 further for data communication with a second web server storing a second content and having an identifier in the Internet and the devices via the client, the method further comprising the steps of: (e) receiving the second content from the second web server (Garcia, 0113-0114, 0119-0121, 0153); and (f) sending the second content to the device (Samuels, col. 41, lines 9-29).

Claim 52 does not teach or define any new limitation other than above claim 38. Therefore, claim 52 is rejected for similar reasons.

Claims 54-58, 60-66 do not teach or define any new limitation other than above claims 27, 29, 31-32, 36, 39-43, 45-46. Therefore, claims 54-58, 60-66 are rejected for similar reasons.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MINH-CHAU NGUYEN whose telephone number is (571)272-4242. The examiner can normally be reached on 9AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JEFFREY L. NICKERSON can be reached on (571) 270-3631. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/MINH-CHAU NGUYEN/
Primary Examiner, Art Unit 2459

Notice of References Cited	Application/Control No. 14/025,109	Applicant(s)/Patent Under Reexamination SHRIBMAN ET AL.	
	Examiner MINH-CHAU NGUYEN	Art Unit 2459	Page 1 of 1

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*	B	US-7,865,585 B2	01-2011	Samuels; Allen	H04L67/2842	709/217
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CONFIRMATION NO. 6194

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/025,109	09/12/2013	709	2459	HOLA-005-US2

APPLICANTS
Hola Networks Ltd., Netanya, ISRAEL;

INVENTORS
Derry Shribman, Netanya, ISRAEL;
Ofer Vilenski, Netanya, ISRAEL;

**** CONTINUING DATA ***************************
This application is a DIV of 12/836,059 07/14/2010 PAT 8560604
which claims benefit of 61/249,624 10/08/2009

**** FOREIGN APPLICATIONS ***************************

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Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /MINH-CHAU NGUYEN/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
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P.O.B 7230
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First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	MINH-CHAU NGUYEN
Attorney Docket Number	19459-6105P

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	Attorney Docket Number	19459-6105P

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	Attorney Docket Number	19459-6105P

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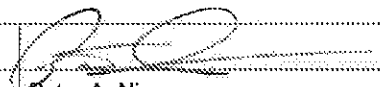
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Name/Print	Peter A. Nieves	Registration Number	48173

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Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

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Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/Minh Chau Nguyen/	Date Considered	03/07/2016

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Signature		Date (YYYY-MM-DD)	2015-01-16
Name/Print	Peter A. Nieves	Registration Number	48173

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Oxylabs LT, UAB v. Bright Data Ltd.
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PTO/SB/08a (01-10)
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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.N./	1	20080109446	A	2006-05-08	Wang	

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FOREIGN PATENT DOCUMENTS

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/M.N./	1	2007-280388	JP	A	2007-10-25	XEROX CORPORATION		☐

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Signature	/Peter A. Nieves/	Date (YYYY-MM-DD)	2014-11-18
Name/Print	Peter A. Nieves	Registration Number	48173

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	1	KEI SUZUKI, a Study on Cooperative Peer Selection Method in P2P Video Delivery, Vol 109, No . 37, IEICE Technical Report, The Institute of Electronics, Information and Communication Engineers, May 14, 2009, Vol 109	☐

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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/M.N./	1	101179389	CN	A	2008-05-14	Wang, Matrix Xin		☐

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14025109	SHRIBMAN ET AL.
	Examiner	Art Unit
	MINH-CHAU NGUYEN	2459

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	201-203, 207	3/7/2016	MN

SEARCH NOTES		
Search on EAST	3/7/2016	MN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016								
	1	-								
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	34	✓								
	35	✓								
	36	✓								

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/07/2016								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								
	43	✓								
	44	✓								
	45	✓								
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	63	✓								
	64	✓								
	65	✓								
	66	✓								

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
584 of 789

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	9	(("7865585") or ("7203741")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/07 13:26
L2	15419	(forward$4 provid$4) with content$1 with server$1 with client$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/07 13:33
L3	5043	2 and (web near1 server) and servers	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/07 13:33
L4	1459	3 and (routers proxies)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/07 13:34
L5	132	4 and (server with (store$1 save$1) with (identifiers ids addresses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/07 13:35
L6	52	5 and (server with select$4 with (device$1 router$1 prox$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/07 13:36
L7	14	6 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/07 13:36

EAST Search History (Interference)

< This search history is empty>

3/ 7/ 2016 2:22:49 PM

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/025,109	09/12/2013	Derry Shribman	19459-6105P

CONFIRMATION NO. 6194

POWER OF ATTORNEY NOTICE

57449
SHEEHAN PHINNEY BASS & GREEN, PA
c/o PETER NIEVES
1000 ELM STREET
MANCHESTER, NH 03105-3701

OC000000080946197

Date Mailed: 02/26/2016

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/14/2016.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sleutchit/

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/025,109	09/12/2013	Derry Shribman	HOLA-005-US2

CONFIRMATION NO. 6194

131926
May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

POA ACCEPTANCE LETTER

OC000000080946254

Date Mailed: 02/26/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/14/2016.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sleutchit/

Oxylabs LT, UAB v. Bright Data Ltd.
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PTO/SB/81 (01-09)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	14/025,109
Filing Date	09-12-2013
First Named Inventor	Derry Shribman
Title	SYSTEM PROVIDING FASTER AND MORE EFFICIENT
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US2

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

131,926

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified application to:

☒ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the:

☐ Applicant/Inventor.

OR

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on 10/16/2013.

SIGNATURE of Applicant or Assignee of Record

Signature		Date	February 10, 2016
Name	Ofer Vilenski	Telephone	
Title and Company	CEO of HOLA NETWORKS LTD.		

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	24910230
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	19459-6105P
Receipt Date:	14-FEB-2016
Filing Date:	12-SEP-2013
Time Stamp:	09:47:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	SIGNED-POA.pdf	65055 9b1ce78347632905640 6ab253a4bd2105d c075fb	no	1

Warnings:	
Information:	

Total Files Size (in bytes):	65055

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020133621	A1	2002-09-19	Talmon Marco et al	
	2	20040107242	A1	2004-06-03	John Vert et al	

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2343536	RU	C2	2009-10-01	Microsoft Corporation		☐

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NON-PATENT LITERATURE DOCUMENTS

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature		Date (YYYY-MM-DD)	2015-01-16
Name/Print	Peter A. Nieves	Registration Number	48173

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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РОССИЙСКАЯ ФЕДЕРАЦИЯ

(19) **RU** (11) **2 343 536** (13) **C2**

(51) МПК
G06F 15/00 (2006.01)

ФЕДЕРАЛЬНАЯ СЛУЖБА
ПО ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ,
ПАТЕНТАМ И ТОВАРНЫМ ЗНАКАМ

(12) ОПИСАНИЕ ИЗОБРЕТЕНИЯ К ПАТЕНТУ

(21), (22) Заявка: **2003134811/09, 01.12.2003**

(24) Дата начала отсчета срока действия патента:
01.12.2003

(30) Конвенционный приоритет:
02.12.2002 US 10/307,752

(43) Дата публикации заявки: **27.05.2005**

(45) Опубликовано: **10.01.2009 Бюл. № 1**

(56) Список документов, цитированных в отчете о поиске: **RU 2149518 C1, 20.05.2000. RU 2180470 C2, 10.03.2002. US 6029192 A, 22.02.2000. US 6269099 A, 31.07.2001.**

Адрес для переписки:
129090, Москва, ул. Б.Спасская, 25, стр.3, ООО "Юридическая фирма Городисский и Партнеры", пат.пов. Ю.Д.Кузнецову, рег.№ 595

(72) Автор(ы):
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МЕСГАР Юджин (US),
ЗАРАХОВСКИЙ Юджин (US),
САРЕТТО Чезаре Джон (US)

(73) Патентообладатель(и):
МАЙКРОСОФТ КОРПОРЕЙШН (US)

(54) МЕХАНИЗМ ОДНОРАНГОВОЙ ШИРОКОВЕЩАТЕЛЬНОЙ ПЕРЕДАЧИ ИНФОРМАЦИОННОГО СОДЕРЖАНИЯ

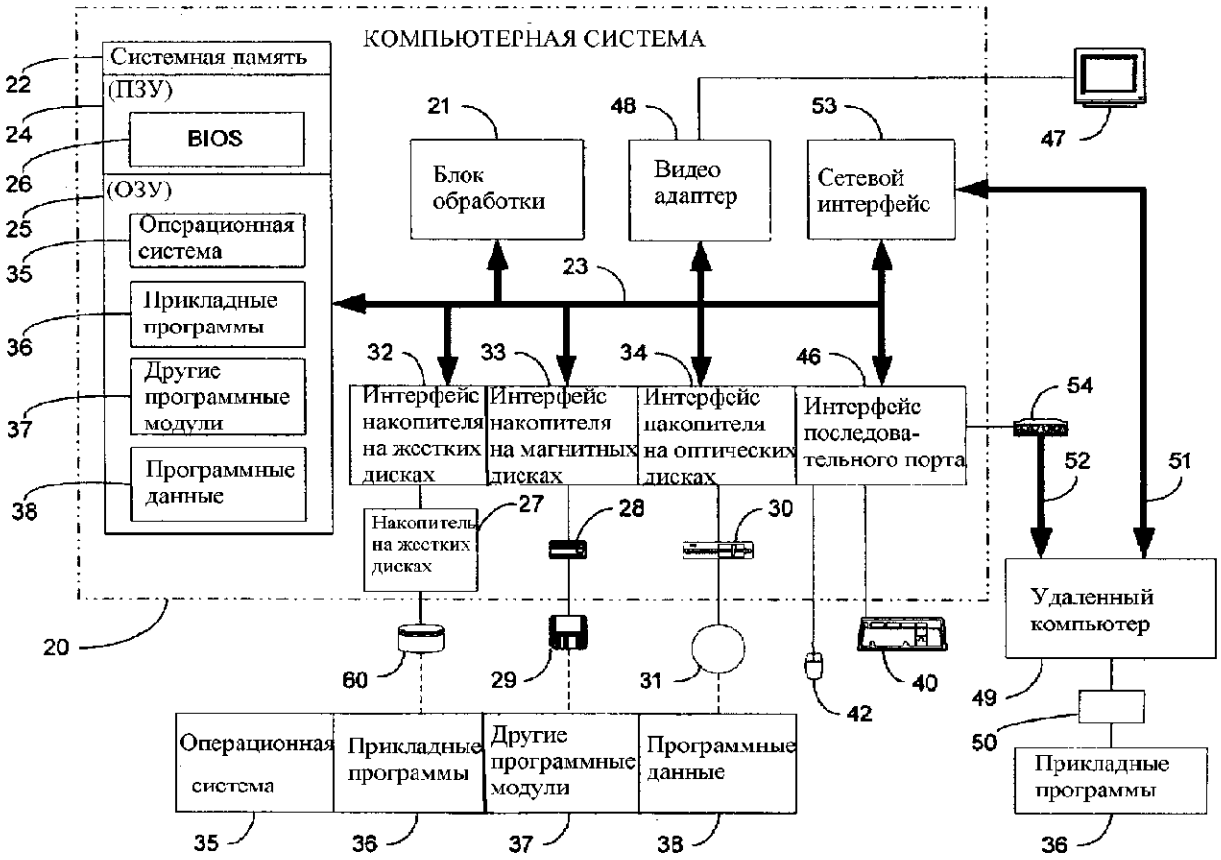
(57) Реферат:

Изобретение относится к способам эффективной пересылки файлов в одноранговой сети. Техническим результатом является повышение скорости пересылки, для обеспечения совместного использования файлов в сети по существу в реальном времени. Узлы в сети могут служить как клиентами, так и серверами, так что бремя пересылки файлов в сети равномерно распределяется по узлам сети, в основном обеспечивая, что процесс распространения файлов выполняется максимально быстро. Каждый узел, который имеет или получает файл, уведомляет о владении файлом, так что другие узлы могут получить от него файл. В одном из вариантов, узел может одновременно принимать файл путем загрузки от конкретного узла и предоставлять тот же самый файл путем подкачки в другой узел. В данном варианте идентификатор поколения данных предпочтительно ассоциируется с каждой копией файла, чтобы исключить ситуацию, когда два узла, имеющие только часть файла, пытались извлечь остальную часть файла друг у друга. 6 н. и 10 з.п. ф-лы, 5 ил.

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ФИГ. 1

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IPR2024-00126, EX. 2028
596 of 789

RUSSIAN FEDERATION

(19) **RU** (11) **2 343 536** (13) **C2**

(51) Int. Cl.
G06F 15/00 (2006.01)

FEDERAL SERVICE
FOR INTELLECTUAL PROPERTY,
PATENTS AND TRADEMARKS

(12) ABSTRACT OF INVENTION

(21), (22) Application: **2003134811/09, 01.12.2003**

(24) Effective date for property rights: **01.12.2003**

(30) Priority:
02.12.2002 US 10/307,752

(43) Application published: **27.05.2005**

(45) Date of publication: **10.01.2009 Bull. 1**

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129090, Moskva, ul. B.Spasskaja, 25, str.3, OOO "Juridicheskaja firma Gorodisskij i Partnery", pat.pov. Ju.D.Kuznetsovu, reg.№ 595

(72) Inventor(s):
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SARETTO Chezare Dzhon (US)

(73) Proprietor(s):
MAJKROSOFT KORPOREJShN (US)

(54) MECHANISM OF PEER BROADCASTING OF INFORMATION CONTENT

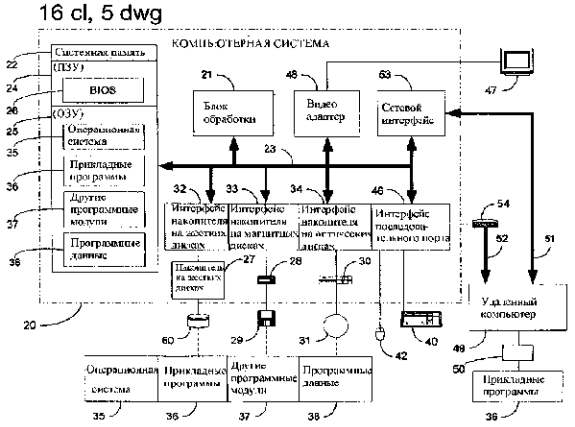
(57) Abstract:

FIELD: physics; computer engineering.

SUBSTANCE: invention is related to methods for efficient sending of files in peer network. Units in network may serve both as clients and servers, therefore burden of files sending in network is evenly distributed among network units, mainly providing for maximum fast process of files distribution. Every unit that has or receives file infoms about file in possession, so that other units may receive file from it. In one of versions unit may simultaneously receive file by loading from specific unit and make the same file available by swapping in the other unit. In this version identifier of data generation is preferably associated with every copy of file in order to avoid situation when two units that have only part of file would try the remaining part of file from each other.

EFFECT: higher speed of sending.

16 cl, 5 dwg



ФИГ. 1

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Область техники

Настоящее изобретение относится к групповому соединению в сети, более конкретно, к пересылке файлов в одноранговой (без иерархии и выделенных серверов) сети.

Предшествующий уровень техники

По мере того как одноранговые сети становятся все более распространенными в количественном аспекте и по популярности и находят новые применения, все более заметными становятся недостатки в современных одноранговых технологиях. Увеличение вычислительной мощности персональных компьютеров (ПК) также привлекает внимание к этим недостаткам в сопоставлении с отсутствием сопутствующего существенного увеличения ширины полосы, доступной для использования в одноранговых соединениях.

Например, современные способы и методологии пересылки файлов в одноранговых сетях часто оказываются неудобными и недостаточно быстродействующими, создавая препятствия быстрому совместному использованию информации в сети. Когда одноранговая система используется для группового взаимодействия в реальном времени, любая существенная задержка в пересылке файла может привести к ощущению разъединения, когда взаимодействие предположительно в реальном времени начинает ощущаться пользователем скорее как неестественное, менее динамичное взаимодействие. Поэтому важно ускорить пересылку файлов, когда это возможно.

Основная причина медлительности современных протоколов одноранговой пересылки файлов заключается в способе, которым нагрузка пересылки файлов распределяется среди одноранговых узлов. Например, в типовом способе пересылки узел, имеющий файл для совместного с группой использования, просто разветвляет (развертывает веером) этот файл ко всем членам группы путем подкачки (загрузки в удаленные компьютеры) параллельно или последовательно. Это накладывает требование значительной ширины полосы и вызывает неудобства в вычислениях для рассылающего узла, поскольку он должен обслуживать каждого запрашивающего или каждый узел, получающий этот материал, и должен делать это по существу синхронно или одновременно. В результате, скорость пересылки файла относительно всей группы ограничивается вычислительными возможностями и скоростью соединения распределяющего узла.

Имеется потребность в механизме одноранговой пересылки файлов, который обеспечивает достаточную скорость пересылки, чтобы обеспечивать групповые взаимодействия по существу в реальном времени с использованием одноранговой сети без чрезмерного прерывания, обусловленного задержкой пересылки файла.

Сущность изобретения

Настоящее изобретение направлено на систему, способ и архитектуру для эффективной пересылки файлов в одноранговой сети. Система приспособлена для обеспечения совместного использования файлов по существу в реальном времени, что особенно полезно в интерактивной среде группового взаимодействия. В возможном варианте осуществления изобретения множество узлов одноранговой сети служат в качестве как клиентов, так и серверов, принимая информацию файлов и передавая принятую информацию другим узлам. Время пересылки файлов распределяется в возможном варианте осуществления изобретения более равномерно между узлами сети, так что в типовом случае ни один из узлов не несет непропорциональной нагрузки пересылки файлов. Это полезно в обеспечении того, чтобы файл пересылался к каждому узлу в сети по возможности быстро.

В возможном варианте осуществления изобретения распределение файлов инициируется публикацией метаданных файла. Приняв метаданные файла, каждый узел определяет, желательно ли ему получить соответствующий файл. Если ему желательно получить файл, соответствующий узел или узлы используют модель откачки для запроса содержимого файла от соответствующих соседних узлов. В возможном варианте осуществления изобретения каждый узел, который имеет или принимает файл, оповещает о своем владении файлом, так что другие узлы могут затем получить файл от этих вторичных узлов. В возможном варианте осуществления изобретения узел может по

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существу синхронно получать файл путем потоковой загрузки от конкретного узла и предоставлять тот же самый файл путем подкачки другому узлу. В этом варианте осуществления предпочтительно используется идентификатор поколения данных для того, чтобы воспрепятствовать двум узлам, обладающим одной и той же частью файла, попытаться получить оставшуюся часть файла друг от друга. Дополнительные признаки и преимущества изобретения поясняются в последующем детальном описании иллюстративных вариантов осуществления изобретения со ссылками на чертежи.

Краткое описание чертежей

Хотя формула изобретения детально определяет признаки настоящего изобретения, однако изобретение, вместе с его целями и преимуществами, наилучшим образом может быть понято из последующего детального описания, во взаимосвязи с иллюстрирующими чертежами, на которых представлено следующее:

Фиг.1 - схематичная диаграмма, иллюстрирующая в общем виде приведенную для примера компьютерную систему, пригодную для реализации варианта осуществления настоящего изобретения;

Фиг.2 - схематичная диаграмма, иллюстрирующая пример одноранговой сети, обеспечивающей пересылку файлов в соответствии с вариантом осуществления настоящего изобретения;

Фиг.3 - блок-схема последовательности операций, иллюстрирующая процесс распределения и извлечения файлов для использования в одноранговой сети в соответствии с вариантом осуществления настоящего изобретения;

Фиг.4 - блок-схема, иллюстрирующая метод присвоения приоритета пересылке файлов для использования в одноранговой сети в соответствии с вариантом осуществления настоящего изобретения;

Фиг.5 - схематичная диаграмма, показывающая архитектуру узла клиент/сервер в соответствии с вариантом осуществления настоящего изобретения.

Детальное описание изобретения со ссылками на чертежи, где одинаковые ссылочные позиции обозначают подобные элементы, изобретение описано ниже в контексте вычислительной среды. Изобретение описано как реализованное с помощью исполняемых компьютером инструкций, таких как программные модули, исполняемые персональным компьютером (ПК), хотя это не является обязательным требованием для реализации изобретения. В общем случае, программные модули включают в себя подпрограммы, программы, объекты, компоненты, структуры данных и тому подобные средства, которые выполняют конкретные задачи или реализуют некоторые абстрактные типы данных.

Изобретение может быть реализовано в конфигурациях компьютерных систем иных, чем ПК. Например, изобретение может быть реализовано в портативных устройствах, мобильных телефонах, мультипроцессорных системах, в основанных на микропроцессорах или программируемых приборах бытовой электроники, сетевых ПК, миникомпьютерах, универсальных компьютерах и тому подобных средствах. Изобретение также может быть реализовано в распределенных вычислительных средах, где задачи выполняются удаленными устройствами обработки, которые связаны коммуникационной сетью. В распределенной вычислительной среде программные модули могут быть расположены как в локальных, так и в удаленных устройствах памяти.

Таким образом, хотя последующее детальное описание изобретения изложено в контексте приведенного для примера универсального вычислительного устройства, такого как обычный ПК 20, следует иметь в виду, что изобретение может быть воплощено во множество типов вычислительных сред, как изложено выше.

Перед детальным описанием изобретения, ниже со ссылками на фиг.1, описана вычислительная среда, в которой могут быть реализованы варианты осуществления изобретения. ПК 20 включает в себя блок 21 обработки, системную память 22 и системную шину 23, которая связывает различные системные компоненты, включая системную память, с блоком 21 обработки. Системная шина 23 может быть любой из различных типов шинных структур, включая шину памяти или контроллер памяти, шину периферийных

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устройств, локальную шину, использующую любую из разнообразных шинных архитектур. Системная память включает в себя ПЗУ 24 и ОЗУ 25. Базовая система ввода/вывода (BIOS) 26, содержащая базовые подпрограммы, которые способствуют переносу информации межу элементами в ПК 20, например при запуске, сохранена в ПЗУ 24. ПК 20 также включает в себя накопитель 27 на жестких дисках для считывания с жесткого диска 60 и записи на него, накопитель 28 на магнитных дисках для считывания со съемного магнитного диска 29 и записи на него, и накопитель 30 на оптических дисках для считывания со съемного оптического диска 31 или записи на оптический диск, такой как, например, ПЗУ-КД (CD-ROM) или иные оптические носители записи.

Накопитель 27 на жестких дисках, накопитель 28 на магнитных дисках и накопитель 30 на оптических дисках соединены с системной шиной 23 посредством интерфейса 32 накопителя на жестких дисках, интерфейса 33 накопителя на магнитных дисках и интерфейса 34 накопителя на оптических дисках соответственно. Накопители и связанные с ними считываемые компьютером носители обеспечивают энергонезависимую память исполняемых компьютером инструкций, структур данных, программных модулей и других данных для ПК 20. Хотя описываемая приведенная для примера среда использует один или несколько из упомянутых жесткого диска 60, съемного магнитного диска 29 и съемного оптического диска 31, специалистам в данной области техники должно быть понятно, что в приведенной для примера операционной среде могут использоваться и другие типы считываемых компьютером носителей для хранения данных, которые могут хранить данные, доступные для вычислительного устройства, такие как магнитные кассеты, платы флэш-памяти, цифровые видеодиски, картриджи Бернулли, ОЗУ, ПЗУ и т.п.

Ряд программных модулей могут быть сохранены на жестком диске 60, магнитном диске 29, оптическом диске 31, ПЗУ 24 или ОЗУ 25, включая операционную систему 35, одну или несколько прикладных программ (приложений) 36, другие программные модули 37 и программные данные 38. Пользователь может вводить команды и информацию в ПК 20 посредством клавиатуры 40 или указательного устройства 42. Другие устройства ввода (не показаны) могут включать в себя микрофон, джойстик, игровую панель, спутниковую параболическую антенну, сканер и т.п. Эти и другие устройства ввода часто соединяются с блоком 21 обработки через интерфейс 46 последовательного порта, связанный с системной шиной, но могут быть соединены и посредством других интерфейсов, таких как параллельный порт, игровой порт или универсальная последовательная шина (USB). Монитор 47 или иное устройство отображения также соединено с системной шиной 23 через интерфейс, например, такой как видео адаптер 48. Помимо монитора, ПК в типовом случае включают в себя другие периферийные устройства вывода (не показаны), например, громкоговорители и принтеры.

ПК 20 работает в сетевой среде с использованием фиксированных или переходных логических соединений с одним или более удаленными компьютерами, такими как удаленный компьютер 49. Удаленный компьютер 49 может представлять собой, в общем случае, другой ПК, сервер, маршрутизатор, сетевой ПК, одноранговое устройство или другой обычный сетевой узел или любое другое устройство того типа, как упомянуто выше. Удаленный компьютер 49 в типовом случае включает в себя многие или все из элементов, описанных выше применительно к ПК 20, хотя это не требуется, и на фиг.1 показано только устройство 50 памяти. Логические соединения, показанные на фиг.1, включают в себя локальную сеть 51 и глобальную сеть 52. Такие сетевые среды являются общеизвестными в офисах, компьютерных сетях предприятий, интранетах и в Интернет.

При использовании в сетевой среде локальной сети ПК соединяется с локальной сетью 51 через сетевой интерфейс или адаптер 53. При использовании в сетевой среде глобальной сети ПК в типовом случае включает в себя модем 54 или иное средство для установления связи в глобальной сети 52. Модем 54, который может быть внутренним или внешним, соединен с системной шиной 23 через интерфейс 46 последовательного порта. Хотя в реализации возможного варианта осуществления изобретения может быть использован стандартный модем, лучшие рабочие характеристики могут быть обеспечены

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при использовании широкополосного соединения, такого как имеющее емкость в пределах от 120 кб/с до 1,5 Мб/с. Программные модули, изображенные по отношению к ПК 20, или их части могут быть сохранены в удаленном устройстве памяти. Следует иметь в виду, что показанные сетевые соединения приведены для примера, и что могут быть использованы и другие средства установления канала связи между компьютерами. Кроме того, не предусматривается ограничение изобретения конкретным типом сети. Любой тип сети, проводной или беспроводной, постоянной или переходной, с коммутацией каналов или с пакетной коммутацией или другие сетевые архитектуры, могут быть использованы для реализации настоящего изобретения.

В последующем описании изобретение будет описываться со ссылками на действия и символические представления операций, которые выполняются одним или несколькими вычислительными устройствами, такими как ПК 20, если не указано иное. Следует иметь в виду, что такие действия и операции, на которые иногда даются ссылки как на выполняемые компьютером, включают в себя манипулирование блоком обработки компьютера с электрическими сигналами, представляющими данные в структурированной форме. Такое манипулирование преобразует данные или сохраняет их в ячейках системы памяти компьютера, что приводит к переконфигурированию или иным образом изменяет работу компьютера способом, хорошо известным специалистам в данной области техники. Структуры данных, в которых поддерживаются данные, являются физическими местоположениями (ячейками) памяти, которые имеют конкретные свойства, определяемые форматом данных. Однако хотя изобретение описано в вышеуказанном контексте, это не означает, что оно должно быть ограничено данным вариантом, так как специалистам в данной области техники должно быть понятно, что действия и операции, описанные ниже, могут также быть реализованы аппаратными средствами.

Приведенная для примера одноранговая сеть 201, используемая в соответствии с вариантом осуществления изобретения, схематично представлена на фиг.2. В типовом случае одноранговая сеть, использующая изобретение, будет содержать примерно от 2 до 10 узлов, хотя для реализации изобретения также могут использоваться более крупные сети. Двунаправленные линии между узлами A-G одноранговой сети представляют одноранговые сетевые соединения. Так, например, в показанной конфигурации узел A соединен непосредственно с узлом B, но только опосредованным образом (то есть не через единственный канал) с узлом C. Каждое одноранговое соединение может в действительности состоять из ряда физических и/или логических, лежащих в его основе соединений, таким образом, как это может быть связано с базовой сетью, на которой строится одноранговая сеть. Заметим, что хотя одноранговая сеть в общем случае будет образована компьютерами, это не является обязательным. Вместо этого, может быть использован любой тип устройств, имеющих соответствующие средства работы в сети, в зависимости от того, какое оборудование выбрано пользователем.

Для повышения эффективности одноранговой сети, каждый компьютер в группе может также хранить «общие файлы» в базе данных, которая актуализируется вместе с базами данных других членов группы. Эта база данных может актуализироваться множеством разных способов. В одной реализации всякий раз, когда конкретный компьютер изменяет базу данных, он может распространить эти изменения к другим компьютерам в одноранговой сети через соединения, описанные выше. Альтернативно, компьютеры в группе могут автоматически обновлять свои базы данных после того, как прошел определенный период времени, опрашивая компьютеры, находящиеся в логическим соединении с ними, для получения новых версий базы данных. Хотя одноранговые технологии в общем случае имеют ряд преимуществ, включая независимость от центрального сервера и зачастую лучшее использование ресурсов, настоящее изобретение может также предусматривать использование центрального сервера или оборудования (не показано), соединенного с одним или несколькими узлами, для хранения данных или для поддержания состояния конкретной однгоранговой группы узлов или конкретных автономных (независимых) участников.

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Одноранговая сеть 201 может формироваться с использованием существующих одноранговых технологий. Например, в принципе, узел соединяется с сетью 201 посредством установления соединения с одним из существующих узлов. В этот момент новый узел может осуществлять вложение (совмещать передачу запросов и ответов) по соединениям (к другим узлам) существующего узла путем оценки других соединений и узлов, если имеются, для существующего узла и сделать выбор, осуществить ли соединение с некоторыми, всеми или не соединяться ни с одним из этих других узлов. Соединяющийся узел учитывает, в общем случае, стоимость нового соединения в зависимости от преимуществ нового соединения при принятии решения, создать ли дополнительные соединения на основе соединений существующих узлов. Каждый узел одноранговой сети также поддерживает запись мгновенного состояния частей сети, о которых он имеет информацию, чтобы отслеживать соответствующий сегмент участников сети и их статус в любой данный момент времени, как это должно быть понятно для специалистов в данной области техники. Именно совокупность таких разнообразных записей по различным узлам в действительности формирует одноранговую сеть, поскольку соединения между узлами в типовом случае не реализованы аппаратными средствами, а в большинстве случае являются переходными (неустановившимися, изменяемыми) в смысле соединений с пакетной коммутацией, а не с коммутацией каналов.

В соответствии с одним из аспектов настоящего изобретения, распространение файлов инициируется узлом одноранговой сети, таким как узел А. Как описано ниже более детально, данные файлов пересылаются по сети к соответствующим получающим узлам, в то время как метод рассылки распределяет затраты на пересылку относительно равномерно по сети. В частности, из блок-схемы 301 последовательности операций, показанной на фиг.3, можно видеть, что распространяющий узел сначала на этапе 303 публикует метаданные, связанные с конкретным файлом. Метаданные не являются данными файла, а представляют информацию о самом файле, а также о контексте файла, например, о приоритете по отношению к другим файлам. Метаданные предпочтительно имеют малый объем для лавинной маршрутизации без проблем ко всем узлам по существующим соединениям с использованием минимальной ширины полосы с помощью регулярного метода лавинной маршрутизации одноранговой записи. В соответствии с этим методом все получающие узлы последовательно пересылают метаданные до тех пор, пока данные не достигнут всех узлов сети. Заметим, что когда узел получает дубликат метаданных, например, по другим соединениям с другими узлами, он просто игнорирует дублирующую информацию без ее дальнейшей пересылки и пересылает только первую принятую копию метаданных.

В одном варианте осуществления изобретения метаданные включают в себя имя файла, размер файла, набор характеристик распространения, информацию о сроке окончания действия, любую специфическую для модуля информацию, которую хочет предоставить приложение или модуль, осуществившие публикацию метаданных. Кроме того, метаданные могут также включать в себя любую другую необходимую информацию, такую как дата создания и/или модифицирования, владелец, создатель, приоритет и т.д. Имя файла в метаданных просто является идентификатором, связанным с файлом. Не требуется, чтобы имя файла было абсолютно уникальным, хотя предпочтительным является идентификатор, который в достаточной степени специфичен, так что маловероятно, что он будет связан с каким-либо другим файлом, отличным от требуемого файла в любом узле сети 201. В случае музыкальных файлов имя файла может включать в себя соответствующие метки MP3 ID3. Информация о размере файла обеспечивает индикацию того, какой объем данных содержится в данном файле, и предпочтительно указывается по отношению к размеру файла в сжатом виде, если при пересылке должно использоваться сжатие. Набор характеристик распространения дополнительно обеспечивает рекомендацию или указание на то, каким образом файл должен распространяться. Наконец, информация о сроке окончания действия определяет время, когда файл, будучи пересланным, должен быть удален из памяти каждого получающего узла. Заметим, что публикация исходных

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метаданных может включать в себя декларацию, что узел-источник имеет предлагаемый файл, но каждый другой узел не делает данную декларацию до тех пор, пока он в действительности не будет иметь по меньшей мере часть файла, как пояснено более подробно ниже.

После того как публикующий узел передал на этапе 303 метаданные, и все узлы одноранговой сети получили метаданные, каждый получающий метаданные узел на этапе 305 принимает решение, запросить или не запрашивать данный файл. Узел может иметь любую из ряда причин для запроса файла. Например, если модуль интерактивного группового взаимодействия в реальном времени, такой как модуль группового восприятия аудиоматериала, вызвал публикацию метаданных файла, и получающий узел активизировал тот же самый тип модуля, затем получающий узел, по всей вероятности, пожелает запросить предлагаемый файл.

Кроме того, в одном из вариантов осуществления изобретения узел осуществляет поиск в своих локальных файлах для определения того, имеет ли он уже копию релевантного файла, и использует любую такую копию вместо запроса загрузки из другого узла. Определение того, является ли локальная копия «той же самой», что и копия, о которой было оповещено, может основываться на множестве факторов. Например, в случае аудиофайлов, одинаковость может быть логически выведена из таких характеристик, как имя файла, исполнитель или иная участвующая сторона, длительность воспроизведения. Однако в другом варианте осуществления изобретения этот локально имеющийся файл не используется для обслуживания запросов других узлов на оповещенный файл. Это связано с тем, что могут иметься различия между локально имеющейся копией и прорекламированной копией, которые могут быть очевидными или неочевидными в узле, являющемся локальным источником, но которые могут воспрепятствовать непрерывности в загрузке, когда имеет место переключение источника в процессе загрузки другим узлом. Такие различия могут состоять в точном методе сжатия, используемом для сокращения файла (например, когда тот же самый файл сжимается различными способами для получения различных конечных версий), или в лежащих в основе данных, использованных для создания файла (например, когда файлы связаны с разными вырезками из одной и той же песни). Решение о том, использовать или не использовать локальный файл в данном контексте, может быть связано с мерой сходства файлов, которая используется.

Если получающий узел принял решение запросить файл, то он осуществляет проверку на этапе 307, чтобы определить, объявил ли какой-либо из непосредственно соседних узлов, что у него имеется этот файл. Если один или несколько соседей объявили, что у них имеется этот файл, что означает, что они имеют по меньшей мере часть файла, то данный узел на этапе 309 принимает решение, от какого из соседних узлов запросить файл. Это решение может быть основано на ряде факторов, включая, например, вычислительные характеристики или характеристики соединений (ранее измеренные характеристики пересылки файлов, скорость, надежность и т.д.) для узлов.

Поскольку множество узлов могут получить части файла и затем уведомить о том, что они владеют ими, то теоретически возможно, что если соответствующие поставщики для этих узлов испытывают проблемы, то узлы могут попытаться получить файл друг от друга. Это привело бы в результате к взаимоблокировке, поскольку ни один узел не обладает полным файлом. Для преодоления этой проблемы, каждый узел, который уведомляет об обладании файлом, также предпочтительно уведомляет о номере поколения (данных) для этого файла. Любой узел, который имеет или получает весь файл, может уведомить о его версии как о файле поколения 0. Узел, который уведомляет о частичной копии, которую он получил от источника поколения 0, уведомляет о своей версии как о поколении 1. В принципе, каждый узел уведомляет о своей версии как о версии поколения на 1 больше, чем версия, которую он одновременно загружает. Когда один узел-источник завершил свою загрузку всей копии файла, он уменьшает значение своего поколения, о котором он уведомляет, до 0, и это уменьшение (отрицательное приращение) распространяется по цепи узлов, на которые он осуществляет подкачку прямо или опосредованно. Таким

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образом, номер поколения, связанный с уведомленными версиями файла, является другим фактором, используемым в одном из вариантов осуществления изобретения, для определения того, от какого узла следует получить файл, причем обычно запрашивается поколение с более низким номером, а поколение с номером, одинаковым с поколением запрашивающего узла, в типовом случае не приемлемо. Если только один соседний узел объявил о наличии у него файла с подходящей версией, то этап 309 опускается для данного запрашивающего узла. На этапе 311 запрашивающий узел запрашивает файл от выбранного соседнего узла, обладающего этим файлом, и начинает принимать файл.

В одном из вариантов осуществления изобретения, как только запрашивающий узел начинает принимать файл, он способен уведомить другие узлы об обладании этим файлом. Это объясняется тем, что запрашивающий узел может предоставить части файла, которые он уже получил, при одновременном продолжении приема файла от своего поставщика примерно с той же скоростью или с более высокой скоростью. Это действие во многих случаях несколько уменьшает время задержки при распространении файлов, поскольку узлу не требуется ожидать завершения приема файла, прежде чем можно будет уведомить об обладании им и предоставить файл другим узлам. Таким образом, на этапе 313 запрашивающий узел передает уведомление своим соседним узлам, что он обладает указанным файлом. На этапе 315 данный узел обслуживает любые принятые запросы на данный файл. Наконец, процесс завершается на этапе 319.

Если на этапе 305 было определено, что данный узел не желает приобретать файл, то процесс переходит к этапу 317, где определяется, послал ли какой-либо узел, соседний с данным узлом, инициативный запрос файла к данному узлу. Поскольку распространение файла обычно осуществляется только на базе запроса, как описано выше, возможно, что узел, которому желательно получить файл, не имеет соседей, которые получают файл и уведомляют о нем по своей собственной инициативе. Тогда, после ожидания в течение соответствующего интервала времени, например, равного одному приращению времени на загрузку файла, такой узел может послать инициативный запрос файла к одному из своих соседей, стимулируя этого соседа извлечь и предоставить данный файл. В возможном варианте осуществления изобретения каждое одноранговое приложение или модуль связаны с конкретной одноранговой сетью, состоящей исключительно или главным образом из узлов, исполняющих одно и то же приложение или модуль. Таким образом, в этом варианте осуществления вероятность потребности в использовании инициативного запроса мала, поскольку каждый узел, вероятно, пожелает иметь файл.

Если на этапе 317 определено, что ни один соседний узел данного узла не послал инициативного запроса к данному узлу, то процесс завершается на этапе 319. Если, напротив, на этапе 317 определено, что один или несколько соседних узлов данного узла послали инициативный запрос на файл к данному узлу, то процесс переходит к этапу 307 и к логически следующим другим этапам. Заметим, что данному узлу может самому потребоваться сделать инициативный запрос на получение файла, в одном из вариантов осуществления изобретения.

Хотя выше детально не рассмотрено, однако имеются ситуации, когда узел делает выбор из множества файлов для подкачки и/или загрузки, и/или когда делается выбор между задачей подкачки и задачей загрузки для конкретного узла. Эти ситуации более детально рассмотрены в отношении обобщенной блок-схемы 401 последовательности операций на фиг.4. Хотя ситуация, представленная на фиг.4, связана с одновременным наличием множества возможностей подкачки (выгрузки) и загрузки, следует иметь в виду, что во многих случаях множества таких возможностей не будет иметься, и в таких ситуациях некоторые из этапов, представленных на блок-схеме 401, могут быть опущены.

На этапе 403 конкретный узел принял запросы на подкачку двух или более конкретных файлов, а также принял уведомления, что два или более других файлов имеются в наличии для подкачки в данный узел. В случае, когда рассматриваемый узел имеет неограниченные возможности подкачки и загрузки, и одновременное исполнение (то есть по существу в одно и то же время или по меньшей мере в течение перекрывающихся

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интервалов времени) всех таких действий может выполняться без замедления или задержки любого одного из действий, то все подкачки и загрузки предпочтительно осуществляются одновременно. Если, однако, что является более типичным, ресурсы узла и/или сети являются ограниченными, так что реализуется только наиболее быстрая загрузка или подкачка, когда никакая другая загрузка или подкачка не обслуживается, то в общем случае будет производиться только наиболее быстрая возможная загрузка или подкачка путем выбора для обслуживания соответствующего действия (подкачки или загрузки) и файла. Следует иметь в виду, что если каналы подкачки и загрузки являются полностью отдельными, как в случае некоторых широкополосных технологий, то установление приоритета для каждого канала может быть выполнено отдельно, а не во взаимодействии, как показано на фиг.4.

На этапе 405 потенциальным действиям подкачки и загрузки файлов присваиваются приоритеты. В частности, каждый файл предпочтительно ассоциируется, например, посредством метаданных, с численно определенным приоритетом, представляющим его текущую важность. Приоритеты могут представлять, например, относительный порядок файлов в списке воспроизведения аудиоматериала и могут изменяться по мере изменения списка воспроизведения. В той степени, в которой один или более релевантных приоритетов файлов изменяются в течение подкачки или загрузки и оказывают влияние на то, какой файл является в текущий момент предпочтительным файлом для подкачки или загрузки, целевой файл может быть переведен в другое состояние на середине потока, причем перенесенные неполные части установленного ранее предпочтительным файла сохраняются для возможного последующего возобновления пересылки. Если каналы подкачки и загрузки файлов являются полностью отдельными, так что они не влияют друг на друга, то присвоение приоритетов предпочтительно происходит на поканальной основе. То есть все потенциальные загрузки файлов по отношению друг к другу и все потенциальные подкачки файлов приоритизируются по отношению друг к другу. Специалисту в данной области техники должно быть понятно, что описываемые методы можно легко модифицировать для использования множества независимых каналов подкачки и множества независимых каналов загрузки.

На этапе 407 производится обслуживание пересылки файла с наивысшим приоритетом. В случае независимых каналов подкачки и загрузки, осуществляется обслуживание подкачки файла с наивысшим приоритетом, а также производится обслуживание загрузки файла с наивысшим приоритетом. Вновь следует отметить, что приоритеты файлов могут изменяться в процессе пересылки файлов, что может привести к появлению другого файла, имеющего более высокий приоритет для подкачки или загрузки, чем обслуживаемый в текущий момент файл, как описано выше. Наконец, на этапе 409 процесс завершается.

На фиг.5 показано схематичное представление архитектуры сервер/клиент, которая может быть использована в соответствии с возможным вариантом осуществления изобретения. В частности, в одноранговой сети в соответствии с различными вариантами осуществления изобретения, множество узлов работают как клиенты и как серверы, хотя ясно, что один или несколько узлов могут работать только как клиенты или только как серверы. Приведенная для примера архитектура 501 клиент/сервер имеет клиентское оборудование 503 и серверное оборудование 505. Клиентское оборудование 503 является ответственным за запрос желательных файлов, если это необходимо, и за прием таковых. Более конкретно, клиентское оборудование 503 предпочтительно включает в себя клиентский интерфейс 507 для приема запроса, такого как от модуля или приложения, на получение конкретного файла, такого как тот, о котором получено уведомление от другого узла. Такие запросы могут быть приоритизированы и поставлены в очередь 511 по приоритету. В этот момент интерфейс 513 соединения узлов используется для выполнения запроса и получения желательного файла в соответствующее время на основе присвоенного запросу приоритета.

Серверное оборудование 505 узла предпочтительно содержит файловый интерфейс 515 для приема данных файлов, например, от другого модуля или приложения в узле.

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Информация файлов может быть сжата, например, в формат 64k Windows Media ® Audio (WMA), или может находиться в унитарном формате для подкачки большого массива данных, или может находиться в потоковом формате для потоковой подкачки. Для ясности внутри интерфейса 515 показаны два интерфейса: интерфейс «опубликования файла» и интерфейс «опубликования потока». Последний используется для облегчения публикации (в сети) потока посредством серверной части 505, в то время как первый используется для облегчения унитарной публикации всего файла, как пояснено выше. Данные файла, принятые в интерфейсе 515, передаются в кэш 517 сервера для временного хранения, и могут быть переупорядочены относительно других ожидающих обработки подкачек в приоритетной очереди 519 сервера. Предпочтительно, файлы наивысшего приоритета принимаются первыми на интерфейсе 515 файлов, хотя приоритеты могут изменять в процессе приема данных файла на интерфейсе 515. Наконец, данные файла предоставляются для доступа в соответствующем приоритетном порядке интерфейсу 513 соединения узла. Понятно, что данные файлов для подкачки могут поступать альтернативным образом от интерфейса 513 соединения узла, например, когда серверное оборудование должно подкачивать те же самые данные к еще одному узлу. В этом случае поступающие данные файлов могут сохраняться как в клиентской приоритетной очереди, так и в серверной приоритетной очереди.

Следует иметь в виду, что описано новое средство для широковещательной пересылки информационного содержания для использования в одноранговой сети. Принимая во внимание многие возможные варианты осуществления, в которых могут быть применены принципы настоящего изобретения, следует иметь в виду, что описанные варианты осуществления со ссылками на чертежи являются только иллюстративными и не должны восприниматься как ограничивающие объем изобретения. Например, специалистам в данной области техники должно быть понятно, что элементы проиллюстрированных вариантов осуществления, показанные в форме программного обеспечения, могут быть реализованы в виде аппаратных средств и наоборот, или что показанные варианты осуществления могут быть модифицированы по своей конфигурации и в деталях без отклонения от сущности изобретения. Поэтому описанное выше изобретение должно принимать во внимание все такие варианты осуществления, которые могут входить в объем нижеследующих пунктов формулы изобретения и их эквивалентов.

Формула изобретения

1. Способ пересылки файла между узлами в одноранговой сети, имеющей множество узлов, включающих в себя узел-источник, по меньшей мере, один узел-получатель и соседний узел, причем узел-получатель имеет непосредственное одноранговое соединение с соседним узлом и опосредованное одноранговое соединение с узлом-источником, причем способ включает в себя действия, при которых получают в узле-получателе метаданные, которые были переданы узлом-источником и которые соответствуют файлу, которым владеет узел-источник, принимают в узле-получателе от соседнего узла уведомление о том, что соседний узел извлек файл, которым обладает узел-источник, и определяют в узле-получателе, следует ли извлечь файл, которым обладает узел-источник, из соседнего узла, на основе метаданных, извлекают файл из соседнего узла в узел-получателя, если в узле получателя принято решение извлечь файл, причем действие извлечения файла включает в себя посылку запроса к соседнему узлу на получение файла и получение от соседнего узла в узле-получателе файла путем потоковой подкачки, и транслируют к другим узлам в одноранговой сети уведомления, что узел-получатель владеет файлом, как только узел-получатель начал получать файл путем потоковой подкачки.

2. Способ по п.1, отличающийся тем, что метаданные включают в себя приоритет, связанный с файлом, основанный на текущей полезности файла для осуществляемого, по существу, в реальном времени группового взаимодействия по одноранговой сети.

3. Способ по п.1, отличающийся тем, что уведомление, что узел-получатель владеет

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файлом, также включает в себя идентификатор поколения, причем упомянутый идентификатор поколения отличает копию файла, доступную от узла-получателя, от копии файла, доступной от узла-источника.

4. Способ по п.3, отличающийся тем, что дополнительно включает трансляцию второго уведомления, что узел-получатель обладает файлом, как только узел-получатель закончил принимать файл путем потоковой подкачки, причем второе уведомление включает в себя второй идентификатор поколения, при этом второй идентификатор поколения не отличает копию файла, доступную от узла-получателя, от копии файла, доступной от узла-источника.

5. Способ по п.1, отличающийся тем, что определение в узле-получателе, следует ли извлечь файл, которым обладает узел-источник, из соседнего узла, на основе метаданных, дополнительно включает определение на основе метаданных, что локальный файл существует на узле-получателе, который соответствует файлу, которым обладает узел-источник, и тем самым принятие решения не извлекать файл из соседнего узла.

6. Способ по п.2, отличающийся тем, что файл, которым обладает узел-источник, является аудиофайлом.

7. Способ по п.6, отличающийся тем, что текущую полезность файла для осуществляемого, по существу, в реальном времени группового взаимодействия по одноранговой сети определяют на основе уровня файла в списке аудиовоспроизведения, при этом текущий уровень воспроизведения в списке воспроизведения ассоциирован с более высоким приоритетом, чем уровень в списке воспроизведения, который не относится к текущему воспроизведению.

8. Считываемый компьютером носитель, имеющий сохраненные на нем исполняемые компьютером инструкции для выполнения способа по п.1.

9. Способ пересылки файлов между узлами в одноранговой сети, имеющей множество узлов, включающих в себя узел-источник, по меньшей мере, один узел-получатель и первый и второй соседние узлы, причем узел-получатель имеет непосредственное одноранговое соединение с первым и вторым соседними узлами и опосредованное одноранговое соединение с узлом-источником, причем способ включает в себя действия, при которых

получают в узле-получателе от первого соседнего узла уведомление, что первый соседний узел может предоставить первый файл, причем узел-получатель владеет первыми метаданными, ассоциированными с первым файлом, и первые метаданные содержат первый приоритет, принимают в узле-получателе запрос от второго соседнего узла на подкачку второго файла от узла-получателя к второму соседнему узлу, причем узел-получатель обладает вторыми метаданными, ассоциированными с вторым файлом, причем вторые метаданные включают в себя второй приоритет,

определяют, какой из первого и второго приоритетов соответствует более высокому уровню приоритета,

извлекают первый файл из первого соседнего узла, если первый приоритет соответствует более высокому уровню приоритета, чем второй приоритет, и в противном случае осуществляют подкачку второго файла во второй соседний узел, и

транслируют первое уведомление, что узел-получатель может предоставить первый файл, как только узел-получатель начал принимать первый файл, при этом первое уведомление включает в себя первый идентификатор поколения, причем упомянутый первый идентификатор поколения отличает первую копию файла, доступную от узла-получателя, от первой копии файла, доступной от первого соседнего узла.

10. Способ по п.9, отличающийся тем, что первая копия файла, доступная от первого соседнего узла, ассоциирована с вторым идентификатором поколения, причем упомянутый второй идентификатор поколения отличает первую копию файла, доступную от первого соседнего узла, от первой копии файла, доступной от узла-источника.

11. Способ по п.9, отличающийся тем, что дополнительно включает трансляцию второго уведомления, что узел-получатель может предоставить первый файл, как только узел-получатель закончил принимать первый файл, при этом второе уведомление включает в

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себя второй идентификатор поколения, причем упомянутый второй идентификатор поколения не отличает первую копию файла, доступную от узла-получателя, от первой копии файла, доступной от первого соседнего узла.

12. Способ по п.11, отличающийся тем, что первый и второй файлы являются аудиофайлами.

13. Способ по п.9, отличающийся тем, что первый и второй приоритеты основаны на уровнях соответствующих файлов в списке аудиовоспроизведения, при этом текущий уровень воспроизведения в списке воспроизведения ассоциирован с более высоким приоритетом, чем уровень в списке воспроизведения, который не относится к текущему воспроизведению.

14. Считываемый компьютером носитель, имеющий сохраненные на нем исполняемые компьютером инструкции для выполнения способа по п.9.

15. Способ пересылки файлов между узлами в одноранговой сети, имеющей множество узлов, включающих в себя узел-получатель и первый и второй соседние узлы, причем узел-получатель имеет непосредственное одноранговое соединение с первым и вторым соседними узлами, причем способ включает в себя действия, при которых

получают в узле-получателе от снабжающего узла часть требуемого файла, имеющего первый идентификатор поколения, и присваивают этой части требуемого файла второй идентификатор поколения, который превышает первый идентификатор поколения,

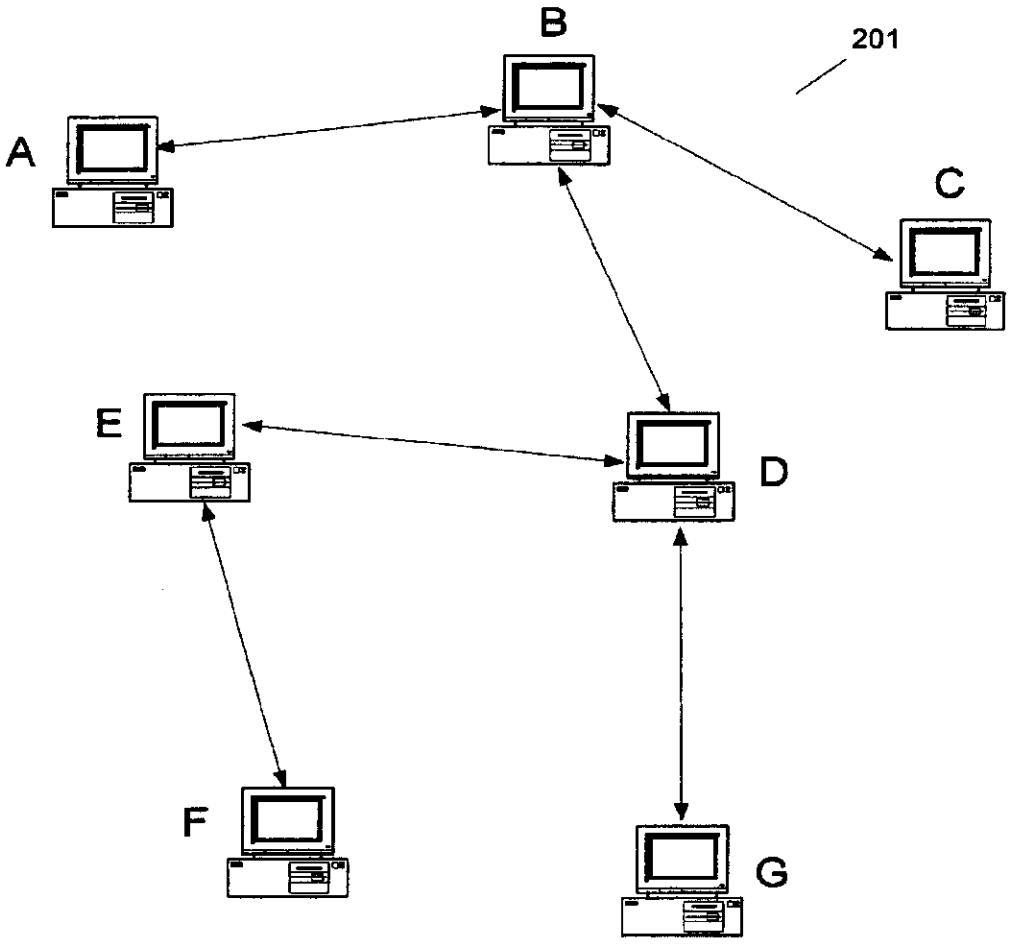
получают в узле-получателе от первого соседнего узла первое уведомление, что первый соседний узел может предоставить требуемый файл, причем первое уведомление содержит идентификатор поколения копии первого соседнего узла,

получают в узле-получателе от второго соседнего узла второе уведомление, что второй соседний узел может предоставить требуемый файл, причем второе уведомление содержит идентификатор поколения копии второго соседнего узла,

определяют, из какого из упомянутых первого соседнего узла и второго соседнего узла следует извлечь оставшуюся часть требуемого файла, на основе идентификаторов поколения первого и второго соседних узлов, извлекают оставшуюся часть требуемого файла из определенного первого или второго соседних узлов.

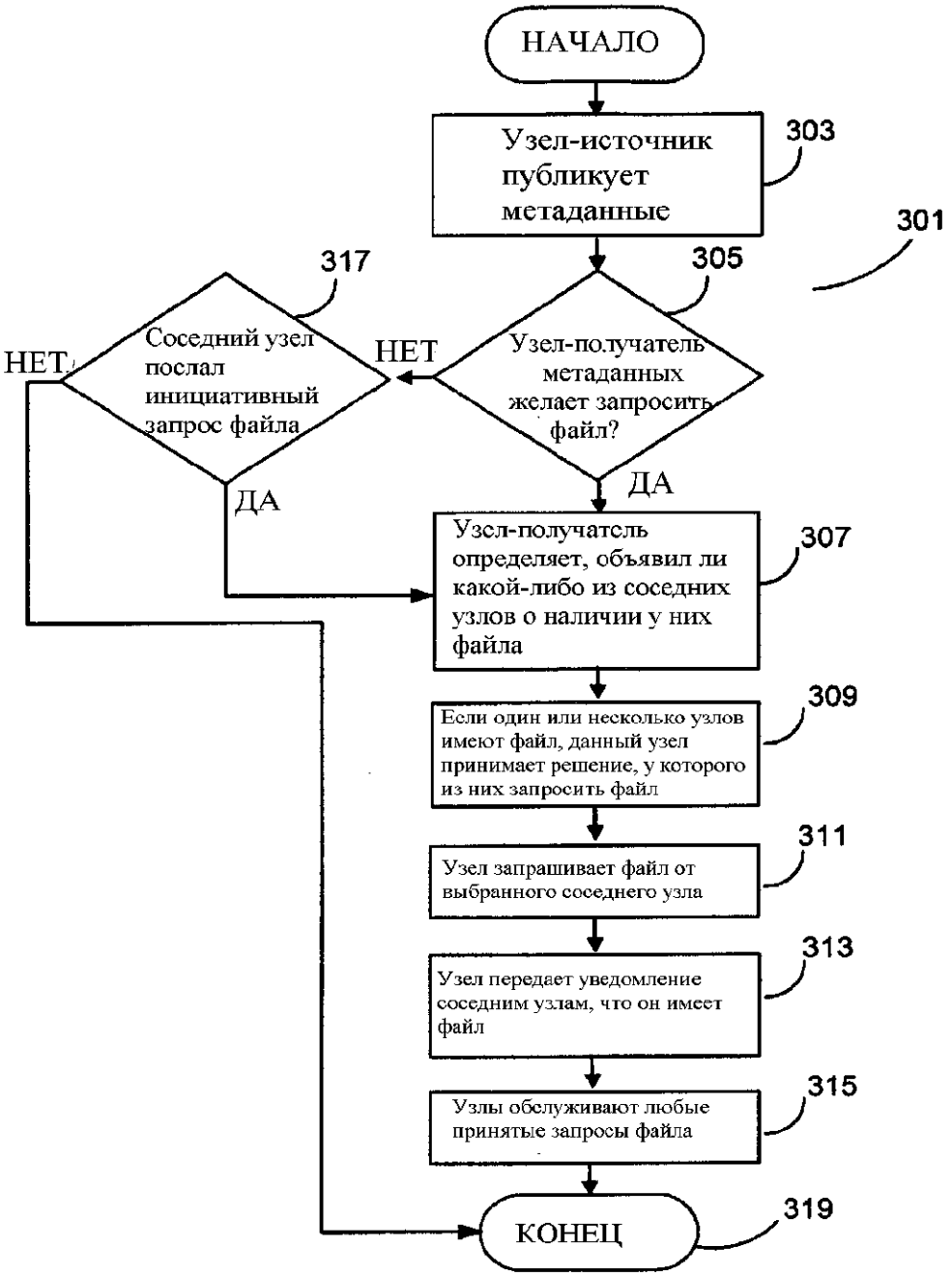
16. Считываемый компьютером носитель, имеющий сохраненные на нем исполняемые компьютером инструкции для выполнения способа по п.15.

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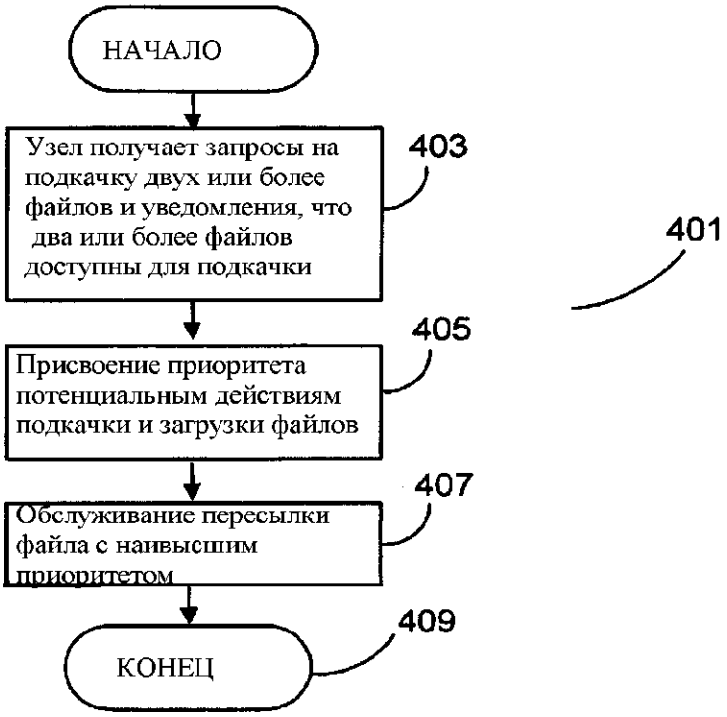
ФИГ. 2

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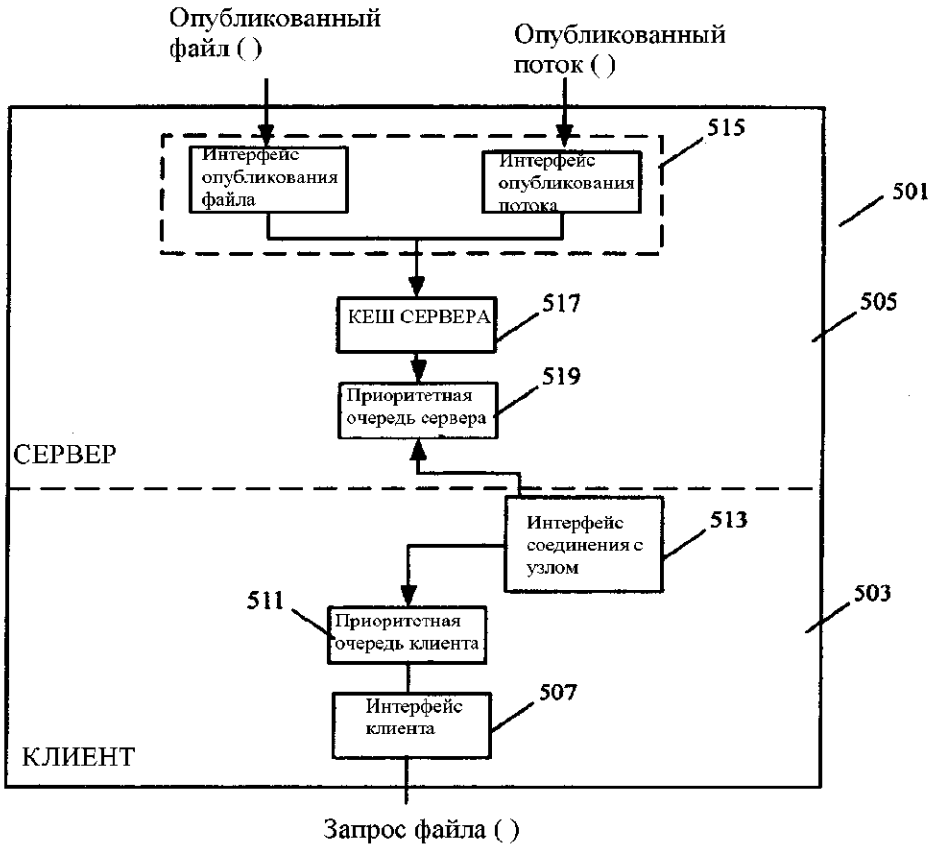


ФИГ. 3

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ФИГ. 4



ФИГ. 5

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Electronic Acknowledgement Receipt

EFS ID:	21245412
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	20-JAN-2015
Filing Date:	12-SEP-2013
Time Stamp:	09:26:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	S0493646.pdf	295818 fbf284e00fb655f55e109141c4f37e3d69cea96f	no	4

Warnings:	
Information:	

This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	S0493060.pdf	1066703 e802bfe70c7faf89521936b57869404e180b138e	no	17
Warnings:					
Information:					
			Total Files Size (in bytes):	1362521	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	CN101075242	CN	A	2007-11-21	TENGXUN SCIENCE & TECHNOLOGY		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	19459-6105P

	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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IPR2024-00126, EX. 2028
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	19459-6105P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Peter A. Nieves/	Date (YYYY-MM-DD)	2015-02-12
Name/Print	Peter A. Nieves	Registration Number	48173

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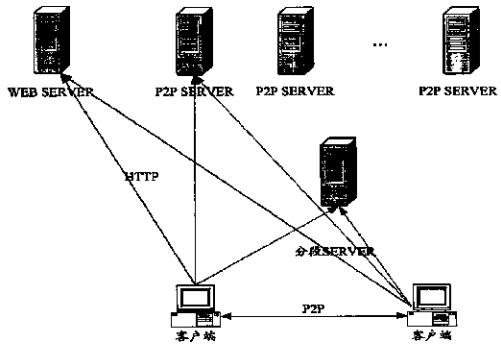
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[54] 发明名称

获取网页中网页元素的系统及方法

[57] 摘要

本发明公开了一种获取网页中网页元素的系统，包括：网页服务器，用于提供网页中的网页元素及其标识；P2P 服务器，用于存储下载过的网页元素的标识及对应的下载该网页元素的客户端信息；客户端，用于从 P2P 服务器上查询与网页元素的标识对应的客户端信息，并根据客户端信息以 P2P 方式下载网页元素，以及在下载完网页元素后将该网页元素的标识及对应的本客户端信息发布给 P2P 服务器。本发明还公开了一种获取网页中网页元素的方法。通过本发明的实施，客户端可以不直接从 WEB 服务器下载所需要的网页元素，而是从就近的其它客户端下载，从而加速客户端浏览网页的速度。



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1、一种获取网页中网页元素的系统，其特征在于，该系统包括:

网页服务器，用于提供网页中的网页元素及其标识;

点对点 P2P 服务器，用于存储下载过的网页元素的标识及对应的下载该网页元素的客户端信息;

客户端，用于从 P2P 服务器上查询与网页元素的标识对应的客户端信息，并根据客户端信息以 P2P 方式下载网页元素，以及在下载完网页元素后将该网页元素的标识及对应的本客户端信息发布给 P2P 服务器。

2、根据权利要求 1 所述的系统，其特征在于，所述 P2P 服务器为多个，每个 P2P 服务器分别存储不同分段的标识及对应的客户端信息;

该系统进一步包括分段服务器，用于向客户端提供不同分段的标识与 P2P 服务器之间的对应关系;

所述客户端进一步从所述分段服务器上下载所述不同分段的标识与 P2P 服务器之间的对应关系，并根据该对应关系和所要下载网页元素的标识确定对应的 P2P 服务器。

3、根据权利要求 1 所述的系统，其特征在于，所述客户端包括浏览器和加速客户端，其中:

浏览器的代理服务器设置为加速客户端，通过加速客户端获取网页元素;

加速客户端，用于从 P2P 服务器上查询与该网页元素的标识对应的客户端信息，并根据客户端信息以 P2P 方式下载网页元素，以及在下载完网页元素后将该网页元素的标识及对应的本客户端信息发布给 P2P 服务器。

4、根据权利要求 1 所述的系统，其特征在于，所述客户端进一步用于判断所下载的网页元素是否最新，并在不是最新时重新下载该网页元素;和/或，

所述客户端进一步用于对所下载的网页元素进行校验，并在校验没有通

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过时重新下载该网页元素。

5、根据权利要求 1 所述的系统，其特征在于，所述客户端进一步利用 HTTP 方式下载网页元素，并结合 HTTP 方式和 P2P 方式下载的结果得到该网页元素。

6、一种获取网页中网页元素的方法，其特征在于，该方法包括:

客户端从 P2P 服务器上查询与网页中网页元素的标识对应的客户端信息，并根据客户端信息以 P2P 方式下载该网页元素;

客户端在下载完网页元素后，向 P2P 服务器发布该网页元素的标识以及对应的本客户端信息。

7、根据权利要求 6 所述的方法，其特征在于，该方法预先设置分段服务器和多个 P2P 服务器，每个 P2P 服务器分别存储不同分段的标识及对应的客户端信息，分段服务器保存不同分段的标识与 P2P 服务器之间的对应关系;

该方法还包括: 客户端从所述分段服务器上下载所述不同分段的标识与 P2P 服务器之间的对应关系，并根据该对应关系和所要下载网页元素的标识确定对应的 P2P 服务器。

8、根据权利要求 7 所述的方法，其特征在于，所述分段为根据标识的 HASH 值进行分段。

9、根据权利要求 6 所述的方法，其特征在于，该方法进一步包括:

客户端判断所下载的网页元素是否最新，并在不是最新时重新下载该网页元素; 和/或，

客户端对所下载的网页元素进行校验，并在校验没有通过时重新下载该网页元素。

10、根据权利要求 6 所述的方法，其特征在于，所述客户端还利用 HTTP 方式下载网页元素，并结合 HTTP 方式和 P2P 方式下载的结果得到该网页元素。

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获取网页中网页元素的系统及方法

技术领域

本发明涉及网页浏览技术领域，特别是一种获取网页中网页元素的系统以及一种获取网页中网页元素的方法。

背景技术

随着因特网的发展和网页制作技术的进步，WEB 网页上的网页元素越来越多，例如，有普通的 html 网页、jpg 图片、gif 图片、swf 文件、脚本文件等等。同时，网页元素的尺寸也越来越大。

由于受到硬件条件和网络带宽的限制，海量的用户从少数服务器下载这些网页元素需要花费大量的等待时间。另外，由于用户和 WEB 服务器（SERVER）所处的地域的差异以及运营商的差异，也会导致用户终端浏览网页的速度存在显著的差别，其中有些浏览非常慢。

为了解决 WEB 浏览的速度问题，现有技术中采用了很多方法，例如：

现有技术一：采用 WEB SERVER+内容分发网络（CDN）的方式让用户就近接入，从较近的 CDN 下载网页元素，从而提高网页浏览的速度。

但是，该技术需要投入大量的资金和设备，一般只有大的门户网站才有能力采取这种技术。

现有技术二：使用加速客户端，如谷歌网页加速器（Google Web Accelerator），其利用 Google 自己提供的服务器缓存（cache）网页元素，在用户端将用户的浏览请求重定向到所提供的服务器上，通过访问该服务器上的 cache 加速浏览。

上述方法都是利用服务器 cache 网页内容的方式来加速用户对网页的浏览速度。但是，当用户数量增大时，从服务器下载网页元素的流量也随之增

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大，此时很难再保持较快的速度。

发明内容

有鉴于此，本发明提出了一种获取网页中网页元素的系统，其目的在于加速用户端获取网页元素的速度。本发明的另一个目的是提出一种获取网页中网页元素的方法。

根据上述目的，本发明提供了一种获取网页中网页元素的系统，该系统包括：

网页服务器，用于提供网页中的网页元素及其标识；

点对点 P2P 服务器，用于存储下载过的网页元素的标识及对应的下载该网页元素的客户端信息；

客户端，用于从 P2P 服务器上查询与网页元素的标识对应的客户端信息，并根据客户端信息以 P2P 方式下载网页元素，以及在下载完网页元素后将该网页元素的标识及对应的本客户端信息发布给 P2P 服务器。

在上述技术方案中，所述 P2P 服务器为多个，每个 P2P 服务器分别存储不同分段的标识及对应的客户端信息；该系统进一步包括分段服务器，用于向客户端提供不同分段的标识与 P2P 服务器之间的对应关系；所述客户端进一步从所述分段服务器上下载所述不同分段的标识与 P2P 服务器之间的对应关系，并根据该对应关系和所要下载网页元素的标识确定对应的 P2P 服务器。

所述客户端包括浏览器和加速客户端，其中：浏览器的代理服务器设置为加速客户端，通过加速客户端获取网页元素；加速客户端，用于从 P2P 服务器上查询与该网页元素的标识对应的客户端信息，并根据客户端信息以 P2P 方式下载网页元素，以及在下载完网页元素后将该网页元素的标识及对应的本客户端信息发布给 P2P 服务器。

所述客户端进一步用于判断所下载的网页元素是否最新，并在不是最新时重新下载该网页元素；和/或，所述客户端进一步用于对所下载的网页元

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素进行校验，并在校验没有通过时重新下载该网页元素。

所述客户端进一步利用 HTTP 方式下载网页元素，并结合 HTTP 方式和 P2P 方式下载的结果得到该网页元素。

本发明还提供了一种获取网页中网页元素的方法，该方法包括：

客户端从 P2P 服务器上查询与网页中网页元素的标识对应的客户端信息，并根据客户端信息以 P2P 方式下载该网页元素；

客户端在下载完网页元素后，向 P2P 服务器发布该网页元素的标识以及对应的本客户端信息。

另外，该方法预先设置分段服务器和多个 P2P 服务器，每个 P2P 服务器分别存储不同分段的标识及对应的客户端信息，分段服务器保存不同分段的标识与 P2P 服务器之间的对应关系；该方法还包括：客户端从所述分段服务器上下载所述不同分段的标识与 P2P 服务器之间的对应关系，并根据该对应关系和所要下载网页元素的标识确定对应的 P2P 服务器。

在上述技术方案中，所述分段为根据标识的 HASH 值进行分段。

该方法进一步包括：客户端判断所下载的网页元素是否最新，并在不是最新时重新下载该网页元素；和/或，客户端对所下载的网页元素进行校验，并在校验没有通过时重新下载该网页元素。

优选地，所述客户端还利用 HTTP 方式下载网页元素，并结合 HTTP 方式和 P2P 方式下载的结果得到该网页元素。

从上述方案中可以看出，由于本发明中客户端在需要下载网页元素时从 P2P 服务器上查询与该网页元素 URL 对应的客户端信息，并根据客户端信息建立 P2P 通道以 P2P 方式下载该网页元素，然后根据所下载的网页元素显示网页并在本地缓存所下载的网页元素，以及在下载完网页元素后，向 P2P 服务器发布该网页元素的 URL 以及对应的本客户端信息，以供后来的客户端使用，这样，客户端可以不直接从 WEB SERVER 下载所需要的网页元素，而是从就近的其它客户端下载，这样可以加速客户端下载网页元素的速度，从而可以进一步提高浏览网页的速度。并且，由于采用的是 P2P 技术，

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还可以解决海量用户和海量流量以及地域差异的瓶颈。

附图说明

图 1 为本发明实施例中的系统结构示意图；

图 2 为本发明实施例的 P2P SERVER 中保存的客户端信息的示意图；

图 3 为本发明实施例中客户端的结构示意图；

图 4 为本发明实施例中多个 P2P SERVER 与分段 SERVER 的关系示意图；

图 5 为本发明实施例中加速客户端进行下载以及发布的流程示意图；

图 6 为本发明实施例中客户端确认下载网页元素最新的流程示意图。

具体实施方式

为使本发明的目的、技术方案和优点更加清楚，以下举实施例对本发明进一步详细说明。

网页元素可以通过多种标识来区别，例如 URL、IP 地址或者其它的字符串，在下面的描述中以 URL 为例进行说明，但是本发明并不局限与此。

本发明的核心思想是：在一个客户端下载了某个 URL 的网页元素之后，将其缓存在本地，当其它客户端需要下载该 URL 的网页元素时，可以通过 P2P 方式从该客户端下载。换言之，在系统中设置点对点（P2P）Server，其中存储了下载过的网页元素的 URL 及对应的客户端信息，在其它客户端需要访问某个 URL 的网页元素时，从 P2P Server 上查询对应的客户端信息，然后建立 P2P 通道并通过 P2P 方式从对应的客户端下载网页元素，另外，在客户端下载完某个网页元素后，将该网页元素的 URL 以及对应的本客户端信息发布（PUB）给 P2P 服务器。

为了与现有的协议和技术更完美地结合，本发明实施例中的 cache 机制完全遵从 HTTP 协议关于 cache 的规定，亦即在下面的实施例中只加速处理 HTTP 响应头里规定可以 cache 的文件。当然，具体实现时，可以对任何文

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件进行下面描述的加速处理。

图 1 所示的是本发明实施例中下载网页元素的系统的结构示意图。

参照图 1，该系统包括 WEB SERVER、P2P SERVER、客户端。另外，该系统还可以进一步包括分段 SERVER。

其中，WEB SERVER 是提供网页、网页中的网页元素的 URL 等等的 HTTP 服务器，WEB SERVER 与现有技术一样，这里不在赘述。

P2P SERVER 存储网页元素的 URL 与下载过该网页元素的客户端信息。优选地，根据客户端自身所处的运营商，分别将客户端信息存储在对应的运营商列表中，这样客户端可以在同一个运营商网内进行 P2P 下载，进一步提高了浏览网页的速度。例如，如图 2 所示，将电信用户的客户端信息存储在电信用户列表中，网通用户的客户端信息存储在网通用户列表中，教育网用户的客户端信息存储在教育网用户列表中。

由于 URL 的数目非常庞大，为了减少 P2P SERVER 需要处理的 URL 数目，可以只在 P2P SERVER 中存储 KEYURL。下面简要说明 KEYURL：在 HTTP 1.1 协议中，为了节约新建 TCP 连接带来的网络和时间开销，规定了持久连接的概念，如果浏览器到 WEB SERVER 的路径上的结点（包括代理服务器）都支持持久连接，那么在该连接中浏览器可能会请求下载多个文件。优选地，本发明实施例中的客户端支持这种持久连接，并且将持久连接中的第一个 URL 称为 KEYURL。进一步，客户端发布和查询客户端信息都是以 KEYURL 来进行的。例如在一个持久连接里浏览器按先后顺序向 WEB SERVER 请求下载了 URL 为 URLA、URLB、URLC 的三个网页元素，则将 URLA 称为 KEYURL。向 SERVER 查询和发布客户端信息都只会对 URLA 进行，但是查询回来的客户端信息对于 URLB 和 URLC 是可复用的。

通常来说，图 2 中用户列表的数目是有限的，如果超过了预定的大小时，P2P SERVER 删除最老的客户端信息，即存储时间最长的客户端信息。另外，同时保存的 KEYURL 数目也是有限的，超过预定的数目之后，则删除最久未更新的条目。

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图 1 所示的客户端在下载完成某个 URL 的网页元素时，会将该网页元素的 URL 以及对应的本客户端信息发布给该 SERVER，让 SERVER 记录下自己的网络信息，供后来要下载该网页元素的其他客户端查询使用。新的客户端需要访问某个 URL 下载网页元素时，从 P2P SERVER 上查询已经下载过该网页元素的客户端信息，然后与这些客户端进行 P2P 交互下载网页元素。

在客户端，cache 的文件可以都存放在本地的一个文件夹下，每个 URL 对应于一个文件。文件中存储的内容包括 HTTP 响应头、URL 等数据，另外为了保证系统的安全性还进一步存储了对文件的 HASH 值等相关信息，防止用户篡改 cache 中的数据。Cache 文件格式如表 1 所示：

文件格式	说明
Expires	Cache 条目的过期时间
Last_Modified	HTTP 响应头中的 Last_Modified
LastValidateTime	Cache 条目的上次生成时间
FileDataLen	实际文件部分长度
FileHashLen	文件部分 hash 值的长度
UrlHashLen	URL HASH 值的长度
RespHeadLen	响应头的长度
FileData	实际文件部分
UrlHash	Url Hash 值
FileHash	File Hash 值
RespHead	相应头

表 1

在表 1 中，FileHashLen 表示文件部分 hash 值的长度，UrlHashLen 表示 URL HASH 值的长度，UrlHash 表示 URL 的 Hash 值，FileHash 表示 File 的 Hash 值，其余的都是现有 HTTP 协议中的内容，这里不再赘述。

另外，为了更好地与现有技术接轨，上述客户端可以由现有的浏览器

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（Brower）和新增的加速客户端组成。如图 3 所示，本发明实施例中的浏览器与现有的浏览器相同，并且在浏览器中设置该浏览器的 HTTP 代理服务器为加速客户端。而加速客户端执行本发明实施例中客户端的下载并缓存网页元素以及向 P2P SERVER 发布本客户端信息等功能。

由于 URL 的数目至少是上亿级的，而且 KEYURL 的数目也非常庞大，如果只有一台 P2P SERVER 处理，那么处理量非常巨大，对于浏览速度提高的效果不是很明显。为了进一步提高处理速度，可以在系统中提供多个 P2P SERVER，每个 P2P SERVER 处理一部分 KEYURL 的网页元素及其对应的客户端信息。也就说，本发明实施例将 URL 分段，然后各个 P2P SERVER 分别负责一段 URL 的相关处理。分段的方式可以有多种，例如按照 URL 的字母顺序分段，即分成 a*.*、b*.*至 c*.*、da*.*至 dk*.*……等等，其中*为通配符。下面详细介绍按照 URL 的 HASH 值来进行分段的方法。

每个 URL 都包含一个主机名，例如 http://game.qq.com/ad.swf 的主机名为 game.qq.com。可以直接对主机名计算 HASH 值，但是主机名的数量巨大，如果这么做，会产生很大的数据量，为了减少数据量，这里以采用二级域名 qq.com 计算 HASH 值为例说明，当然也可以采用三级域名等。

为此，如图 1 所示，本发明实施例中的系统进一步包括分段 SERVER。分段 SERVER 对上面所述的二级域名的 HASH 值做一个分段，每台 P2P SERVER 只负责其中一段的用户信息的保存和查询。

例如，采用的 HASH 算法是映射到整型（INT）数据空间，分段 SERVER 选择分为 4 段：[0-10 亿)、[10 亿-20 亿)、[20 亿-30 亿)以及[30 亿-40 亿)，分别对应于 4 台 P2P SERVER。该分段情况如图 4 所示。

假设 qq.com 计算出来的 hash 值落在[10 亿-20 亿)这个分段中，那么客户端对于二级域名是 qq.com 的 URL 的发布和查询请求都会发送到 P2P SERVER B 上来处理。

另外，为了获取最新并且准确的分段情况，加速客户端在启动的时候可

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以登录到分段 SERVER 获取 URL 与 P2P SERVER 的对应关系或者 URL 二级域名的 HASH 值与 P2P SERVER 的对应关系，如以表格存在的分段表，同时还获取其他的运行时参数，如发布和查询的时间间隔等等。

下面参照图 5，描述本发明实施例中客户端下载网页元素以及发布信息的流程。

如图 5 所示，该流程包括主要包括以下步骤：

步骤 101，加速客户端启动，并监听代理端口，准备处理浏览器的代理请求。

步骤 102，加速客户端登录分段 SERVER，获取分段表和其它运行参数，如发布和查询的时间间隔等。

步骤 103，加速客户端接收到浏览器请求的 URL，例如浏览器请求的 URL 为 http://game.qq.com/ad.swf。

步骤 104，计算 URL 二级域名的 HASH 值，根据从分段 SERVER 获取分段表得知其属于 P2P SERVER B 处理，然后向 P2P SERVER B 发送查询种子的请求，即查询与 URL 对应的客户端信息的请求，该请求中至少携带网页元素的 URL。

P2P SERVER B 接收到请求后会将与上述 URL 对应的客户端信息返回给请求的加速客户端。

步骤 105，加速客户端接收到查询种子的回应，根据其中的客户端信息创建 P2P 连接通道，并开始以 P2P 方式下载网页元素。

在执行步骤 104 至步骤 105 的时候，可以同时执行下述步骤 106，以使用 HTTP 方式和 P2P 方式协同下载网页元素。当然以可以只执行步骤 104 至步骤 105。

步骤 106，加速客户端根据网页元素的 URL 启动 HTTP 方式的从 WEB SERVER 下载网页元素。

需要注意的是，当前的 HTTP 标准只能支持 HTTP 方式下载文件时从前

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往后下载，所以使用 HTTP 和 P2P 协同下载时，可以选择 HTTP 方式从前往后下载，而 P2P 方式从后往前下载，当两者到达结合点时，下载完成。这样可以避免资源的浪费，节约 HTTP 方式以及 P2P 方式的下载流量。

步骤 107，使用 P2P 方式或者 HTTP 和 P2P 协同的方式下载网页元素完成。

步骤 108，在下载完成之后，加速客户端将所下载的网页元素缓存在本地，并向 P2P SERVER B 发布下载完成信息，即发布 URL 和与其对应的本客户端信息。

另外，下载完成之后，客户端的浏览器可以根据所下载的网页元素浏览该网页。

另外，由于 Web 网页元素的更新非常频繁，需要解决使用 P2P 下载的文件是否是网页中最新的文件的问题，或者 P2P 下载的文件和 HTTP 下载的是否同一个文件的问题。在 HTTP 协议里有个 Last_Modified 的标识表示文件的修改时间，本发明实施例根据该标识来判断所下载的文件是否是最新的。该流程如图 6 所示，包括以下步骤：

步骤 201，在开始下载的时候，加速客户端设置 Last_Modified 的初始默认值 time1。

步骤 202，按照上述步骤 104 至 105 以及步骤 106 启动 P2P 以及 HTTP 下载。

步骤 203，判断在交互过程中是否得到新的 Last_Modified，即所获得的 Last_Modified 是否与本地 Last_Modified 不同，如果是，则执行步骤 204 及其后续步骤，否则执行步骤 205 及其后续步骤。

步骤 204，将本地 Last_Modified 更新为新的 Last_Modified，并执行步骤 202。

步骤 205，下载完成，执行步骤 206。

步骤 206，判断是否通过 HTTP 方式得到了 Last_Modified，如果是则执

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行步骤 207，否则执行步骤 208。

步骤 207，根据从 HTTP 方式获取的作为标准，验证所下载的文件是否是最新，如果是，则执行步骤 209，确认下载最终完成，并结束流程；否则，执行步骤 204。

步骤 208，判断 HTTP 方式是否超时，如果是，则执行步骤 207，否则再次执行步骤 206。

根据上述流程，可以使得客户端下载的网页元素是 WEB SERVER 上最新的网页元素。

另外，在 P2P 下载方式中，校验问题一直比较突出，常规的做法是 WEB SERVER 保存文件的 HASH 值供客户端下载，然后客户端根据从 WEB SERVER 下载的 HASH 值和对下载文件计算得到的 HASH 值进行验证，如果一致，则验证出下载的文件是正确的，否则下载的文件不正确，需要重新下载。但是在 WEB 浏览的场景下文件太多，WEB SERVER 即使可以保存 HASH 值，客户端获取这些 HASH 值的通讯包量也过大，极大地延迟了下载和浏览速度。

在本发明实施例中，优选地采用多客户端验证的策略，即：在 P2P 方式下载网页元素时同时下载 HASH 值，并且验证所下载的 HASH 值和根据下载数据计算得到的 HASH 值，进一步对于通过 P2P 方式获取到的网页元素，只有经过其他 2 个以上的客户端的 HASH 值验证过以后才能确认是正确的，否则重新下载。

以上所述仅为本发明的较佳实施例而已，并不用以限制本发明，凡在本发明的精神和原则之内，所作的任何修改、等同替换、改进等，均应包含在本发明的保护范围之内。

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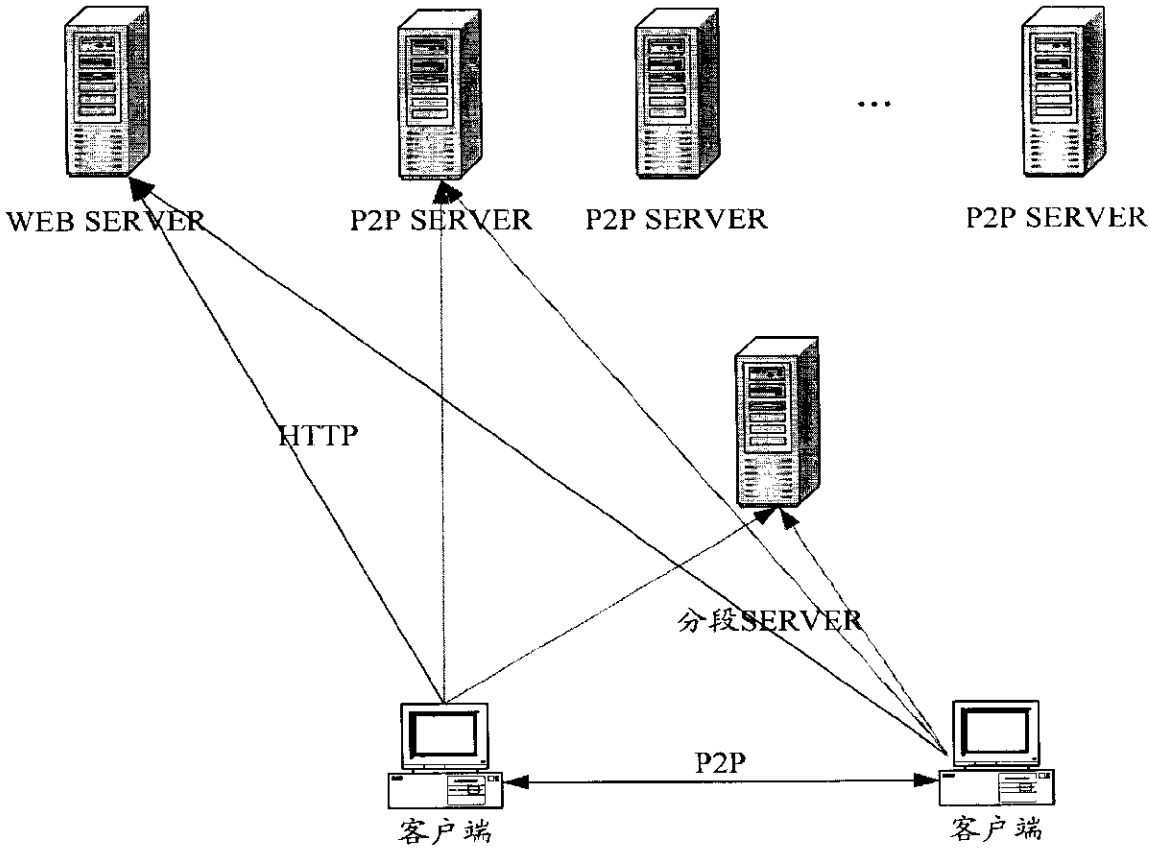


图 1

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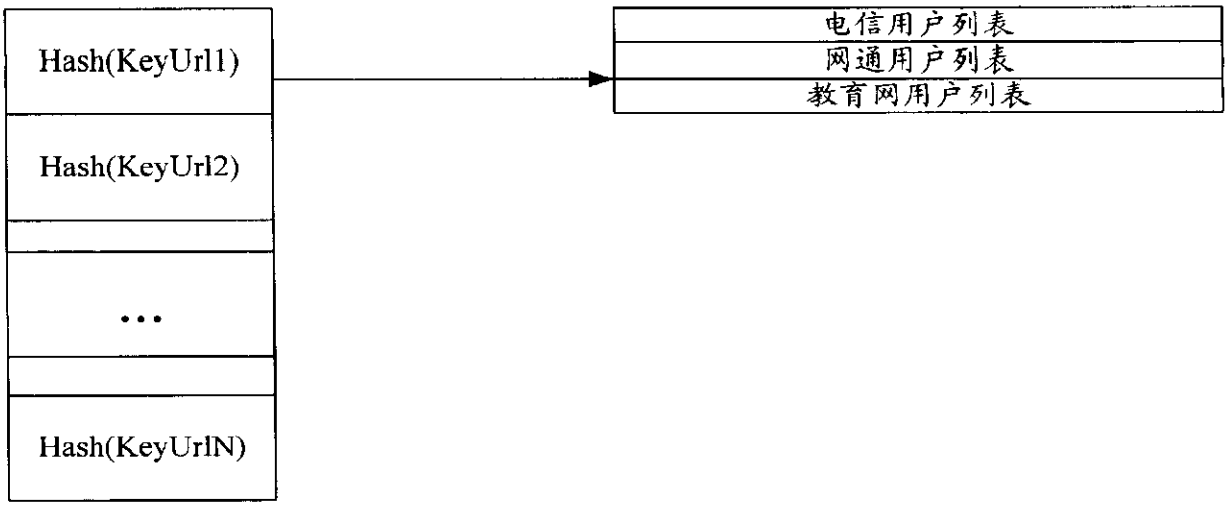


图 2

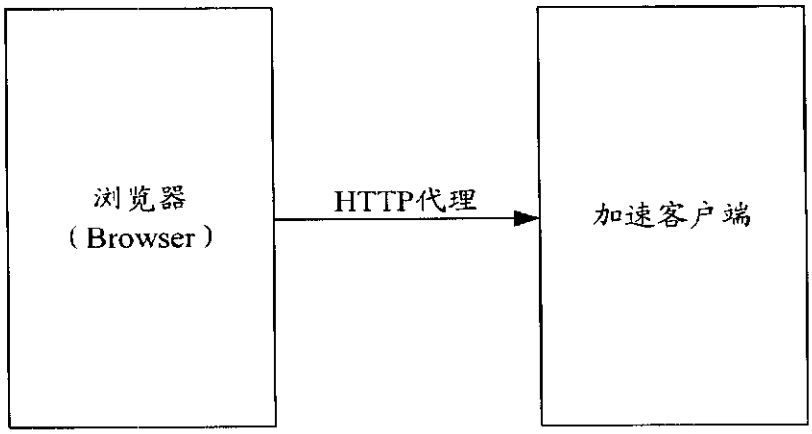


图 3

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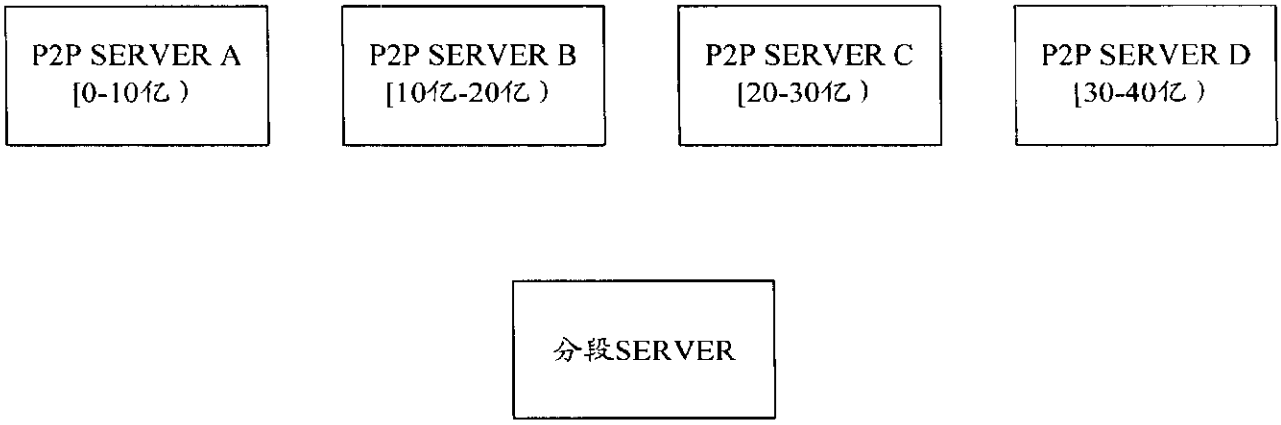


图 4

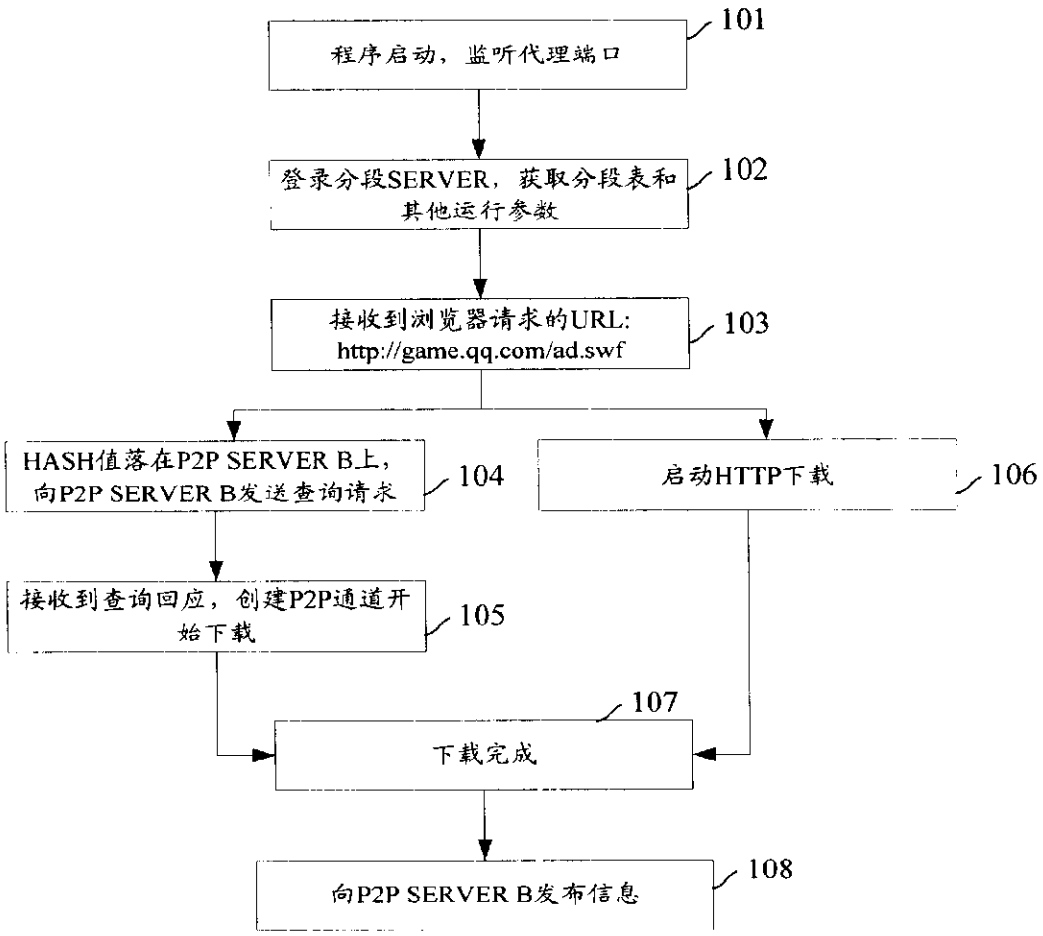


图 5

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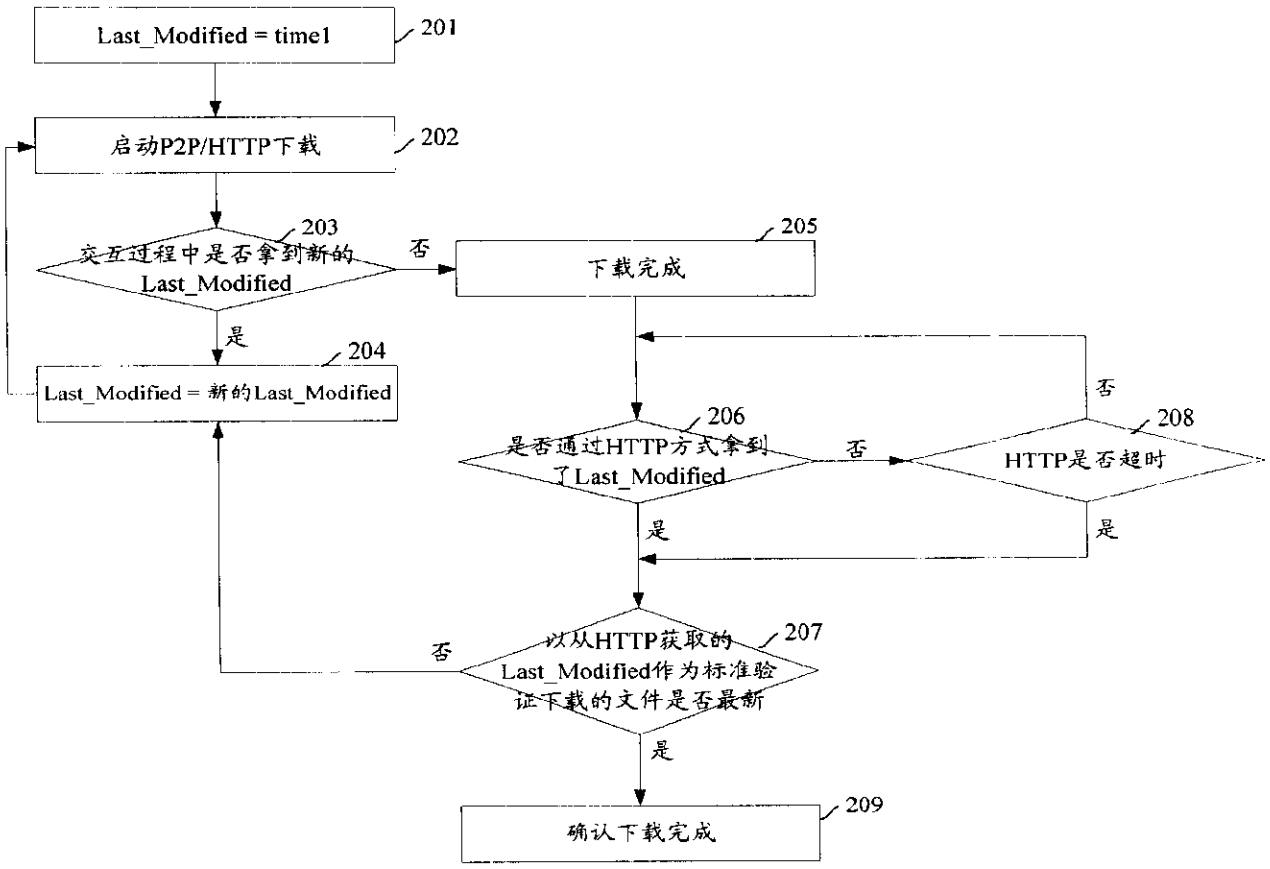


图 6

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Electronic Acknowledgement Receipt

EFS ID:	21190715
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	13-JAN-2015
Filing Date:	12-SEP-2013
Time Stamp:	09:27:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	S0490872.pdf	293417 570290021677 01fe06558e390bd6fd528fdf6861	no	4

Warnings:	
Information:	

This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	S0490904.pdf	753748 2fca9d7b44825ed8729d76cf0bfce9a27cfd7331	no	17
Warnings:					
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			Total Files Size (in bytes):	1047165	

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New International Application Filed with the USPTO as a Receiving Office

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(Not for submission under 37 CFR 1.99)

Application Number	14025109
Filing Date	2013-09-12
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20080109446	A	2006-05-08	Wang	

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	1	2007-280388	JP	A	2007-10-25	XEROX CORPORATION		☐

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	19459-6105P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Peter A. Nieves/	Date (YYYY-MM-DD)	2014-11-18
Name/Print	Peter A. Nieves	Registration Number	48173

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14025109
	Filing Date	2013-09-12
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	19459-6105P

	1	KEI SUZUKI, a Study on Cooperative Peer Selection Method in P2P Video Delivery, Vol 109, No . 37, IEICE Technical Report, The Institute of Electronics, Information and Communication Engineers, May 14, 2009, Vol 109	☐

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Espacenet

Bibliographic data: JP2007280388 (A) — 2007-10-25

PEER-TO-PEER FILE SHARING SYSTEM AND METHOD USING DOWNLOADABLE DATA SEGMENT

Inventor(s): ST JACQUES ROBERT J ± (ST JACQUES ROBERT J)

Applicant(s): XEROX CORP ± (XEROX CORP)

Classification: - **international:** ***G06F12/00; G06F13/00***
- **cooperative:** **H04L67/104**; **H04L67/108**; H04L67/32

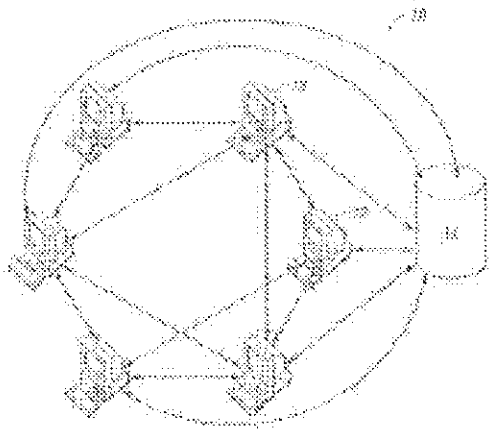
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Abstract of JP2007280388 (A)

PROBLEM TO BE SOLVED: To provide a peer-to-peer filing sharing system and method which overcomes the problem associated with prior art P2P network system. SOLUTION: The peer-to-peer filing sharing system includes a network 10 having a plurality of peers 12. And the peers 12 include a processor for performing a set of programmable instructions for executing a set of programmable instructions for performing a peer-to-peer filing sharing method including: a step of requesting at least one segment of a file from at least one peer of a plurality of peers 12 of the network; and a step of providing at least a portion of the at least one requested segment to at least one peer 12. ;COPYRIGHT: (C)2008,JPO&INPIT



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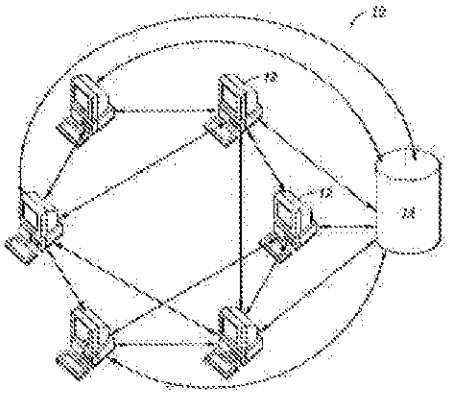
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(54)【発明の名称】ダウンロード可能データセグメントを使用するピアツーピアファイル共有システムおよび方法

(57)【要約】
【課題】先行技術のＰ２Ｐネットワークシステムに関連する問題を克服するピアツーピアファイル共有のシステムおよび方法の必要性がある。
【解決手段】ピアツーピアファイリング共有システムは、複数のピア１２を有するネットワーク１０を備える。また、ピア１２は、ネットワークの複数のピア１２のうちの少なくとも１つのピア１２にファイルの少なくとも１つのセグメントを要求するステップと、少なくとも１つの要求されたセグメントの少なくとも一部を少なくとも１つのピア１２に提供するステップと、を含むピアツーピアファイリング共有の方法を実行するためのプログラマブル命令のセットを実行するプロセッサを備える。
【選択図】図１



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【特許請求の範囲】
【請求項１】
ピアによってネットワーク上の複数のピアのうちの少なくとも１つのピアにファイルのセグメントを要求するステップと、
前記ネットワーク上の前記複数のピアのうちの前記少なくとも１つのピアによって要求されたセグメントの少なくとも一部を前記ピアに提供するステップと、
を含むことを特徴とするピアツーピアファイリング共有の方法。
【請求項２】
請求項１に記載の方法であって、さらに、
前記ピアによって要求されたセグメントの少なくとも一部をダウンロードするステップと、
前記ダウンロードされたセグメントの少なくとも一部をデータベースに格納するステップと、
前記複数のピアの別のピアに、前記ピアによって要求されたセグメントの少なくとも一部を提供するステップと、
前記複数のピアの別のピアにより別のセグメントの少なくとも一部を同時にダウンロードするステップと、
を含むことを特徴とする方法。
【請求項３】
複数のピアを有するネットワークと、
ネットワークの複数のピアのうちの少なくとも１つのピアにファイルの少なくとも１つのセグメントを要求するステップと、前記少なくとも１つの要求されたセグメントの少なくとも一部を少なくとも１つのピアに提供するステップと、を含むピアツーピアファイリング共有の方法を実行するためのプログラマブル命令のセットを実行するプロセッサと、
を備えることを特徴とするピアツーピアファイリング共有システム。
【請求項４】
請求項３に記載のシステムであって、
前記方法は、
クエリーを前記複数のピアに同報通信するステップと、
前記同報通信されたクエリーに応答して前記複数のピアから少なくとも１つの応答を受け取るステップと、
前記要求されたセグメントの少なくとも一部を提供するように応答するピアを選択するステップであって、前記クエリーは前記要求されたセグメントのパラメータの１つおよび要求されたデータセグメントを記述するフィルタとを含み、前記少なくとも１つの応答はオフセットおよび前記要求されたセグメントの長さを超えない長さを指定するメッセージを含むステップと、
をさらに含むことを特徴とする、システム。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、ピアツーピアファイル共有システムおよび方法に関する。
【背景技術】
【０００２】
ピアツーピア（Ｐ２Ｐ）ネットワークシステムにおいて、ファイルの完全コピーを有する１つ以上のピア（提供者）およびダウンロードすることによってファイルを取得することを望むその他のピア（利用者）の間でファイルを共有する方法がある。利用者は、ファイルの全体または一部をダウンロードしてしまうと、ファイルを他の利用者に提供し始めることもある。このようにして、ピアは、ファイルをダウンロードおよびアップロードする「作業」をＰ２Ｐネットワークシステムにわたって分散する。ファイルのダウンロードは、最初のバイトから始まり、ファイル全体がダウンロードされるまで、最終バイトまで

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順次に進む。

【０００３】

前述のピアツーピアファイル共有方法の主要な問題は、利用者が誰もファイルの完全なコピーを持たないことにある。したがって、提供者が使用できなくなった場合、利用者は、ダウンロードを続行するために、完全なファイルが利用できるようになるのを無期限に待ち続けなければならない。ファイルが再び使用可能になった場合、ダウンロードは、前回正常に取り出されたバイトのオフセットから開始する。

【０００４】

問題は特に、全ファイルの完全なコピーを有するピアツーピアファイル共有システムのピアがほとんどいない場合に生じる。ファイルが大型ファイルである場合、問題はさらに悪化する。問題は、以下の例によって説明される。

１．ピアＡがピアツーピア（Ｐ２Ｐ）ネットワークシステムに接続し、Ｆｉｌｅ１．ｔｘｔ（１０２４バイト）をネットワークで使用できるようにする。

２．ピアＢは、第１バイトから始めてファイルをピアＡからダウンロードし始め、５１２バイトのデータを正常にダウンロードし、データの提供を開始する（この時点でピアは提供者でもあり利用者でもある）。

３．ピアＣは、第１バイトから始めてファイルをピアＡからダウンロードし始め、２５６バイトのデータを正常にダウンロードする。

４．ピアＡはネットワークから切断する（あるいは、Ｆｉｌｅ１．ｔｘｔの提供を中断する）。

５．ピアＣは、ピアＢからのデータのダウンロードを続行し、さらに２５６バイトのデータを正常にダウンロードする（合計５１２バイト）。

【０００５】

この時点において、ピアＢは、ピアＡがネットワークから切断する前に最初の５１２バイトをダウンロードすることしかできないので、Ｆｉｌｅ１．ｔｘｔの後半の５１２バイトのコピーを有する提供者はＰ２Ｐネットワークシステム上にいないことになる。ピアＢおよびピアＣはいずれも、完全なファイルが使用可能になるのを無期限に待つ必要がある。他の利用者がＰ２Ｐネットワークに接続してファイルを要求した場合、ピアＢおよびピアＣは、ダウンロードされたファイルの部分コピーを他のピアに提供することができるが、ファイルの完全コピーを持つ提供者がＰ２Ｐネットワークに接続するまでは、利用者は誰もファイルをダウンロードすることができなくなり、データ転送の進行を事実上停止させる。

【０００６】

ピアは多くの場合、ファイルの完全コピーが可能な限り長時間Ｐ２Ｐネットワークシステム上に確実にとどまるようにするため、ファイルのダウンロード後に「厚意」としてしばらくの間ファイルを引き続き提供することが期待される。多くの場合、Ｐ２Ｐネットワークシステム上で使用可能なファイルの完全コピーはほとんどない、これはつまり、提供者が切断した場合、Ｐ２Ｐネットワークシステム全体のファイルの可用性を損なうということである。

【発明の開示】

【発明が解決しようとする課題】

【０００７】

以上のことから、先行技術のＰ２Ｐネットワークシステムに関連する問題を克服するピアツーピアファイル共有のシステムおよび方法の必要性がある。

【課題を解決するための手段】

【０００８】

本開示によれば、Ｐ２Ｐネットワークシステム内のピアが不確定の順序で大型ファイルのセグメントをダウンロードして、それらをデータベースに格納し、それらのセグメントをＰ２Ｐネットワークシステム内の他のピアが使用できるようにする、ピアツーピアファイリング共有のシステムおよび方法が提供される。Ｐ２Ｐネットワークシステム内の少数

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のピアのみがいつでもファイルの完全コピーを有することができる可能性を考慮すれば、完全なファイルからの異なるセグメントのサブセットをそれぞれ有する潜在的に多数のピアは、即座にセグメントを他のピアが使用できるようにすることができる。

【０００９】

十分な数のピア、および適度な時間を与えられれば、たとえ元の提供者がＰ２Ｐネットワークシステムから切断するか、または何らかの他の理由により使用不可能になったとしても、ファイルの完全コピーが存在し、Ｐ２Ｐネットワーク全体を通じて配布される可能性は極めて高い。これにより、それぞれファイルの不完全なコピーを持つ残りのピアは、ファイルのさらに完全なコピーを作成するためにファイルのセグメントを引き続き交換することができる。たとえ使用可能なセグメントのスーパーセットが完全なファイルではない場合であっても、さまざまなピアは、元のファイルのソースが利用できなくなった後に引き続きデータを交換することができ、（最終的にすべてのピアがセグメントの同一セットを有するまで）各ピアでファイルのさらに完全なコピーを作成することができるようになる。

【００１０】

本開示によれば、ピアツーピアファイル共有システムは、Ｐ２Ｐネットワークシステム向けに提供される。ファイル共有システムは、ピアツーピアファイリング共有方法を実行するためのプログラマブル命令のセットを実行する複数のピアを有するネットワークおよびプロセッサを含む。方法は、ネットワークの複数のピアのうちの少なくとも１つのピアにファイルの少なくとも１つのセグメントを要求するステップと、少なくとも１つの要求されたセグメントの少なくとも一部を少なくとも１つのピアに提供するステップとを含む。システムはさらに、ファイルの少なくとも１つのセグメントを格納するデータベースを含む。

【００１１】

本開示はさらに、ピアツーピアファイリング共有の方法を提供する。方法は、ピアによってネットワーク上の複数のピアのうちの少なくとも１つのピアにファイルのセグメントを要求するステップと、要求されたセグメントの少なくとも一部をネットワーク上の複数のピアのうちの少なくとも１つのピアによってピアに提供するステップとを含む。方法はさらに、ピアによって要求されたセグメントの少なくとも一部をダウンロードするステップと、ダウンロードされたセグメントの少なくとも一部をデータベースに格納するステップとを含む。要求されたセグメントは、要求されたセグメントの長さを指定する表記によって識別される。表記は（ｘ，ｙ）であり、ここでｘは要求されたセグメントが開始するオフセットを指定し、ｙは要求されたセグメントの長さを指定する。

【００１２】

方法はさらに、元のソースからまだ取り出されていないセグメントを判別するためにデータベースをスキャンすることによりピアによって要求されたセグメントを選択するステップと、判別されたセグメント内からのランダムオフセット、およびランダムオフセットと判別されたセグメントの終点との間のランダム長さを選択するステップとを含む。

【００１３】

本開示によれば、データセグメントが、ファイル、特に大型ファイルのさらに完全なコピーを作成するためにＰ２Ｐネットワークシステムの２つ以上のピア間で共有または交換できるようにする、ダウンロード可能なデータセグメントを使用するピアツーピアファイル共有のシステムおよび方法が提供される。

【発明を実施するための最良の形態】

【００１４】

ここで、図１および図３を参照すると、本開示による模範的なＰ２Ｐネットワークシステムおよび方法のブロック図がそれぞれ示される。全体を通して参照番号１０によって指定されている本開示のＰ２Ｐネットワークシステムは、６つのピア１２、および６つのピア１２の各々と通信するデータベース１４を含む。各ピア１２は、本開示による方法を実行するための少なくとも１つのプロセッサを含む。

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【００１５】
少なくとも１つのプロセッサは、本開示による方法を実行するための本明細書で以下に説明される機能およびステップを実行する。特に、少なくとも１つのプロセッサは、本開示によるシステムおよび方法の機能を実行するための一連のプログラマブル命令を有するアプリケーションソフトウェアを実行する。アプリケーションソフトウェアは、ＣＤ－ＲＯＭ、ＤＶＤ、ハードドライブ、およびディスケットなどのコンピュータ可読媒体に格納されうる。
【００１６】
本開示によるピアツーピアファイル共有のシステムおよび方法は、ファイルの完全コピーを有する別のピア１２が使用不可になるか、または使用不可状態にある場合、ファイルのダウンロードを試みて別のピア１２を無期限に待たなければならないというピア１２の問題を解決するか、または少なくとも問題を大幅に軽減する。本開示によるシステムおよび方法は、ファイルがＰ２Ｐネットワークシステム１０のピア１２間で共有または転送される方法を変える。
【００１７】
本開示によれば、ピア１２（利用者）は、望ましいファイル内のさまざまなオフセットから選択されたセグメントを要求する（セグメントを選択するメカニズム（たとえば、ファイル内のオフセット、および各セグメントの長さ）は本明細書において以下で詳細に説明される）。セグメントは、各ピア１２にローカルなデータベース１４に保存され、ピア１２（提供者）は直ちに、これらのセグメントを関心のある利用者に提供し始める。セグメントはファイル全体にわたるオフセットから選択されるので、たとえ元の提供者がＰ２Ｐネットワークシステム１０から切断した場合であっても、ファイルの完全（またはほぼ完全な）コピーが残りの利用者間に存在する可能性がはるかに高くなる。利用者は、各利用者が使用可能なセグメントのスーパーセットのコピーを持つまで、ファイルのセグメントを引き続き交換することができる。たとえ各利用者がファイルの完全コピーを有していない場合であっても、ダウンロードの順次的な特性を考慮すれば、従来のＰ２Ｐネットワークシステムで可能となるよりもはるかに多くのファイルの部分を有する可能性が高い。
【００１８】
セグメントは、表記（オフセット、長さ）を使用して例に示される。たとえば、（２５６、５１２）はオフセット２５６で開始してオフセット５１２で終了するセグメントではなく、オフセット２５６で開始して長さが５１２単位のセグメントを示す。最も一般的に使用されるデータ転送の測定単位はバイトであるが、本明細書に説明されるメカニズムは、任意の測定単位に適用されうる（たとえば、ビット、バイト、ワードなど）。
【００１９】
以下の例は、本開示によるシステムおよび方法の動作を説明する。
１．ピアＡがＰ２Ｐネットワークシステム１０に接続し、Ｆｉｌｅ２．ｔｘｔ（１０２４バイト）をＰ２Ｐネットワークシステム１０で使用できるようにする。
２．ピアＢは、ピアＡからファイルをダウンロードし始め、（５１２、５１２）のセグメントを正常に取得する。
３．ピアＣは、ピアＡからファイルをダウンロードし始め、（０、２５６）のセグメントを正常に取得する。
４．ピアＡはＰ２Ｐネットワークシステム１０から切断する（あるいは、Ｆｉｌｅ２．ｔｘｔの提供を中断する）。
５．ピアＢは、ピアＣからファイルをダウンロードし始め、（０、２５６）のセグメントを正常に取得する（ここでピアＢはファイルの２つのセグメント（０、２５６）および（５１２、５１２）を有する）。
６．ピアＣは、ピアＢからファイルをダウンロードし始め、（５１２、５１２）のセグメントを正常に取得する（ここでピアＣはファイルの２つのセグメント（０、２５６）および（５１２、５１２）を有する）。
【００２０】

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この時点で、Ｐ２Ｐネットワークシステム１０にファイルの完全なコピーを有する提供者はいないので（セグメント（２５６、２５６）が欠落）、この例は理想的なシナリオを提供しないが、ピアＢおよびピアＣは他の場合に比べてファイルの大きい部分を有し、背景技術のセクションに示されている例における同等のピアと全く同じバイト数を各々ピアＡから転送されているにもかかわらず、各ピアに使用可能なファイルの７５％をもたらす。

【００２１】

本開示によるシステムおよび方法を使用すれば、前述の例によって分かるように、元の提供者がＰ２Ｐネットワークシステム１０から切断された後にピア１２がファイルのセグメントを引き続き交換し、ピア１２がそれぞれデータの異なるセグメントを有するので、Ｆｉｌｅｉ．ｉｘｉの全体的な配布は改善されている。さらに重要なことに、任意の提供者がセグメントを欠落した状態でＰ２Ｐネットワークシステム１０に接続した場合（必ずしも完全なファイルでなくてもよい）、すべてのピア１２は欠落したセグメントを交換して、各ピア１２においてファイルの完全コピーを作成することができる。Ｐ２Ｐネットワークシステム１０のすべての使用可能なセグメントのスーパーセットがファイルの完全コピーを含む限り、すべてのピア１２が作業を続行するため、いずれのピア１２もファイル全体を有する必要はない。このことは、すべてのピアがファイルにアクセスするために、ファイルの完全コピーがＰ２Ｐネットワークシステム上のどこかに存在する必要があるという点において、従来のＰ２Ｐネットワークシステムとは異なる。

【００２２】

これは、ほんの（比較的）短期間のみ（各セグメントが少なくとも１つのピアによってダウンロードされるまで）完全なファイルを使用可能にするために、各ピアがダウンロードするファイルのセグメントがインテリジェントに選択され、元の提供者が切断できるようにするか、またはＰ２Ｐネットワークシステム１０に悪影響を及ぼすことなくファイルの提供を停止できるようにする場合に可能である。ピア１２の数が増加すれば、それに応じて、ファイルの完全コピーを含むことが必要とされる提供者の数は減少する。

【００２３】

データセグメントは、オフセットおよび長さを使用して定義されたファイルまたはドキュメントのコンテンツの順次的サブセットである。オフセットは、セグメントの開始するファイル内の位置を示す（たとえば、「０」のオフセットはファイル内の１番目のバイトを参照し、「９９」のオフセットはファイル内の１００番目のバイトを参照する）。長さは、オフセットから開始するセグメント内のデータの量を示す（たとえば、「０」のオフセットおよび「５」の長さは、ファイル内のバイト０、１、２、３、および４を参照する）。前述のように、セグメントは本明細書において、表記（オフセット，長さ）を使用して表される。

【００２４】

図１に示されるように、「純粋な」Ｐ２Ｐネットワークシステムにおいて、システムおよび使用可能なリソースに関する情報を収集する中央データリポジトリまたはサーバーはない。そのようなシステムにおいて、ピアは、要求をネットワークに同報通信して応答を待つことにより通信する必要がある。利用者はそのような同報通信メッセージを使用して、望ましいリソースのＰ２Ｐネットワークシステムに要求を発行し、提供者は、要求されたリソース内のデータの少なくとも一部を提供できるとき、かつそのときに限り応答する。提供者は、同様のメカニズムを使用して使用可能なリソースを通知し、利用者は、リソース内のデータの少なくとも一部を要求するとき、かつそのときに限り応答する。

【００２５】

その他のＰ２Ｐネットワークシステムは、サーバーを使用する（ローカルリソースを追跡してその他のリソースの要求をドメインネームシステムが機能する方法と同様の階層まで転送する中央に位置する「トラッカー」または分散サーバー）。そのようなシステムにおいて、ピアは、Ｐ２Ｐネットワークシステム１０に接続する際に同報通信要求を発行してトラッカーを発見することができる。そのような要求には、トラッカーのみが応答する

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（その他のピアは要求を完全に無視する）。提供者は、トラッカーを発見すると、使用可能なリソースをトラッカーに通知する。利用者は、リソースの要求をトラッカーに直接発行し、トラッカーは、要求されたリソースを転送することのできる１つ以上の提供者で応答する。

【００２６】

Ｐ２Ｐネットワークシステム１０上の任意のピアがトラッカーの役割を引き受けるように選択することが可能であるが、トラッカー、提供者、および利用者の役割は論理的に別個であると見なされる。

【００２７】

利用者は、多くの方法でセグメントを選択することができるが、そのうちのいくつかが本明細書において説明される。どのような場合でも、利用者が一度に大量のデータをダウンロードしようと試みることを防ぐため、セグメントの最大長は比較的小さい数値に制限することが推奨される。セグメントが小さくなれば、それに応じて、提供者が利用できなくなる前に利用者がセグメント全体を取り出すことができる可能性も高くなる（ただし、以下に次のサブセクションで説明されるように、利用者は部分的セグメントを容易に処理することができる）。

【００２８】

利用者は、完全にランダムなセグメントを選択することができる。利用者は、まだ取り出されていない任意のセグメントをランダムに選択することによって（これはローカルデータベースをスキャンすることにより行うことができる）、これを行う。欠落しているセグメントは、すでに取り出されているセグメント間のバイトの全範囲であると見なされ、利用者がまだセグメントを取り出していない場合にはファイル全体を含むことができる。欠落セグメントが見つけ出されると、利用者はセグメント内からのランダムオフセット、オフセットとセグメントの終点との間のランダム長さを選択する。

【００２９】

利用者は、固定長のランダムなセグメントを選択することができる。利用者は、固定長を選択することにより（これは転送を開始する前、または構成可能プロパティを通じてランダムに決定されうる）、これを行う。次に利用者は、以下の計算を行う。

セグメントの数＝合計長／セグメント長

オフセット＝ランダム（セグメントの数）＊セグメント長

【００３０】

もちろん、利用者は、まだ取り出されていないセグメントに対するオフセットが見い出されるまでランダムオフセット選択を繰り返す必要がある。提供者はセグメントの一部のみを自由に転送することができ、利用者はセグメント全体を提供しない提供者を自由に選択できることに留意することは重要である。この場合、固定長のランダムセグメントを選択する利用者は、部分的セグメントを一時的にバッファに入れ、セグメントをローカルデータベースに格納する前に、全セグメントが転送されるまで残りのセグメントの後続の要求を発行する必要がある。

【００３１】

最後に、利用者は、受け入れ可能なセグメントを示すフィルタを使用して、セグメントを要求することができる。フィルタは、まだ利用者に転送されていないセグメントを表すバイト範囲のサブセットを指定すべきであり、通常はセグメントのリスト｛（オフセット、長さ）、（オフセット、長さ）、．．．｝によって表される。提供者は、リスト内の任意のセグメントのサブセグメントを記述する任意のオフセットおよび長さを自由に選択することができ、それを利用者に提供するよう提案する。これについては、以下で詳細に説明される。

【００３２】

セグメントが利用者によって転送するように選択されると、クエリーが同報通信の形式でＰ２Ｐネットワークシステム１０に発行されるか（「純粋な」Ｐ２Ｐネットワークシステムにおいて）、またはトラッカーへの要求が発行される必要がある。同報通信は、セグ

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メントのパラメータ（オフセットおよび長さ、または受け入れ可能なデータセグメントを記述するフィルタ）を含む必要がある。Ｐ２Ｐネットワークシステム１０上のピア１２は、セグメント内のデータの少なくとも一部を提供できるとき、かつそのときに限り応答する。応答は、セグメントのオフセット、および使用可能な長さ（利用者によって要求された長さより小さいかまたはそれと等しい）を含む。

【００３３】

利用者は、最初に応答する提供者を選択することも、または短期間待機して最善の提供者を選択するように選択することもできる。論理的には、最善の提供者は、要求されたセグメント全体を提供できる、最初に応答する提供者である。最初に応答する提供者は、要求を処理するための最多のリソースおよび／または最小のネットワーク待ち時間を備える可能性が高い。提供者のいずれもセグメント全体を提供することができない場合、利用者は、セグメントの多くを提供できる最初の提供者を論理的に選択する。どの提供者も応答しない場合、利用者は、同じセグメントまたは新しく選択されたセグメントに対する新しい要求をサブミットする前に、ある期間待機するように選択することもできる。

【００３４】

利用者が提供者を選択すると、利用者は、オフセットおよび長さを含む望ましいセグメントの提供者に要求を直接送信する。ピア間の接続が確立されると、利用者はセグメントをダウンロードし、それを一時バッファに流し込む。転送が完了すると、利用者はセグメントをローカルデータベースに書き込む。

【００３５】

転送が失敗した場合、利用者は要求を再発行することができる。高い失敗率を持つ提供者は、利用者によって（一時的または恒久的に）ブラックリストに掲載され、ある期間にわたりその提供者からの応答を完全に無視する、または可能であればいつでも単に他の提供者を使用するように、利用者が選択できるようになっている。利用者は、部分的に正常な転送を、より小さいデータセグメントの正常な転送として処理し、部分的セグメントをローカルデータベースに格納して、セグメントの残り（または全く新しいセグメント）に対する新しい要求を発行することができる。

【００３６】

利用者がセグメント（全体または部分）を正常に転送し、（チェックサムまたは他の何らかの検証のメカニズムを介して）随意的にセグメントの保全性を検証すると、セグメントはデータベース１４に格納される。データベース１４の実装については確定していないが、単に、各ファイルに格納されたセグメントを識別するために使用されるフラットファイルのセットおよびマニフェストを含むディレクトリであってもよい。これはまた、より堅固であってもよい（各セグメントを表す行、および各行内にＢＬＯＢとして格納されたバイナリセグメント自体を備えるテーブル含むＯｒａｃｌｅ（商標）データベースなど）。利用者は、セグメントの提供をより容易にするため、順次セグメントが格納されるときにこれらを連結する必要がある。利用者は、（セグメントが取り出される際に）同期的または非同期的に連結を実行するように選択することができる。連結が非同期的に実行される場合、（連結が実行中であることを示すために）セグメントはデータベース内でマーク付けされる必要があり、マーク付けされたセグメント内のデータの要求は、連結が完了するまで遅延される必要がある。そのような遅延された要求は、利用者に別の提供者を選択させる場合もあるが、これは利用者が連結にリソースを浪費している場合に適切である。

【００３７】

少なくともデータの一部がローカルに使用可能な特定のセグメントに関するクエリーを受け取る提供者は、オフセット、および要求されたセグメントの長さまでの（ただしこれを超えない）長さを含むメッセージで応答する必要がある。利用者がデータセグメントの要求で応答した場合、提供者は、利用者との接続を確立して、セグメント内のデータのアップロードを開始する必要がある。提供者は、どのセグメントがどの利用者に転送されたかに関する別個のデータベースを保持するように選択することもできる。特定の利用者への複数の転送が失敗した場合、提供者はその利用者を一時的にブラックリストに掲載し、

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他のより信頼できるピアによりよく対応できるときに、信頼できないピアへのデータ転送を試みてリソースを無駄にしないようにすることができる。

【００３８】

提供者はまた、利用者が必要とするデータセグメントを記述するフィルタを含むクエリーを受け取ることもできる。提供者は、フィルタによって受け入れられる要求されたリソースから現在使用可能である任意のセグメントの任意の長さでクエリーに自由に応答することができる。提供者は、Ｐ２Ｐネットワークシステム１０で使用可能なセグメントのスーパーセットがファイル全体のコピーを含む可能性を高めるためにあまり頻繁にはアップロードされていないセグメントを選択するため、提供者または他の利用者に送信されたセグメントに関する統計を使用することができるが、これは必須ではない。提供者はまた、ランダムにセグメントを選択することも、または単にセグメントを順次アップロードすることもできる。提供者は、フィルタによって受け入れられる任意のセグメントを全く自由に選択することができる。

【００３９】

標準的なＰ２Ｐファイル転送システムにおいて、リソースから最初のデータがクライアントに正常にダウンロードされたら直ちにリソースの提供を開始することは、利用者の礼儀であると見なされる。この期待は、本開示によるＰ２Ｐネットワークシステム１０にまで及ぶ。多くのそのようなＰ２Ｐネットワークシステムにおいて、リソース全体が利用者に転送された後に一定の時間リソースを引き続き提供することも、礼儀であると見なされる。このことは、リソースの１つ以上の完全コピーがいつでもＰ２Ｐネットワークシステム１０において使用可能なセグメントのスーパーセット内に存在する可能性がより高いため、本開示によるＰ２Ｐネットワークシステム１０においてはさほど重要ではない。

【００４０】

これ以降、ランダムに選択された固定長のセグメントを使用してデータを交換する少数のピア１２を含む流れの例について説明される。この例示のために、すべてのデータは、完全バイトの単位で転送される。セグメントは、表記（オフセット、長さ）を使用して定義される（たとえば、（０、２５６）はオフセット０で始まり、２５６バイトのデータを含むセグメントである）。フィルタは、セグメントのリストとして指定される（たとえば｛（０、２５６）、（５１２、２５６）｝、フィルタによって指定されているセグメント内のデータのサブセットを含む任意のセグメントはフィルタによって受け入れられる）。

１．ピアＡはＰ２Ｐネットワークシステム１０に接続し、１０２４バイトのデータを含むファイルであるＦｉｌｅ１．ｔｘｔの提供を開始する。ピアＡは、Ｆｉｌｅ１．ｔｘｔの送信元ソースである。

２．ピアＢはＰ２Ｐネットワークシステム１０に接続し、Ｆｉｌｅ１．ｔｘｔのセグメント（０、２５６）に対する同報通信クエリーを発行する。

３．ピアＡは、全セグメントを提供できることを示してクエリーに応答する。

４．ピアＢは、セグメント（０、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。

５．ピアＣがＰ２Ｐネットワークシステム１０に接続し、Ｆｉｌｅ１．ｔｘｔのセグメント（５１２、２５６）に対する同報通信クエリーを発行する。

６．ピアＢはクエリーを無視する。セグメント（５１２、２５６）は使用可能ではない。ピアＡは、全セグメントを提供できることを示してクエリーに応答する。

７．ピアＣは、セグメント（５１２、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。

８．ピアＢは、フィルタ｛（２５６、７６８）｝と一致する任意のセグメントに対するクエリーを同報通信する。

９．ピアＡは、セグメント（２５６、２５６）を提供できることを示してクエリーに応答する。ピアＣは、セグメント（５１２、２５６）を提供できることを示して要求に応答する。

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１０．ピアＢは、セグメント（５１２、２５６）の要求を直接ピアＣに発行する。ピアＣは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。
１１．ピアＣは、フィルタ｛（０、５１２）、（７６８、２５６）｝と一致する任意のセグメントに対するクエリーを同報通信する。
１２．ピアＡは、セグメント（７６８、２５６）を提供できることを示してクエリーに応答する。ピアＢは、セグメント（０、２５６）を提供できることを示してクエリーに応答する。
１３．ピアＣは、セグメント（７６８、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。ピアＣは、セグメント（５１２、２５６）および（７６８、２５６）の単一のセグメント（５１２、５１２）への連結を開始する。
１４．ピアＢは、フィルタ｛（２５６、２５６）、（７６８、２５６）｝と一致する任意のセグメントに対するクエリーを同報通信する。
１５．ピアＡは、セグメント（２５６、２５６）を提供できることを示してクエリーに応答する。ピアＣは、セグメント（７６８、２５６）を提供できることを示して応答する。
１６．ピアＢは、セグメント（２５６、２５６）の要求を直接ピアＡに発行する。ピアＡは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。ピアＢは、セグメント（０、２５６）、（２５６、２５６）、および（５１２、２５６）の単一のセグメント（０、７６８）への連結を開始する。
１７．ピアＡはＰ２Ｐネットワークシステム１０から切断する。ここで、Ｆｉｌｅ１．ｔｘｔの完全コピーを提供するピア１２はない。
１８．ピアＣは、フィルタ｛（０、５１２）｝と一致する任意のセグメントに対するクエリーを同報通信する。
１９．ピアＢは、セグメント（２５６、２５６）を提供できることを示してクエリーに応答する。
２０．ピアＣは、セグメント（２５６、２５６）の要求を直接ピアＢに発行する。ピアＢは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。ピアＣは、セグメント（２５６、２５６）および（５１２、５１２）の単一のセグメント（２５６、７６８）への連結を開始する。
２１．ピアＢは、セグメント（７６８、２５６）に対するクエリーを同報通信する。
２２．ピアＣは、セグメント（７６８、２５６）を提供できることを示してクエリーに応答する。
２３．ピアＢは、セグメント（７６８、２５６）の要求を直接ピアＣに発行する。ピアＣは、セグメントをピアＢに転送する。ピアＢは、セグメントをデータベース１４に格納する。ピアＢは、セグメント（０、７６８）および（７６８、２５６）の、完全なＦｉｌｅ１．ｔｘｔ（１０２４バイトのデータを含むファイル）への連結を開始する。
２４．ピアＣは、セグメント（０、２５６）に対するクエリーを同報通信する。
２５．ピアＢは、セグメント（０、２５６）を提供できることを示してクエリーに応答する。
２６．ピアＣは、セグメント（０、２５６）の要求を直接ピアＢに発行する。ピアＢは、セグメントをピアＣに転送する。ピアＣは、セグメントをデータベース１４に格納する。ピアＣは、セグメント（０、２５６）および（２５６、７６８）の、完全なＦｉｌｅ１．ｔｘｔ（１０２４バイトのデータを含むファイル）への連結を開始する。

【００４１】

この時点において、ピアＢまたはピアＣのいずれか一方がファイルの完全コピーをダウンロードする前に、ステップ１８においてピアＡがＰ２Ｐネットワークシステム１０から切断したという事実にもかかわらず、ピアＢおよびピアＣはいずれもＦｉｌｅ１．ｔｘｔの完全コピーを有する。この例は、リソースの完全コピーがＰ２Ｐネットワークシステム１０から除去された後にファイル転送が続行し、すべてのピア１２が完全コピーを取得す

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ることができるという理想的な状況を示している。図２は、データ転送を説明する。セグメントは最初、セグメントが転送されたピア１２を表すために網掛けされる。

【００４２】

この例は、本開示によるダウンロード可能データセグメントを使用するＰ２Ｐファイル転送のシステムおよび方法の利点を説明する。ピアＡがネットワーク１０から切断すると、ピアＢおよびピアＣは引き続き情報を交換し、断片をまとめてネットワーク１０上で使用可能なセグメントのスーパーセットからのファイルの完全コピーを作成することができる。

【００４３】

従来のＰ２Ｐネットワークシステムにおいて、ピアＡがシステムからＦｉｌｅ１．ｔｘｔを削除すると、残りのピアは、ピアＡまたは別の提供者がリソースの提供を続行するのを（無期限に）待つことを強いられる。一部の従来のＰ２Ｐネットワークシステムにおいて、この待機は数日、数週間に及ぶ可能性もあり、（最悪の場合）リソース全体が２度と使用可能にならないこともある。

【００４４】

現在説明されているシステムおよび方法には、他にも利点がある。前述の例において、ピアＡは、他のすべてのピアが取得する必要のある極めて重要なリソースを取得する最初のピアである。Ｐ２Ｐネットワークシステム内の複数のピアが大容量のソフトウェアパッチを取得する必要があるシナリオを想定されたい。単一のピアが、ファイアウォール経由で接続してインターネットからパッチをダウンロードすることを許可される。パッチはここで、Ｐ２Ｐネットワークシステム上の残りのピアに配布される必要がある。このダウンロードはネットワーク内のピアごとに１回しか発生しない。それはつまり、ピア間の今後の配布は最小限となり、このため利用者間でパッチを配布できる従来のＰ２Ｐシステムの能力を活用することは最低限に抑えられるということである。

【００４５】

そのような従来のＰ２Ｐネットワークシステムにおいて、データ転送はデータの第１バイトから開始し、ファイルの終わりまで順次遂行する。ごく少数の提供者が完全なファイルにアクセスすることができ、大多数の利用者すべてがほぼ同じ速度でほとんど同時に開始してファイルをダウンロードしている場合、提供者に膨大なストレスをもたらす結果になる（印刷装置の状態の監視または診断の実行など、ピアが厳密にはファイル処理に関連しない作業を実行するためにリソースを使用することが予期される場合、潜在的に破滅的なシナリオ）。利用者がすべて、同時間にファイルのほぼ同じ部分をダウンロードしたということはつまり、利用者間の共有はほとんど発生しえない、またはほとんど発生しないということである。

【００４６】

しかし、本開示によるシステムおよび方法において、利用者はそれぞれファイルの異なる部分をダウンロードし、それぞれのピアとの別個のセグメントの交換を直ちに開始して、元のコンテンツ提供者のストレスを取り除くことができる。

【００４７】

図３は、前述の流れの例と類似した単一の利用者のイベントの流れを概説する。図３によって示される流れにおいて、利用者は、接続し、単一のファイル（または以前開始されたファイルの残り）をダウンロードし、次いでＰ２Ｐネットワークシステム１０から切断する。ステップ３００において、利用者はＰ２Ｐネットワークシステム１０に接続し、ステップ３０２においてダウンロードするセグメントを選択する。ステップ３０４において、利用者は、選択したセグメントを要求してＰ２Ｐネットワークシステム１０内の他のピアにクエリーを同報通信する。

【００４８】

ステップ３０６において、提供者がクエリーに応答するかどうかが判別される。応答しない場合、利用者はステップ３０８において短時間待機してから、ステップ３０２において、同じセグメントまたはダウンロードする別のセグメントを選択する。応答する場合、

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利用者は、クエリーに応答した少なくとも１つの提供者に要求を送信する。ステップ３１２において、利用者は提供者からの着信接続を受け入れ、ステップ３１４において、利用者はセグメントをバッファにダウンロードする。ダウンロードされたセグメントは次に、ステップ３１６において利用者によってデータベース１４に保存される。

【００４９】

ステップ３１８において、ダウンロードされたセグメントに隣接するセグメントがデータベース１４内に存在するかどうかが判別される。存在しない場合、ステップ３２０において、ファイルが利用者に完全に転送またはダウンロードされたかどうかが判別される。応答する場合、利用者は、ステップ３２２において、Ｐ２Ｐネットワークシステムから切断する。ステップ３１８においてダウンロードされたセグメントに隣接するセグメントがあると判別された場合、ファイルが利用者に完全に転送されたかどうかがステップ３２０において判別される前に、利用者はステップ３２４においてセグメントを連結する。ステップ３２０において、ファイルが利用者に完全に転送されていないことが判別された場合、プロセスは、ファイルの別のセグメントが転送またはダウンロードされるように利用者が選択するステップ３０２に戻る。

【００５０】

上記で開示されているさまざまな特徴および機能、あるいはそれらの代替は、他の多くのさまざまなシステムまたはアプリケーションに望ましく組み合わされうることが理解されよう。さまざまな現在予測または予期されない代替、変形、変異、または改善は、付属の特許請求の範囲によって網羅されることも意図され、当業者によって引き続き行われうる。

【図面の簡単な説明】

【００５１】

【図１】本開示によるＰ２Ｐネットワークシステムを示すブロック図である。

【図２】本開示による、ピアがデータを交換する模範的な流れを示す図である。

【図３】本開示によるＰ２Ｐネットワークシステムのファイル共有方法を示す流れ図である。

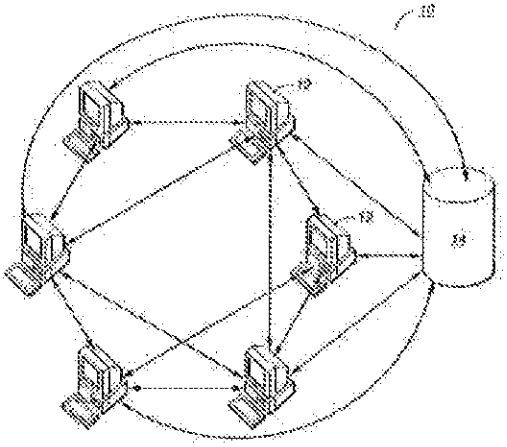
【符号の説明】

【００５２】

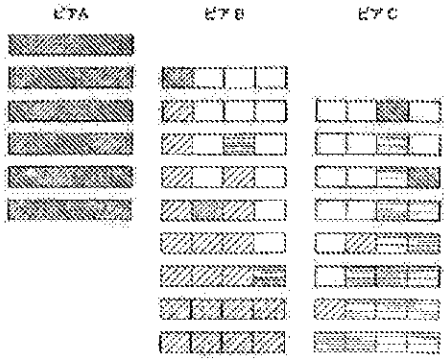
１０　ネットワーク、１２　ピア、１４　データベース、１８，３００，３０２，３０４，３０６，３０８，３１０，３１２，３１４，３１６，３１８，３２０，３２２，３２４　ステップ。

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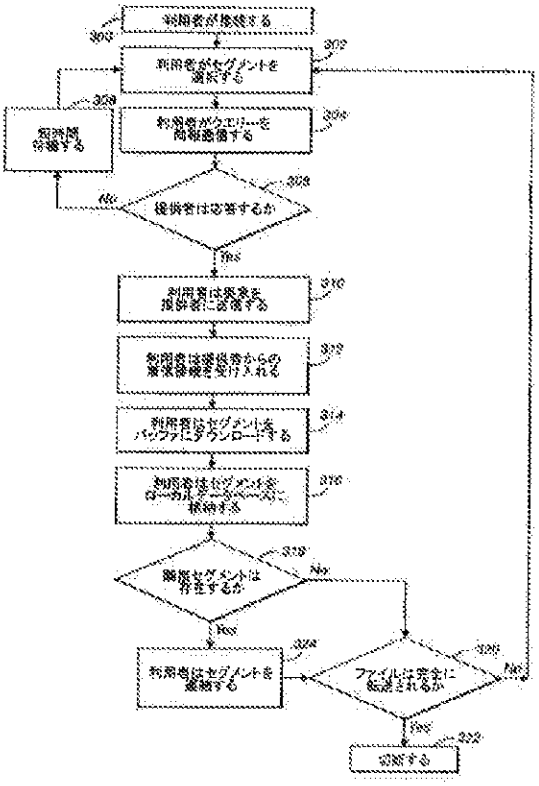
【図１】



【図２】



【図３】



Electronic Acknowledgement Receipt

EFS ID:	20730691
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	18-NOV-2014
Filing Date:	12-SEP-2013
Time Stamp:	15:39:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	S0461837.pdf	295721 35d82626ecf1af4c565b29ef2a7fe637e0dbaa44	no	4

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Derry Shribman
Art Unit	
Examiner Name	
Attorney Docket Number	19459-6105P

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1	101179389	CN	A	2008-05-14	Wang, Matrix Xin		☐

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	Art Unit	
	Examiner Name	
	Attorney Docket Number	19459-6105P

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	Application Number	
	Filing Date	
	First Named Inventor	Derry Shribman
	Art Unit	
	Examiner Name	
	Attorney Docket Number	19459-6105P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/PAN/	Date (YYYY-MM-DD)	2024-03-26
Name/Print	Peter A. Nieves	Registration Number	48173

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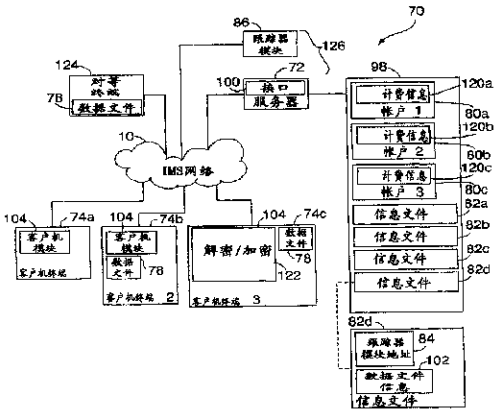
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IMS 网络的对等文件下载系统

[57] 摘要

作为 IMS 网络的一部分，服务器应用与多个客户机/对等终端互联。对于选择数据文件的对等转移，客户机终端在所述服务器应用上建立并存取安全账户。所述客户机终端从所述服务器应用获得一个或多个对等终端的网络位置，所述对等终端在其上存储有数据文件的分段/片段。所述客户机终端联系这些对等终端，以通过 IMS 网络获取来自这些对等终端的数据文件分段。客户机终端和/或对等终端通过安全账户向服务器应用传送结算数据。所述结算数据与转移的数据量和/或数据转移速率相关，并可以用于计费目的。



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1、一种经过 IMS 网络转移数据的方法，所述方法包括步骤：

将与存储在第二客户机终端中的数据文件的至少一部分相关的网络位置传送到第一客户机终端，用以将数据文件或者其部分从所述第二客户机终端转移到所述第一客户机终端；

其中所述网络位置被从与所述 IMS 网络接口的服务器应用传送，用以管理对等文件转移。

2、根据权利要求 1 的方法，其中：

所述数据文件以多个数据文件部分的形式被分布在多个第二客户机终端中；并且

所述方法进一步包括：

向所述第一客户机终端传送与所述数据文件部分相关的网络位置，以便经过所述 IMS 网络，从所述第二客户机终端向所述第一客户机终端转移所述数据文件部分。

3、根据权利要求 2 的方法，进一步包括：

通过至少一个安全连接，接收来自所述第一客户机终端和所述第二客户机终端的结算数据，所述结算数据与从所述第二客户机终端向所述第一客户机终端转移数据文件部分相关。

4、根据权利要求 3 的方法，进一步包括：

根据所述结算数据产生计费数据，其中所述结算数据包括每个所述数据文件部分在所述 IMS 网络上转移的速率以及每个所述数据文件部分的数据量中的至少一项。

5、根据权利要求 2 的方法，进一步包括：

从服务器终端向所述第一客户机终端传送跟踪器模块的网络位

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置，其中所述跟踪器模块被配置成在所述第一客户机终端访问在所述网络位置上的跟踪器模块时，向所述第一客户机终端传送所述多个数据文件部分的网络位置；并且

跟踪客户机终端的位置，所述客户机终端具有从其它客户机终端接收的数据文件部分，用以提供给请求转移所述数据文件部分的客户机终端，其中所述位置由所述跟踪器模块跟踪。

6、一种经过 IMS 网络转移数据的方法，所述方法包括步骤：

在第一客户机终端中接收与存储在第二客户机终端中的数据文件的至少一部分相关的网络位置，所述位置是从与所述 IMS 网络接口的服务器应用接收的；并且

基于所述位置，经过所述 IMS 网络从所述第二客户机终端获得所述数据文件或者其部分。

7、根据权利要求 6 的方法，其中：

所述数据文件以多个数据文件部分的形式被分布在多个第二客户机终端中；并且

所述方法进一步包括：

根据与从所述服务器应用中接收的数据文件部分相关的网络位置，经过所述 IMS 网络从所述第二客户机终端获得所述数据文件部分。

8、根据权利要求 7 的方法，进一步包括：

向所述服务器应用传送结算数据，其中：

所述结算数据与经过所述 IMS 网络从所述第二客户机终端向所述第一客户机终端转移数据文件部分相关；

在从所述第二客户机终端向所述第一客户机终端转移所述数据文件部分期间或者之后，所述结算数据由所述第一和第二客户机终端自动安全地生成并且被传送；并且

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所述结算数据包括经过 IMS 网络获取的每个数据文件部分的速率，以及为获取每个数据文件部分经过 IMS 网络传送的数据量中的至少一项。

9、一种经过网络转移数据的方法，所述方法包括步骤：

在第一客户机终端中获得来自多个第二客户机终端的多个数据文件部分，所述数据文件部分基于从服务器应用中接收的多个网络位置而获得，

其中所述第一客户机终端具有用于与所述服务器应用通信的安全账户，所述安全账户需要用户鉴权以存取所述账户，从而从所述服务器应用接收所述位置。

10、根据权利要求 9 的方法，其中：

每个所述第二客户机终端具有用于与所述服务器应用通信的安全账户；并且

所述方法进一步包括：

自动安全地生成与通过所述网络从所述第二客户机终端向所述第一客户机终端转移所述数据文件部分相关的结算数据；并且

通过安全账户向服务器应用传送结算数据，在从所述第二客户机终端向所述第一客户机终端转移所述数据文件分段期间或者之后，所述结算数据由所述第一和第二客户机终端生成并且被传送。

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IMS 网络的对等文件下载系统

技术领域

本发明涉及通信，尤其涉及在基于 IMS 的网络或其它通信网络中的文件转移服务。

背景技术

IP 多媒体子系统（IMS）是标准化的“下一代”组网体系结构，用以在移动/无线网和固定/有线网中提供多媒体服务。基于 3GPP/3GPP2 的会话初始协议（SIP）的标准化实现，IMS 一般对分组数据通信使用互联网协议（IP），对语音通信使用基于 IP 语音的通信（VoIP）。（SIP 是一种信令协议，用以在 IP 网络中建立会话，诸如双向电话呼叫或多方电话会议）。IMS 可以在基于有线及无线的任何分组交换网，诸如 GPRS、UMTS、CDMA2000 及 WiMAX 网络中运行。通过网关支持已有的电路交换电话系统及类似系统（如 POST，GSM）。 IMS 包括会话控制、连接控制、以及带有用户和服务数据的应用服务框架。它使得新的语音与数据服务的集中使用成为可能，同时在用户间促进了这些集中服务的协同操作性。

图 1 以简单形式示出了基于 IMS 的网络 10。IMS 控制体系结构包括归属用户服务器（HSS）12 和呼叫会话控制功能（CSCF）14，并且通常可以被划分为服务/应用层 16a、IMS 层 16b 和传输层 16c。HSS 12 是所有特定于用户的授权、服务简表及偏好信息的中央存贮区。HSS 12 集成了多个模块/单元，它们中有些可能已经存在（比如在无线网的归属位置寄存器中），包括用户简表数据库、用户服务许可、鉴权和授权、用户偏好设置和移动鉴权服务器等。当使用多个 HSS 时，就需要用户定位功能（SLF）18。CSCF 14 在网络中执行主要的 SIP 信令功能。CSCF 14 包括多种类型的 SIP 服务器，包括代理 CSCF

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服务器（设备和控制鉴权的第一个联系点）、协商 CSCF 服务器（所有 SIP 信息的入口点）、以及管理会话控制功能的服务 CSCF 服务器。另外，应用服务器 20 宿留和执行服务，并且利用 SIP 与 CSCF 14 接口。这使得第三方能够在 IMS 基础架构上很容易地集成和部署它们的增值服务。这些服务的实例可以包括与呼叫用户身份相关的服务、呼叫等待、呼叫保持、单键呼叫、语音会议服务、语音邮件、即时信息、呼叫阻塞及呼叫转移。电路交换网网关（CS）22 将 IMS 10 和诸如公共交换电话网（PSTN）的电路交换网 24 连接。网关 22 可能包括出口网关控制功能（BGCF），它是 SIP 服务器，并且该服务器包括基于电话号码的路由功能、连接到网络 24 的信令平面的信令网关（SGW）、用于呼叫控制协议转化的媒体网关控制器功能（MGCF）、以及连接到电路交换网 24 的媒体平面的媒体网关（MGW）。媒体资源功能 26（MRF）可以被提供作为网络中的媒体资源，例如，用于多媒体会议、文本-语音转换和语音识别、以及实时多媒体数据的代码转换，例如在不同的编解码器间的转换。

在传输层 16c 中，IMS 层 16b 可能通过 MRF 26 和/或 IMS 网关 30，连接到核心宽带 IP 网络 28。IMS 网关可能包括 IMS 应用层网关 32（IMS-ALG）和翻译网关 34（TrGW），用于利用诸如 IPv4 和 IPv6 的网络协议的不同版本，与网络实现通信。核心 IP 网 28 同样连接到一个或多个外部 IP 分组数据网 36（IP PDN），如因特网；也可连接到其它网络，如 DSL 和其它有线网络 38、无线局域网 40（WLAN）以及无线网络 42。典型地，一个或多个中间网络单元被用以实现这些连接，例如 WLAN 接入网关（WAG）和/或 WLAN 分组数据网关 44、服务 GPRS 支持节点 46（SGSN）和网关 GPRS 服务节点（GGSN）48、数字用户线接入复用器（DSLAM）和宽带接入服务器（BAS）50。SGSN 46 负责移动性管理和 IP 分组会话管理。它将用户分组业务从无线电网络 42 路由到合适的 GGSN 48，提供对外部分组数据网的接入，这时外部分组数据网是核心网 28。DSLAM 50 是一个网络设备，它通常位于电话公司中心局或在相邻的服务区接口上作为数字环路载

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波的一部分，该网络设备从多用户 DSL 连接接收信号，在高速骨干线上利用复用技术汇聚信号。在这种情况下，DSLAM 50 将 DSL 网 38 和核心 IP 网 28 连接。

网络 38、40、42 可以通过不同的控制/功能单元，在功能/逻辑上连接到 CSCF 14。例如，IMS 系统可以包括策略判定功能 52（PDF），这个功能允许使用动态策略管理网络接入。附加功能单元 54（为了简明起见被分组在一起）可能包括服务策略判定功能（SPDF）、接入资源与准入控制功能（A-RACF）以及网络附加子系统（NASS）。例如，SPDF 使用策略规则来判定策略，并将根据应用功能得到的会话和媒体相关信息转发到 A_RACF，以进行准入控制的目的。A-RACF 是执行资源保留准入控制和网络策略组装功能的功能单元。为了简明起见，一些中间单元，例如接入网关和服务器节点没有被示出。关于 IMS 网络运行的进一步说明在文献中可以得到，它们已为本领域技术人员所知。

在用户级，接入终端 56a、56b 为用户提供在网络中与其它用户通信的手段。每个终端都是带有基于硬件和/或软件功能的电子设备，用于在网络中通信，典型地包括用户输入输出单元，如键盘和显示器。实例包括计算机终端、诸如移动电话的无线设备、无线 PDA、诸如那些符合“3-G”或“4-G”标准的具有高速数据转移性能的无线设备、带有“WiFi”的计算机终端等。当一个终端 56a 启动与另一个终端 56b 的通信时，根据其通信协议，网络自动执行各种信令进程，以开启两个终端间的通信信道。

除了用于语音通信目的转移数据，例如 VoIP 数据分组之外，IMS 网络越来越多地用于从一个终端向另一个终端转移大的数据文件。例如，用户可能要求经过 IMS 网络 10，获取电子音乐文件、视频剪辑甚至整部的电影，取代从传统信号源，诸如音像店铺获得这些材料。出于这个目的，参见图 2，IMS 网络 10 可以被配置成用于文件下载。如图所示，多个终端 56a-56e（有时称为“客户机终端”）以标准形式连接到网络 10。服务器终端 58 也可以以标准形式连接到网络 10。例如，

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服务器终端 58 可以是上述的 IMS 应用服务器 20 之一。服务器终端 58 包括数据库和/或大容量存储器 60，诸如硬盘或磁盘阵列。数据库 60 包括多个数据文件 62a-62c。运行时，为获得选择的数据文件 62a，客户机终端 56a 在网络 10 中以标准方式联系服务器终端 58。例如，服务器终端 58 可能是一个用于文件下载的指定的服务器终端，并且通过互联网站点/索引、目录、预编程信息等，客户机终端被告知服务器终端地址。经过一个或多个可选管理功能后（例如，要求客户机终端为文件提供电子付费），被请求的文件 62a 通过网络 10 转移到客户机终端 56a，如标有"A"的箭头所示。

当图 2 中示出的传统服务器-客户配置也能以基本级在 IMS 网络中进行文件下载，服务提供商就无法识别与文件下载相关的业务。就是说，即使文件下载数据占用着相当多的带宽，但它看起来却像其它数据。这样一来，服务提供商无法具体地管理下载业务，也就无法根据数据业务类型进行计费。相反，计费只是与其它数据一样仅仅基于业务量。此外，下载系统/特性依赖于服务器的操作。如果服务器资源的负载过重，文件转移次数会受到影响，这样就要求服务器配备额外的存储空间、处理和带宽资源，或需要为文件下载系统提供一个以上的服务器终端。同理，如果服务器发生故障，整个文件下载系统也就发生故障了。

发明内容

本发明涉及在 IMS（IP 多媒体子系统）或其它网络中实现对等文件转移或下载的系统和方法。在系统中，数据文件（或其中的部分）在对等终端间转移，而不是从中心服务器终端转移，这样就降低了由于服务器发生故障或过载导致服务中断的可能性。此外，通过安全账户接入系统要求对于下载数据文件的用户鉴权，从而利用由能够为文件转移/下载服务付费的可信任用户组成网络域。与文件转移相关的结算数据也要通过安全账户生成，从而允许系统具体地跟踪 IMS 网络中的对等数据业务，例如用于计费的目的。

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在一个实施例中，系统包括一个或多个服务器应用和多个客户机/对等终端，所有这些设备都经过 IMS 网络通信。对于“终端”，它指的是能够经过网络通信的电子设备。服务器应用是网络连接的基于软件和/或硬件的模块（如服务器终端），并且被配置成执行该系统的一个或多个对等文件转移管理功能。在运行中，为了下载选择的数据文件，客户机终端通过安全账户接入服务器应用。按照来自客户机终端的请求，服务器应用将数据文件的网络位置传送给客户机终端。“网络位置”是指数据文件在 IMS 网络中的地址或者其它位置，其中在对等终端中存储有数据文件等。然后，客户机终端根据该网络位置，例如，从对等终端获得数据文件。

在另一个实施例中，为了对等文件转移，多个数据文件的部分或分段分布在各个对等终端。（这些数据文件部分一起构成一个完整的数据文件，诸如包括多媒体内容的数据文件，例如歌曲或视频。）服务器应用将数据文件部分的网络位置传送给客户机终端，然后将数据文件部分从对等终端通过 IMS 网络转移到客户机终端。

在另一种实施例中，结算数据由客户机终端和/或对等终端产生，并且传送给服务器应用。结算数据涉及数据文件部分从对等终端向客户机终端的转移，并且可以用于跟踪对等文件转移业务。例如，结算数据可以包括数据文件部分在 IMS 网络中转移的速率，和/或数据文件部分中的数据量。结算数据可以在获得数据文件部分期间或之后自动安全地生成。“自动”是指无需用户输入或初始化，“安全地”是指不具有用户干预或修改的可能性，包括在 IMS 网络中可能的安全传输。出于这个目的，可以给客户/对等终端提供一个能够从客户机终端协调的客户机模块（如基于软件和/或硬件的应用或程序），（i）与服务器应用通信，（ii）对等文件转移，以及（iii）生成并传送结算数据。

在另一个实施例中，服务器应用使用结算数据以生成计费数据，例如根据数据转移速率和/或数据转移量。“计费数据”是指与对用户或用户账户的资金或类似费用（如借或贷）进行计费相关的信息/数据。典型地，从对等终端获得文件或文件部分的用户为文件转移付费。传

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送文件的对等终端会因为传送文件获得信用。

在另一个实施例中，在 IMS 网络中使用系统用于对等文件转移需要与服务器应用建立安全账户。“安全账户”是指这样一个账户（如按照账户名或其它标识符，组织相关数据的分组），即基于用户鉴权（如账户标识符和口令字保护）和其它可能的安全特性，限制对于所述账户的存取。建立了账户后，为获取数据文件，客户机终端存取服务器应用上的账户。随后，客户机终端存取服务器的数据库，以从服务器获得信息文件。信息文件与数据文件相关，并可能包括与数据文件相关的信息，例如，描述文件的信息和/或关于文件（或其中的部分）能在哪获得的信息。

在另一个实施例中，服务器应用包括服务器终端和跟踪器模块。服务器终端可以是一个包含账户、数据库和信息文件的计算机终端。跟踪器模块是网络连接的基于软件和/或硬件的应用或程序，用作服务器终端的代理，以执行文件转移/下载系统的某些通信及其它功能。例如，信息文件可能包括跟踪器模块的网络地址或其它位置。客户机终端在提供的位置访问跟踪器模块，并从该跟踪器模块获得数据文件的位置，或者如果数据文件被划分成存储在不同对等终端的多个不同部分，从跟踪器模块获得数据文件部分的位置。典型地，跟踪器模块将具有最近更新的关于数据文件的每个片段/部分的信息。

附图说明

参照附图，并阅读以下非限制实施例的描述会更好地理解本发明，其中：

图 1 是 IP 多媒体子系统（IMS）网络的示意图；

图 2 是按照现有技术的文件转移/下载系统的示意图；

图 3 是根据本发明实施例的文件下载系统的示意图；

图 4 是文件下载系统的另一个实施例的示意图；

图 5 是文件下载系统的另一个实施例的信令图的示意图；

图 6A 和 6B 是文件下载系统的实施例的操作流程图。

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具体实施方式

参照图 3-6B，对等文件下载系统 70 包括服务器终端 72 以及由 IMS（IP 多媒体子系统）网络 10 互连的多个客户机或对等终端 74a-74c。为了客户机终端之一 74a 通过系统 70 获取数据文件 78，客户机终端 74a 通过预先建立的账户 80a 存取服务器终端 72。典型地，由于使用系统 70 需要建立一个账户，每个客户机终端 74a-74c 会在服务器上具有安全账户 80a-80c。客户机终端 74a 得到与数据文件 78 相关的信息文件 82d，信息文件 82d 是服务器上多个信息文件 82a-82d 之一，每个信息文件用于可被下载的每个数据文件。信息文件 82d 包括跟踪器模块 86 的网络地址或其它位置 84。客户机终端 74a 访问跟踪器模块，以获取一个或多个终端 74b、74c 的网络位置 88a、88b（见图 5），所述终端 74b、74c 具有存储于其中的数据文件 78。客户机终端 74a 选择并联系其中一个终端 74b，以获取数据文件 78，也就是说，在由终端 74a 联系之后，终端 74b 在 IMS 网络 10 中向终端 74a 传送数据文件 78。客户机终端 74a 将与在网络 10 中转移的数据量相关的结算数据 90 安全地传送给跟踪器模块 86，跟踪器模块再将其转发给服务器 72，用于计费目的。结算数据 90 也可以包含这样的指示，即在客户机终端 74a 中已经得到文件，并且该文件可以由其它终端从终端 74a 下载。

参考图 4，系统 70 可以以用于某些对等网络的形式的配置，在这些队等网络中，用于下载的数据文件 78 被分成具有相同大小的多个片段或分段 92a-92d，并被分布在多个对等终端 74b-74d 中。在这里，客户机终端 74a 从服务器终端 72 得到与被选数据文件 78 相关的信息文件 82（典型地，对于可以经过系统下载的每个数据文件，将存在一个信息文件）。信息文件 82 包含跟踪器模块 86 的网络地址或其它位置 84。客户机终端 74a 访问跟踪器模块 86，以获得在其上存储有数据文件部分 92a-92d 的终端 74b-74d 的网络位置 88a、88b。（备选地，位置也可以作为数据文件部分位置的列表 94 而被包含在信息文件 82

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中。）如果多于一个的终端具有相同的数据文件分段，客户机终端 74a 就从可获选项中选择。根据位置，客户机终端 74a 以对等方式从终端 74b-74d 获得数据文件 78 的分段 92a-92d。一旦获得所有的数据文件分段/部分，数据文件分段 92a-92d 就被分类，并且根据客户机终端 74a 可利用的散列信息/数据 96 重新组装成数据文件 78。散列数据是用于验证数据文件分段 92a-92d 的数据，用以将数据文件部分 92a-92d 重新组装成文件 78，和/或为了快速有效的数据库存储和检索，对数据文件部分 92a-92d 进行分类。散列数据 96 可以从与数据文件 78 相关的信息文件 82 中得到。典型地，终端 74a-74d 中的一个或多个也可以传送核算数据 90，该核算数据也可以包含已完成对数据文件分段 92a-92d 的下载并已准备好供其它终端下载的指示。

应当注意的是，典型地，系统 70 也可与 IMS 网络 10 相结合地实施，IMS 网络 10 的实例如前所述。终端 72、74a-74d 是能够在网络 10 中与一个其它终端通信的电子设备，并且例如可以包括计算机终端、诸如传统电话和增强型/多媒体电话的有线连接的通信设备、和/或无线单元，所述无线单元诸如是移动电话、无线 PDA、符合“3-G”或“4-G”标准的带有高速数据转移性能的无线设备、配置有“WiFi”的计算机终端等。终端 72、74a-74d 以标准形式在网络 10 中相互通信，这依赖于 IMS 网络的特殊配置、用于在网络 10 中通信的特殊协议以及用于接入网络的终端类型。在计算机终端和 IMS 网络的情况下，一个终端（如一个客户机终端）向另一个终端（如服务器终端）传送对于数据的请求，并且来自服务器终端的数据以分组形式转移回客户机终端。例如，为了接入互联网的站点，用户会输入站点的 URI（统一资源标识符）/URL（统一资源定位符）或 IP 地址到运行在用户计算机终端的网络浏览器软件程序，如微软的 Internet Explorer™。URL 是符合一个遵守标准格式的字符串，通过其位置描述互联网上的资源（如站点的主页），并且具体说明用于通信的协议、与之通信的主机/服务器、连接到的服务器的网络通信端口、以及通向服务器资源的路径（例如，它的文件名）。一旦输入了 URL，服务器终端就被联系上，

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并且如果可以的话，服务器终端就按照特定 URL，向用户终端传送回所请求的数据。例如，如果 URL 与一个站点主页相对应，存储在服务器中的对应于该主页的数据（典型地以 HTML 格式）就被传送回用户终端。数据被网络浏览器转换/译码，以在用户终端的显示器上重新生成图形形式的网页。

服务器终端 72 是一个标准的服务器配置的终端（或终端的分组），具有经过该网络通信的单元，例如一个或多个标准网络适配卡/模块、调制解调器等。服务器终端 72 也包括大容量存储器或其它存储器，这些存储器可以被组织为一个或多个数据库 98，用以存储账户 80a-80c 和信息文件 82a-82d。典型地，服务器终端 72 也可以包括接口 100，用于用户接入服务器 72（从客户机终端 74a-74d）以建立账户，以及启动文件下载等。例如，接口 100 可以是一个以根据现有技术众所周知的标准方式，如 HTML 码实施的互联网站点。

为了在服务器上建立用于对等转移的账户 80a，用户在客户机终端 74a 接入接口 100。例如，如果接口 100 是一个互联网站点等，用户将在客户机终端 74a 上激活网络浏览器程序，并且输入接口 100 的 URL 到网络浏览器。接入到接口 100 之后，用户被提供选项，诸如“建立新的账户”和“存取已有的账户”。用户也会被提供关于系统 70 的信息，包括计费选项和速率。如果选择了“建立新的账户”选项，用户会被提示输入个人信息以及建立账户需要的其它信息，诸如姓名、付费地址、电子邮件地址、例如银行账户借贷卡的付费方式、以及诸如用户名和口令字的安全信息。像用户账户 80a 一样，该信息以标准方式存储为数据库 98 中的一个或多个相关文件。接下来，为了存取账户 80a，用户存取接口 100，选择“进入已有账户”功能（或类似功能），然后输入用户鉴权信息，诸如账户名、口令字和/或其它安全信息。

服务器终端 72 也包括存储在数据库 98 中的信息文件 82a-82d，或另外可接入服务器终端 72 的信息。信息文件 82a-82d 中的每一个对应于系统 70 中的可用于下载/转移的不同数据文件 78（换句话说，每个数据文件 78 具有一个对应的存储于服务器 72 中的信息文件

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82a-82d。）。每个信息文件 82a-82d 包括跟踪器模块 86 的网络地址或其它位置 84，例如用以在 IMS 网络 10 中访问跟踪器模块的 URL 或跟踪器模块的 IP 地址。如下文将进一步描述的，跟踪器模块 86 实质上可以是用于通用目的，例如跟踪器模块与一个以上数据文件 78 结合使用，或者它也可以单个专用的或被指派给数据文件 78。如果可应用的话，信息文件 82a-82d 进一步包括关于它们各自的相关数据文件 78 的信息 102，诸如文件名、文件类型、文件大小、主题和内容概要，并且还包括计费信息，诸如获取文件的速率。例如，在歌曲或音乐文件的情况下，文件信息 102 可以包含文件名、歌曲名、与歌曲通常相关的唱片名、艺术家、音乐类型，文件大小、诸如 MP3 的文件类型、以及下载音乐文件的费用。信息文件也可以包含散列数据 96，散列数据 96 与数据文件 78 相关，或者如果数据文件被划分成多个分段进行对等转移，则散列数据 96 与每个数据文件分段 92a-92d 相关。

作为下载数据文件 78 的初始步骤，用户引导客户机终端 74a 通过接口 100 接入服务器终端 72，如图 5 中的步骤 200，选择“存取已有账户”选项或类似选项，然后输入存取用户账户 80a 所需的信息。接下来，用户选择用于选择和/或下载数据文件的选项。选择数据文件 78 可能涉及使用关键字之类搜索数据文件，搜索文件的目录或分组，输入文件名或其它标识符，如果知道的话，或者通过可用数据文件的列表或选择浏览，列表或可用数据文件的选择可能通过分类、类型、类别进行划分。这样，接口 100 可以为此目的提供功能，如标准站点搜索功能、用于浏览的各个链接的网页、一个或多个索引之类。一旦一个特定的数据文件 78 被选择，用户选择“下载”之类的功能，并且需要请求批准用于下载文件的流量速率或费用。然后在步骤 202 中，与被选数据文件 78 相关的信息文件 82a 通过网络 10，从服务器终端 72 转移到客户机终端 74a。

信息文件 82a 用以与信息文件 82a 中标识的跟踪器模块 86 联系并通信的目的。出于这个目的，客户机终端 74a 就会被提供一个客户机模块 104。客户机模块 104 是运行在客户机终端 74a 上的硬件、硬

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件/软件、或软件应用/程序，并且被配置成以标准方式经过网络 10 通信，例如客户机模块 104 访问客户机终端的网络通信单元（网络适配卡，调制解调器等），以在网络 10 中发送和接收消息及其它数据。客户机模块 104 可以是在客户机终端用户接口或操作系统后台运行的一个多用途软件程序，和/或它可以提供用户可访问的功能性，诸如显示下载状况、下载历史之类。它也可以像基于客户机终端的接口那样访问服务器终端 72。一般而言，当用户初次建立账户时，都要从服务器 72 下载客户机模块 104。然后客户机模块 104 以标准方式安装在客户机终端中。使用系统 70 可能需要下载并安装客户机模块。备选地，客户机模块可以被“构建”在客户机终端里。例如，在无线设备的情况下，客户机模块可以利用无线单元的无线服务器提供商或指定的第三方所操作的系统 70，被提供在无线设备中，作为其中一个标准的可用功能。

一旦在客户机终端 74a 中接收到信息文件 82a，在步骤 204 中，客户机模块 104 在由信息文件 82 提供跟踪器模块地址/位置 84 上，启动与跟踪器模块 86 的通信。特别地，客户机模块 104 向跟踪器模块 86 传送数据文件标识符 106，并且跟踪器模块利用列表 108 进行响应，在该列表中，终端具有数据文件 78 或者数据文件分段 92a-92d。数据文件标识符 106 唯一地标识被选的数据文件 78，并且典型地是信息文件 82a 中的数据文件信息 102 的一部分。例如，数据文件标识符可以是数据文件的文件名、数据文件的序列号或索引号等。在一些系统里，客户机终端 74a 也可以向跟踪器模块传送联系信息 110。客户机终端联系信息 110 包括跟踪器模块 86 与客户机终端 74a 通信所需的所有信息，诸如客户机终端的网络地址（URL 或 IP 地址）以及/或者客户机终端正在监听的通信端口。

跟踪器模块 86 是一个网络连接的基于软件和/或硬件的应用/程序，用作服务器终端的代理，以实现系统 70 的某些通信和其它功能。例如，可以提供跟踪器模块 86 用以实现对等数据文件转移的对等联系，用以为计费目的搜集核算数据 90，和/或用以跟踪哪些终端经过该系统得到了哪些数据文件（或数据文件分段 92a-92d）。跟踪器模块

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86 实施 HTTP 上层的简单通信协议（也就是说，被实施以与所述网络上的通信协议相结合地操作，诸如 HTTP），在这个通信协议中，客户机终端发送文件标识符 106，跟踪器模块利用对等列表 108 做出响应，在所述对等列表 108 中包含具有选择的数据文件 78 或可能是选择的数据文件 78 的分段 92a-92d 的客户机/对等终端 74b、74c 的网络位置/地址 88a、88b。标识在对等列表 108 中的终端可能先前已经过系统 70 下载（或正在下载）所选的数据文件 78（或数据文件分段），其中服务器终端 72 和/或跟踪器模块 86 已经跟踪到影响后来由其它客户机终端启动的对等下载的信息。（换句话说，当客户机终端在系统中下载文件或文件分段时，服务器可能被配置成注意客户机终端当前具有可供用于对等下载的文件或文件分段，包括存储该客户机终端的网络地址，以便后来提供给需要获取数据文件或文件分段的客户机终端。）备选地，数据文件可能源自被标识的对等终端 74b，74c 的其中一个，然后所述被标识的对等终端通知服务器终端 72（例如，从客户机模块以及/或者通过接入接口 100）这个数据文件可用于对等转移。在这种情况下，服务器终端 72 中可能会设置措施以安全维护版权保护文件。

应当注意的是，一个跟踪器模块/应用 86 可能用于所有对等事务，或者由于事务量可能需要一个以上跟踪器模块，那么可以按需为事务指派多个跟踪器模块 86。备选地，可能存在与每个数据文件 78 相关的跟踪器模块 86，所述跟踪器模块专用于涉及该数据文件的事务。在这种情况下，客户机终端就没必要向跟踪器模块传送文件标识符 106。相反，已与特定跟踪器模块联系的客户机终端将暗指可供下载的数据文件。跟踪器模块 86 可以存储在服务器 72 上或另一个网络连接的终端上。

当跟踪器模块 86 从客户机终端 74a 接收到选择的数据文件 78 的识别符 106 和/或客户机模块连接信息 110，跟踪器模块 86 通过向客户机终端 74a 传送对等列表 108 做出响应，参见步骤 206。应当注意的是，对等列表 206 包括一系列具有选择的数据文件 78 或数据文件分段

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92a-92d 的一个或多个对等终端的网络位置/地址 88a、88b。这些可以是在系统 70 中具有选择的数据文件 78 或文件分段 92a-92d 的终端所有或者一些子集，或者只有那些当前正在与网络通信的终端。接下来，如果要下载完整文件 78，客户机模块 104（在客户机终端 74a 上运行）选择所列举的对等终端中的一个，或者如果要下载多个文件分段 92a-92d，就选择一个或多个对等终端。选择可以简化为在对等列表中列举的第一有效终端，或者在网络 10 中离客户机终端 74a“最近”的有效对等终端。其它选择准则也是可能的。一旦已经选择对等终端，例如对等终端 74b，对等文件转移就开始了。特别地，在步骤 208 中，客户机模块 104 通过网络 10，启动与在对等列表 108 中提供的对等终端 74b 的位置/地址 88a 上的被选择对等终端 74b 的通信。例如，这可以包括向对等终端 74b 传送对等文件请求消息 112。作为响应，在步骤 210 中，被选择的对等终端 74b 上的客户机模块将存储在对等终端 74b 中的被选择数据文件 78（或数据文件分段 92a）以标准方式传送给客户机终端 74a。数据文件 78（或数据文件分段 92a）在客户机终端 74a 中被接收，并被存储以备检索和后续使用。如果是以多个数据文件分段 92a-92d 的形式获得数据文件 78，就对其它对等终端重复这个过程直至得到所有分段。

在转移文件或文件分段期间或者之后，选择的对等终端 74b 和客户机终端 74a 上的两个客户机模块 104 或者其中之一至少周期性地向跟踪器模块 86 传送结算数据 90（步骤 212）。结算数据 90 可以包括与被转移文件 78 的数据转移速率相关的数据 114、与被转移的数据量相关的数据 116、用于标识客户机终端 74a、对等终端 74b 的数据 118a，118、和/或与这些终端相关的账户 80a、80b。典型地，转移速率将用于统计目的，数据量将用于计费目的的业务记录，例如计费可以基于转移的数据量而不是转移速率。备选地，用户可以选择突发转移速率，这样就以更高的速率计费，或者如果基于每个文件计费，结算数据可以简单地指示已成功地转移文件。可以根据上载和下载量生成和/或使用结算数据，下载是指在请求的客户机终端 74a 接收数据，上载是指

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由对等终端 74b 转移数据。上载量可于作为对等终端计费贷记的基础，例如，用作系统 70 中的数据源的对等终端可以有效被支付或贷记较少的量，从而激励对等终端的用户使之乐意以后给其它对等终端转移文件。典型地，结算数据 90 将会以安全方式，诸如对称加密，传送给跟踪器模块和/或服务器终端，以确保结算数据不被客户机终端 74a 的用户修改。需要理解的是，在这种方式下，结算数据的产生和传输都是自动地执行，不可能有用户介入，并且使用系统用于对等文件转移的先决条件是使用客户机模块（以及结算数据的隔绝/安全生成）。此外，因为要求每个对等用户都建立一个安全账户并使用客户机模块，一个安全/可信任的对等网络也就被建立了，其中对对等数据转移的费用收集都也被保证。在这种情况下，客户机终端 74a 从多个终端 74b-74d 获取数据文件分段 92a-92，每个终端 74a-74d 都可以产生结算数据 90。

如果结算数据 90 被传送给跟踪器模块 86，跟踪器模块就将数据 90 转发给服务器终端 72，如步骤 214 所示。服务器终端 72 使用结算数据 90 来生成计费数据 120a-120c。“计费数据”意指与对于用户或用户账户施加的资金或类似费用进行计费（如借或贷）相关的信息/数据。因此，计费数据 120a-120c 可以基于数据转移速率 114 和/或数据量 116，并且例如可以包括对于在结算数据 90 中识别的账户或者根据结算数据 90 确定的帐户收取或支付费用。例如，如果计费速率基于数据量 116，那么账户 80a 可以如下按照美元帐户计费：

$$\$收费 = (数据量) \times (\$/单位数据)$$

这个信息作为计费数据 120a-120c 被存储在用户各自的账户 80a-80c 中，系统 70 以标准方式根据用户协议和账户类型收取资金，例如，直接的银行账户负债、信用卡计费之类。系统 70 收取的资金可用于支付版权许可费以及网络服务提供商提供的网络带宽。

应当注意的是，每当对等终端获取一个特殊的数据文件或数据文件分段时，与该数据文件或数据文件分段相关的终端的网络地址或其它位置被跟踪器模块 86 和/或服务器终端 72 跟踪。换句话说，跟踪器模块和/或服务器存储了这样的数据（例如，在数据库或其它存储器

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中），即该数据与具有数据文件（或数据文件的特殊片段/分段）的对等终端的地址/位置相关，如指示对等终端具有可供对等转移的数据文件。随后，当另一个对等终端请求该数据文件或数据分段时，相对于该数据文件搜索或者存取数据库或其它存储器，以编译用于该数据文件的相关对等列表 108。对等列表中包含的内容依赖于终端是否在与网络通信，这样，跟踪器模块和/或服务器终端可以为这种情况执行测试。备选地，如果发现一个对等终端不能用于文件转移，客户机终端可以在该对等列表中选择备选的对等终端。

从客户机终端 74a 和/或客户机模块 104 的角度看，对于转移完整文件 78 的情况，系统 70 的一个实施例的操作如图 6A 所总结的。在步骤 220，客户机终端从跟踪器模块/应用 86 或服务器终端 72 接收选择的数据文件 78 的位置。位置可以是其上存储有数据文件的对等终端 74b 的网络地址或其它位置，或者它可以是数据文件自身的地址或其它位置，例如，对等终端 74b 的子地址或位置。在步骤 222，客户机终端 74a 通过网络 10 从对等终端 74b 获得数据文件 78。在步骤 224，客户机终端 74a 向跟踪器模块/应用 86 和/或服务器终端 72 传送结算数据 90。应当注意的是，结算数据与经过网络从对等终端到客户机终端的数据文件的转移相关，例如，数据转移速率和/或数据转移量。典型地，在数据文件被得到期间或者之后，结算数据将被自动安全地生成并传送。换句话说，一旦得到数据文件，客户机模块就自动（例如，无需用户输入）安全地（例如，用户不可能干涉）产生结算数据，并且自动安全地将它（例如，诸如加密的安全传输）传送到跟踪器模块或服务器。

对于多个数据文件分段 92a-92d 的情况，客户机终端 74a 从跟踪器模块/应用 86 或服务器终端 72 接收选择的数据文件 78 的分段 92a-92d 的位置。例如，这些位置可以是其上存储数据文件分段 92a-92d 的对等终端 74b-74d 的网络地址或其它位置。客户机终端 74a 通过网络 10 从对等终端 74b-74d 获得数据文件分段 92a-92d。终端 74a-74d 向跟踪器模块/应用 86 和/或服务器终端 72 传送结算数据 90。

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从跟踪器模块 86 和/或服务器终端 72 的角度看，系统 70 的实施例的操作如图 6B 所总结的。在步骤 226，根据来自客户机终端 74a 的请求，服务器和/或跟踪器模块向客户机终端 74a 传送选择的数据文件 78 的网络地址或其它位置。数据文件 78 存储在对等终端 74b。接着，在步骤 228，服务器终端和/或跟踪器模块从客户机终端 74a 和对等终端 74b 的其中一个或二者接收结算数据 90。结算数据 90 与经过网络从对等终端到客户机终端的数据文件转移相关，例如，数据转移速率和/或数据转移量。在数据文件分段 92a-92d 的情况下，根据来自客户机终端 74a 的请求，服务器和/或跟踪器模块向客户机终端 74a 传送数据文件分段 92a-92d 的网络地址或其它位置。数据文件分段 92a-92d 存储在对等终端 74b-74d 中。典型地，服务器终端和/或跟踪器模块将从所有终端 74a-74d 接收结算数据 90。

系统 70 可以被提供加密和/或反盗版措施，从而数据文件 78 或文件分段只能通过系统 70 转移到给其它终端。例如，系统可以这样设置，即每当数据文件被复制或转移时，文件自动地自我加密或者被客户机模块自动地加密，其中客户机模块 104 具有解密文件用以使用的功能 122。因此，用户将不能够在系统 70 之外以可用形式转移数据文件 78，否则就会导致侵犯版权，违反许可合同之类。

需要理解的是，数据文件 78 可源自服务器 72。例如，音乐或其它数据文件 78 可以因不存在版权许可目的而存储在服务器终端 72 上。存储在服务器的文件（或文件的分段）第一次被下载，文件或文件的分段以如前所述形式，从服务器终端转移到正在下载的客户机终端，例如，服务器终端像对等终端那样有效实施地工作。备选地，文件并非存储在服务器终端 72 并从服务器终端 72 自己转移，而是专用的“对等”服务器 124 配置为像真正的对等终端 74b，74c 那样工作，在第一事例中用于存储并下载数据文件 78。对等服务器 124 的网络地址或其它位置会被提供在对等列表等中，如前所述。数据文件 78 或数据文件分段从服务器 72 或对等服务器 124 被下载之后，服务器 72 或对等服务器 124 会从后来的对等列表中排除，而数据文件 78 被对等地转移。

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备选地，在没有对等终端可用于下载特殊的数据文件或文件分段的情况下，服务器和/或对等服务器可以作为备份。

尽管跟踪器模块 86 有效地划分了系统 70 中的通信功能，系统 70 可以被配置为仅单独地利用服务器终端或终端 72 操作，而不脱离本发明的精神和范围。因此，服务器终端就可以被配置成执行如前所述的跟踪器模块的功能，除了对等文件转移外的所有事例中，客户机/对等终端都直接与服务器终端通信。此外，可以按与前述方式不同的方式分配跟踪器模块 86 和服务器终端 72 的功能。因此，跟踪器模块 86 和服务器终端 72 可以共同地或者单独地被表征为“服务器应用”126，意指与网络接口的硬件和/或软件单元，并且被配置成执行一个或多个如前所述服务器和/或跟踪器模块的功能。

在系统 70 中，IMS 网络 10 执行一个或多个信令/通信功能，以根据网络 10 中的通信协议，互联客户机终端 74a-74d 和服务器应用 126。此外,系统 70 可以为网络 10 执行一个或多个如上面所述的服务器应用功能，例如，跟踪器模块和/或服务器终端的功能。例如，IMS 网络可以被配置为（i）管理用于接入站点接口 100 并下载文件 78 的客户机终端请求，（ii）使客户机终端与服务器应用 126 连接，（iii）连接客户机终端与对等终端以进行文件转移，以及（iv）管理客户机终端与服务器应用 126 之间的连接。特别地，在文件 78 被选择用于在客户机终端 74a 中通过安全账户下载之后，IMS 处理来自客户机终端 74a 的下载文件的请求，联系服务器应用 126，获得信息文件 82d，并将其连同服务器应用 126 的地址 84 一起传送给客户机终端 74a 以供下载的目的，例如下载服务器应用 126 的套接字信息。客户机终端 74a 连接到服务器应用 126，开始文件下载，并向 IMS 传送请求，以联系具有数据文件 78（或其分段 92a-92d）的对等终端 74b-74d。IMS 定位对等终端 74b-74d，然后建立客户机终端 74a 与对等终端 74b-74d 之间的连接，以便客户机终端 74a 获取数据文件分段。IMS 也可以向服务器应用 126 发送用于更新目的的消息。

需要理解的是，尽管数据文件分段 92a-92d 已经被表征为数据文

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件 78 的部分或分段，但是每个数据文件部分自己就是一个数据文件，例如，数据的分组。这样，数据文件部分也可以被表征为数据文件，其中数据文件 78 就是由多个小数据文件或数据文件分段组成的大的复合数据文件。

需要理解的是，系统 70 利用对等网络模型用以文件下载，以及基于账户的客户/服务器网络模型以管理文件下载和收集计费信息。因此，系统在文件转移方面是有效的，同时保持精确性、安全性、以及在网络带宽使用和计费方面的计费能力。

由于可以对于上述 IMS 网络的对等文件下载系统做出某些改变，而不会背离在此涉及的本发明的精神和范围。这就意味着上面所述或附图中显示的所有主题仅应该理解为示例说明本发明构思的实例，而不应该被看作是对于本发明的限制。

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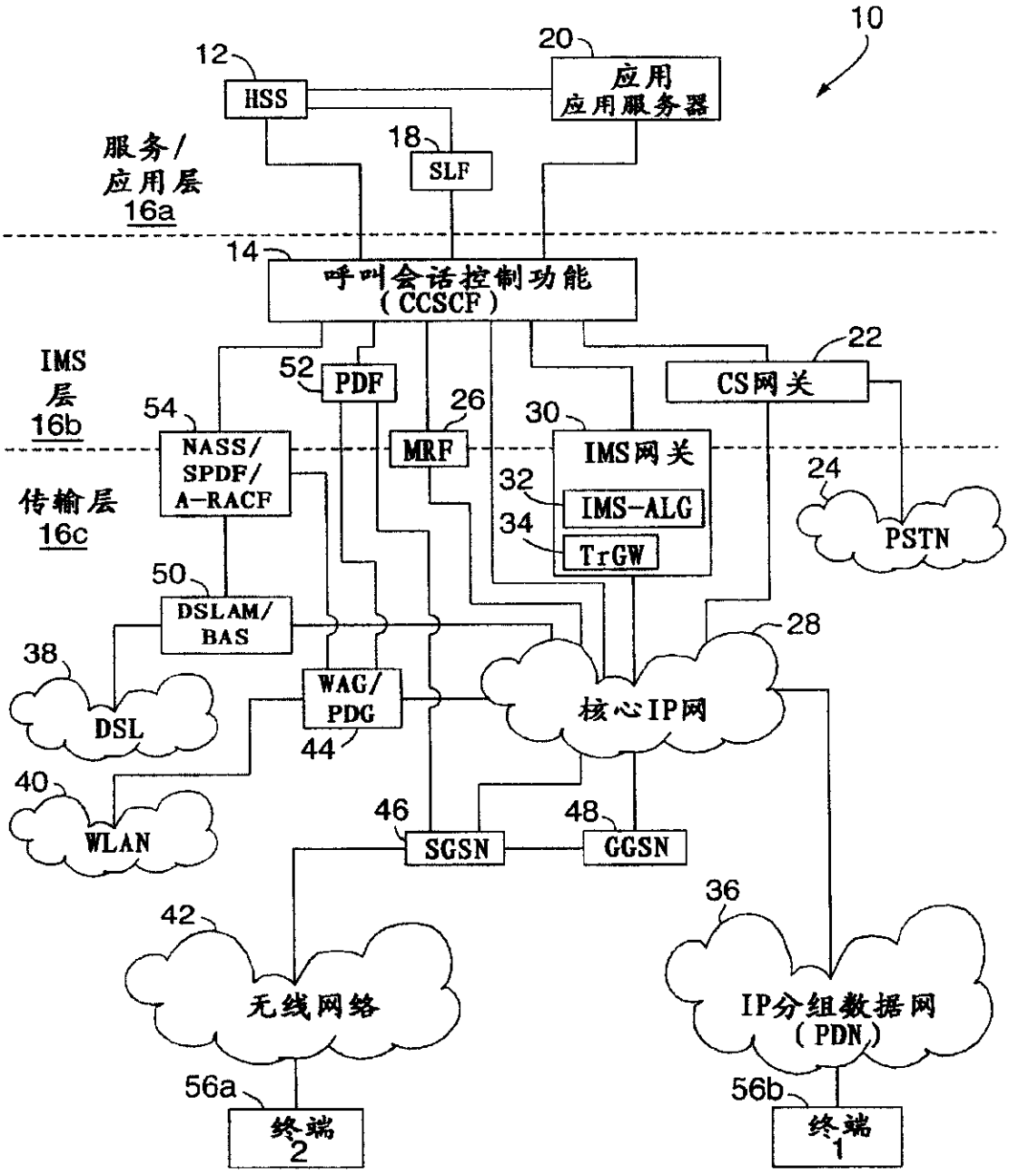


图1

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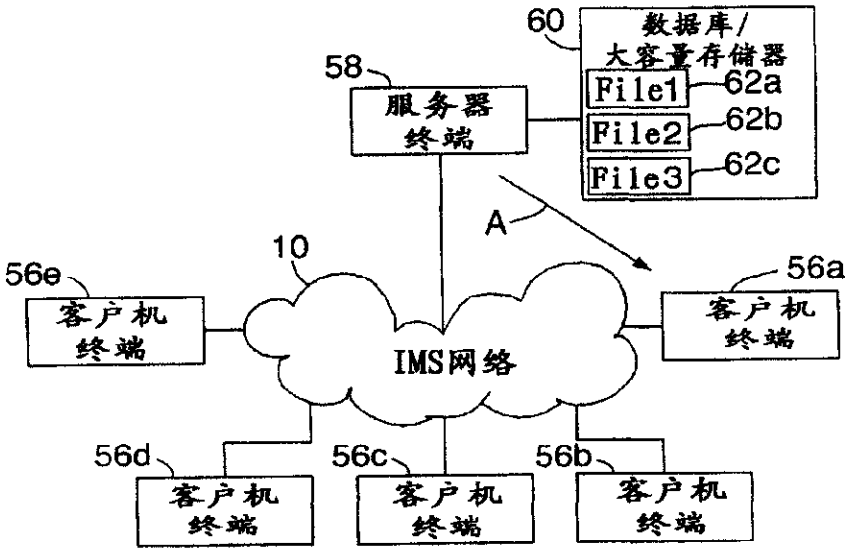


图2

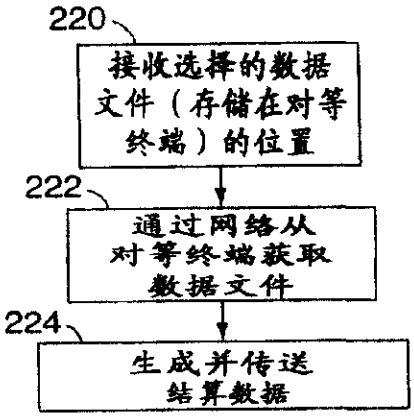


图6A

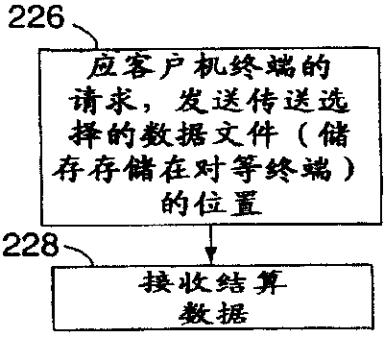


图6B

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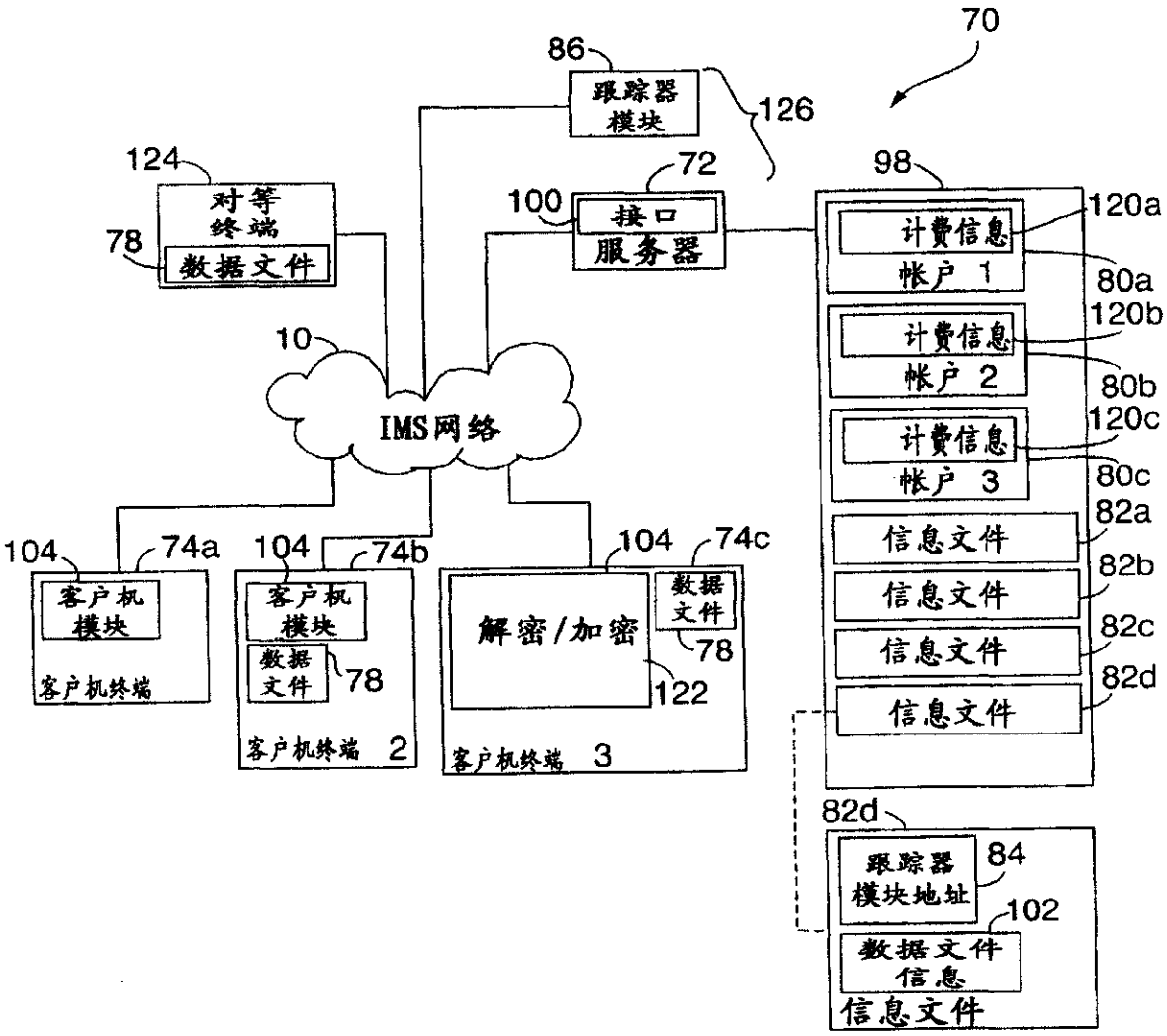


图 3

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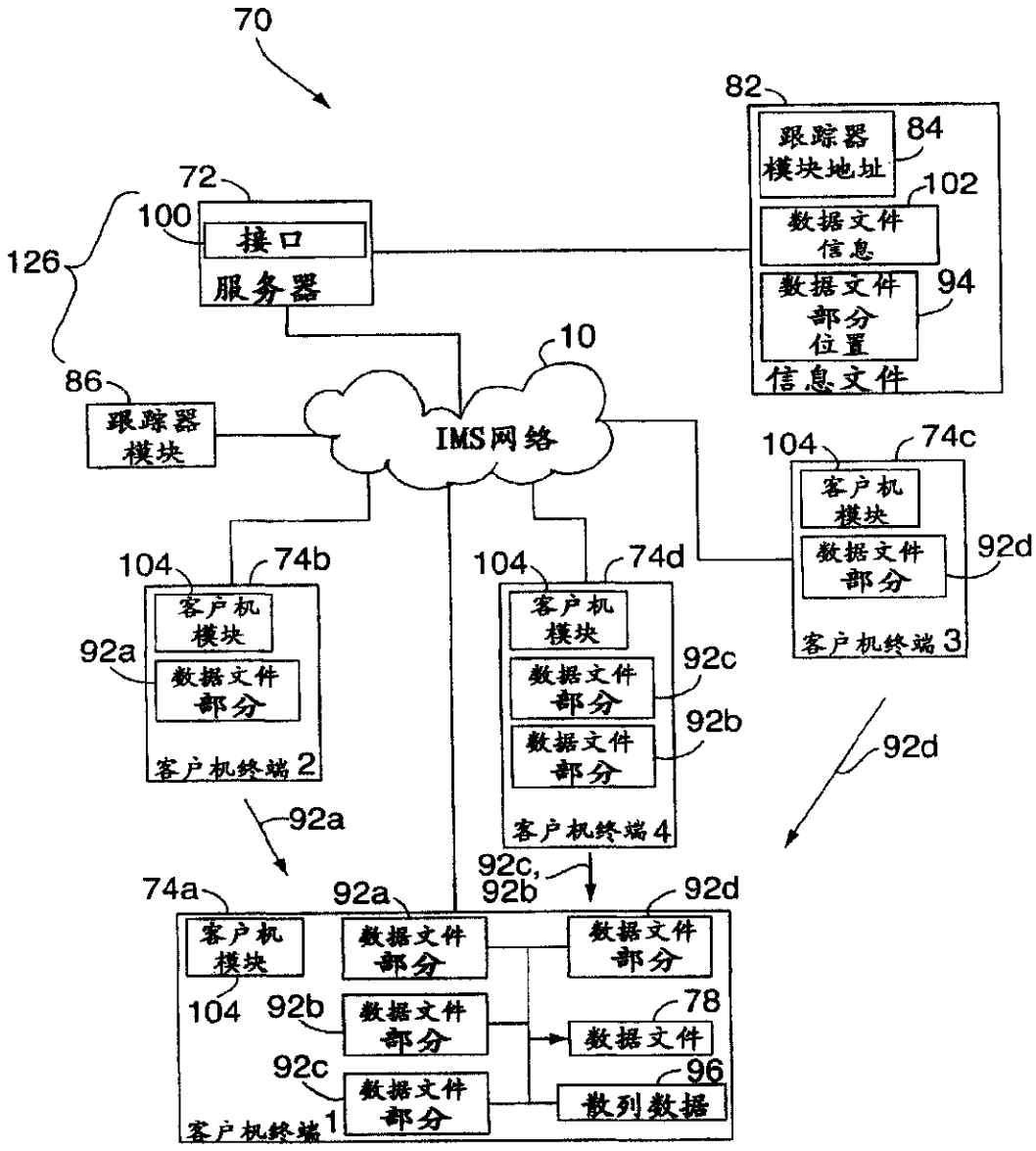


图4

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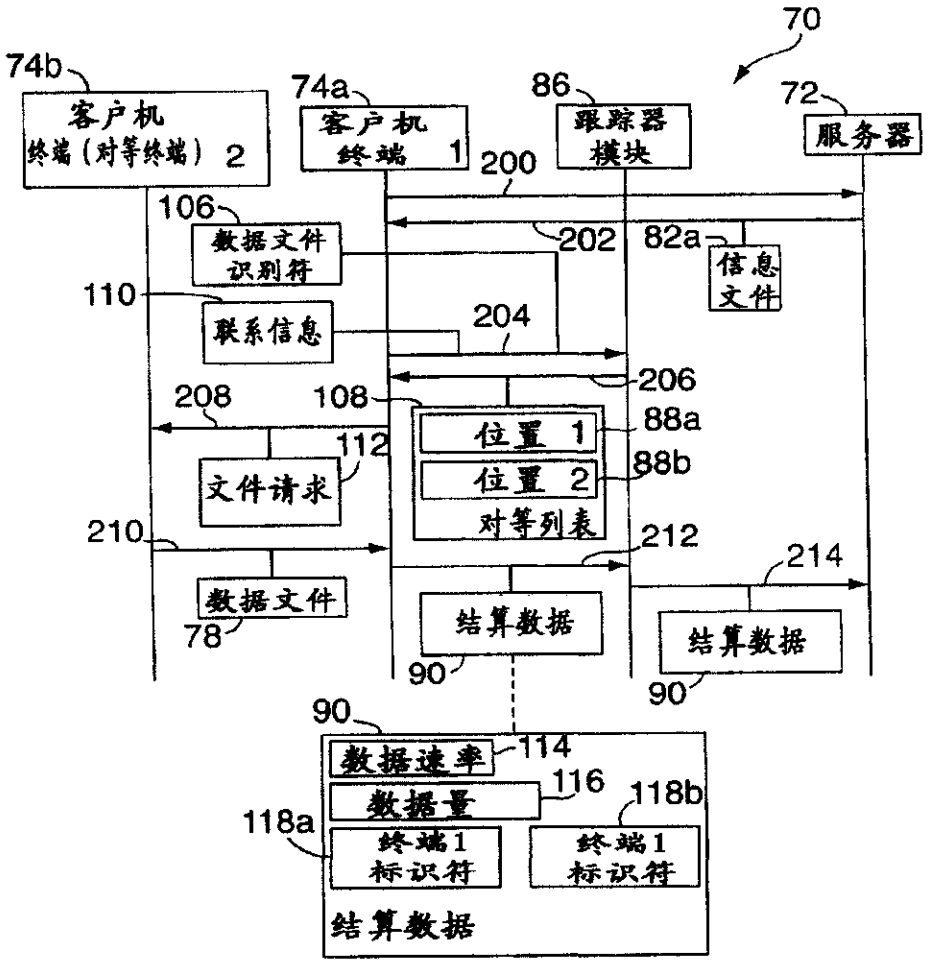


图5

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Electronic Acknowledgement Receipt

EFS ID:	18610705
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	28-MAR-2014
Filing Date:	12-SEP-2013
Time Stamp:	12:04:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	S0357328.pdf	301319 fba320613ff38bcee7260b8777eacfe49219 6f3f	no	4

Warnings:	
Information:	

This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	S0355255.pdf	1759985 9ffd1a91a1b8cecee5cc0f692ac2347749448 7a1	no	27
Warnings:					
Information:					
			Total Files Size (in bytes):	2061304	

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/025,109	09/12/2013	Derry Shribman	19459-6105P

CONFIRMATION NO. 6194

57449
SHEEHAN PHINNEY BASS & GREEN, PA
c/o PETER NIEVES
1000 ELM STREET
MANCHESTER, NH 03105-3701

PUBLICATION NOTICE



Title:SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

Publication No.US-2014-0019514-A1
Publication Date:01/16/2014

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
690 of 789

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	14/025,109
Applicant:	Hola Networks Ltd.
Docket No.:	19459-6105
Title:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

PRELIMINARY AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir or Madam:

The Applicant hereby submits a preliminary amendment to the pending patent application. Review and consideration of the presently pending claims is respectfully requested.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 8 of this paper.

AUTHORIZATION TO DEBIT ACCOUNT

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefore (including fees for net addition of claims) are hereby authorized to be charged to deposit account no. 501304.

Oxylabs LT, UAB v. Bright Data Ltd.
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Amendment To The Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Please cancel claims 1-25. Claims 26-66 are new.

Listing of Claims:

1-25. (Cancelled)

26. (New) A method for data communication between a web server storing a content and a client via one or more devices, for use with a first server, and where the web server, the client, the first server, and the devices are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server;

(b) the first server storing the identifiers of the devices;

(c) the client sending its identifier and the web server identifier to the first server;

(d) the first server selecting one of the devices based on associating the identifiers of the devices with the web server identifier;

(e) the first server sending the identifier of the selected device to the client;

(f) the selected device receiving the content from the web server; and

(g) the client receiving the content from the selected device.

27. (New) The method according to claim 26 wherein the steps are sequentially executed.

28. (New) The method according to claim 26 wherein the web server is Hypertext Transfer Protocol (HTTP) server and responds to HTTP requests from the selected device.

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29. (New) The method according to claim 26 wherein the first server is HTTP server and responds to HTTP requests from the client or the devices.

30. (New) The method according to claim 26 wherein the web server is Transmission Control Protocol / Internet Protocol (TCP/IP) server and communicates based on, or according to, using TCP/IP protocol or connection.

31. (New) The method according to claim 26 wherein the first server is a TCP / IP server and communicates based on, or according to, using TCP/IP protocol or connection.

32. (New) The method according to claim 26 wherein the content includes web-page, audio, or video content.

33. (New) The method according to claim 26 wherein the first server selecting one of the devices is based on the web server IP address or URL.

34. (New) The method according to claim 26 wherein the first server selecting one of the devices is based on the selected device IP address.

35. (New) The method according to claim 26 wherein the selected device further storing the content received from the web server.

36. (New) The method according to claim 26 wherein the client sending its identifier and the web server identifier to the first server as part of browser or email application execution.

37. (New) The method according to claim 26 further comprising the step of the client sending its identifier to the first server, and the first server storing the client identifier.

38. (New) The method according to claim 37 further for data communication between a second web server storing a second content and having an identifier in the Internet and a one of the devices via the client, the method further comprising the steps of:

(h) one of the devices sending the second web server identifier to the first server;

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(i) the first server sending the identifier of the client to the one of the devices;

(j) the client receiving the second content from the second web server; and

(k) the one of the devices receiving the second content from the client.

39. (New) The method according to claim 26 wherein the communication with the web server or the first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

40. (New) The method according to claim 26 wherein the communication with the client or the selected device is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

41. (New) The method according to claim 26 wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL).

42. (New) The method according to claim 26 wherein the web server identifier, the first server identifier, the client identifier, or any of the device's identifier is using Internet Protocol (IP) address.

43. (New) The method according to claim 26 wherein in step (d) the first server selecting two or more of the devices based on associating the identifiers of the devices with the web server identifier; and in step (e) the first server sending the identifiers of the selected two or more devices to the client.

44. (New) The method according to claim 43 further comprising the step of the client selecting one of the devices as the selected device.

45. (New) The method according to claim 26 further comprising the steps of the client sending a communication port number to the selected device, followed by communication between the client and the selected device using the communication port number.

46. (New) The method according to claim 26 further comprising the step of the client sending the web server identifier to the selected device.

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47. (New) The method according to claim 46 further comprising the step of the selected device communicating with the web server.

48. (New) The method according to claim 26 wherein step (d) the first server selecting one of the devices based on the geographical location of the devices.

49. (New) A method for data communication between a web server storing a content and a client via one or more devices, for use with a first server, and where the web server, the client, the first server, and the devices are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) each of the devices sending its identifier to the first server;

(b) the first server storing the identifiers of the devices;

(c) the client sending its identifier and the web server identifier to the first server;

(d) selecting one of the devices based on the geographical location of the devices;

(e) the first server sending the identifier of the selected device to the client;

(f) the selected device receiving the content from the web server; and

(g) the client receiving the content from the selected device.

50. (New) The method according to claim 49 wherein in step (d) the first server is selecting one of the devices.

51. (New) The method according to claim 49 wherein in step (d) the client is selecting one of the devices.

52. (New) The method according to claim 49 further for data communication between a second web server storing a second content and having an identifier in the Internet and a one of the devices via the client, the method further comprising the steps of:

(h) one of the devices sending the second web server identifier to the first server;

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(i) the first server sending the identifier of the client to the one of the devices;

(j) the client receiving the second content from the second web server; and

(k) the one of the devices receiving the second content from the client.

53. (New) A method for data communication between a client and a web server storing a content via a device, for use with a first server and a device, and where the web server, the client, the first server, and the device are communicatively coupled via the Internet and each is identified in the Internet using a distinct identifier, the method comprising the steps of:

(a) sending its identifier and the web server identifier to the first server;

(b) receiving from the first server the identifier of the device;

(c) sending the web server identifier to the device; and

(d) receiving the content associated with the web server from the device.

54. (New) The method according to claim 53 wherein the steps are sequentially executed.

55. (New) The method according to claim 53 wherein the first server is HTTP server and responds to HTTP requests.

56. (New) The method according to claim 53 wherein the first server is a TCP / IP server and communicates based on, or according to, using TCP/IP protocol or connection.

57. (New) The method according to claim 53 wherein the content includes web-page, audio, or video content.

58. (New) The method according to claim 53 wherein the steps are part of browser or email application execution.

59. (New) The method according to claim 53 further for data communication with a second web server storing a second content and having an identifier in the Internet and the devices via the client, the method further comprising the steps of:

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(e) receiving the second content from the second web server; and

(f) sending the second content to the device.

60. (New) The method according to claim 53 wherein the communication with the web server or the first server is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

61. (New) The method according to claim 53 wherein the communication with the device is based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

62. (New) The method according to claim 53 wherein the web server identifier, the first server identifier, or the content identification is using a Uniform Resource Locator (URL).

63. (New) The method according to claim 53 wherein the web server identifier, the first server identifier, the client identifier, or the device identifier is using Internet Protocol (IP) address.

64. (New) The method according to claim 53 wherein step (b) comprising the receiving from the first server the identifiers of two or more devices, and further comprising the step of selecting one out of devices based on associating the identifiers of the devices with the web server identifier.

65. (New) The method according to claim 53 further comprising the steps of sending a communication port number to the device, followed by communication with the device using the communication port number.

66. (New) The method according to claim 53 further comprising the step of sending the web server identifier to the device.

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REMARKS

No new matter has been added. Claims 26-66 are pending. The Applicant respectfully submits that the claims 26-66 are in condition for review and respectfully requests allowance.

In light of the foregoing and for at least the reasons set forth above, the Applicant respectfully requests favorable reconsideration and allowance of the present application. If in the opinion of the Examiner, a telephonic conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (603) 627-8134.

Respectfully submitted,

SHEEHAN PHINNEY BASS + GREEN PA

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IPR2024-00126, EX. 2028
698 of 789

Electronic Patent Application Fee Transmittal

Application Number:	14025109
Filing Date:	12-Sep-2013
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Filer:	Peter Anthony Nieves/Karen Morin
Attorney Docket Number:	19459-6105P

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	2202	15	40	600
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**600**

Electronic Acknowledgement Receipt

EFS ID:	17741416
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	23-DEC-2013
Filing Date:	12-SEP-2013
Time Stamp:	14:07:08
Application Type:	Utility under 35 USC 111(a)

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Payment Type	Deposit Account
Payment was successfully received in RAM	$600
RAM confirmation Number	460
Deposit Account	501304
Authorized User	

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1	Preliminary Amendment	S0311121.pdf	357365 03cb73644d526296e288a32b4eb4b0f5ee5e24a5	no	8
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30191 a5bd8f2393a5421f096b527e70c34038e66cf104	no	2
Warnings:					
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EFS ID:	17741416
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
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First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	23-DEC-2013
Filing Date:	12-SEP-2013
Time Stamp:	14:07:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

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Payment Type	Deposit Account
Payment was successfully received in RAM	$600
RAM confirmation Number	460
Deposit Account	501304
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Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30191 a5bd8f2393a5421f096b527e70c34038e66cf104	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	387556		

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/025,109	Filing Date 09/12/2013	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **12/23/2013**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 40	Minus	** 25	= 15	X $40 =	600
Independent (37 CFR 1.16(h))	* 3	Minus	***4	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	**600**

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/025,109	09/12/2013	Derry Shribman	19459-6105P

CONFIRMATION NO. 6194

57449
SHEEHAN PHINNEY BASS & GREEN, PA
c/o PETER NIEVES
1000 ELM STREET
MANCHESTER, NH 03105-3701

POA ACCEPTANCE LETTER

OC000000064453490

Date Mailed: 10/23/2013

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/16/2013.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/snguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Doc Code: PA...
Document Description: Power of Attorney

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
14/025,109	September 12, 2013

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 57449

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name	
Address	
City	State / Zip
Country	
Telephone	Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in this box)

Hola Networks Ltd.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Date (Optional)
Name	Ofer Vilenski
Title	CEO

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	17141623
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	16-OCT-2013
Filing Date:	12-SEP-2013
Time Stamp:	14:13:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	S0276984.pdf	91597 eb0f0e9d6bee87aa47d36dbc22b1e041802 3a0d9	no	1

Warnings:	
Information:	

2	Oath or Declaration filed	S0276982.pdf	91646 3b90bbc2171b6194b4ce13b054c4580a4eafa50e	no	1
Warnings:					
Information:					
3	Power of Attorney	S0276985.pdf	111834 a0cd1ce6051c5984db26049b9b95d1e46180a372	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	295077		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/01 (08-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

[ ] The attached application, or

[x] United States application or PCT international application number 14/025,109

filed on September 12, 2013

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a nonpublication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Derry Shribman Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

The collection of information is estimated by 15 U.S.C. 119 and 37 CFR 1.63. This collection is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/05 (08-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

- ☐ The attached application, or
- ▩ United States application or PCT international application number 14/025,109 filed on September 12, 2013

The above identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Ofer Vilenski — Date (Optional):

Signature:

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/05 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14 and 41.6. The collection is estimated to take 1 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/025,109

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	25 minus 20 =	* 5	x 40 =	200	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 210 =	210			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	1140		TOTAL	

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/025,109	09/12/2013	2447	1210	19459-6105P	25	4

CONFIRMATION NO. 6194

57449
SHEEHAN PHINNEY BASS & GREEN, PA
c/o PETER NIEVES
1000 ELM STREET
MANCHESTER, NH 03105-3701

FILING RECEIPT



Date Mailed: 10/07/2013

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Derry Shribman, Netanya, ISRAEL;
Ofer Vilenski, Netanya, ISRAEL;

Applicant(s)

Hola Networks Ltd., Netanya, ISRAEL

Assignment For Published Patent Application

Hola Networks Ltd., Netanya, ISRAEL

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a DIV of 12/836,059 07/14/2010 PAT 8560604
which claims benefit of 61/249,624 10/08/2009

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 09/27/2013
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/025,109**
Projected Publication Date: 01/16/2014
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
713 of 789

Title

SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

Preliminary Class

709

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/025,109	09/12/2013	Derry Shribman	19459-6105P

CONFIRMATION NO. 6194

57449
SHEEHAN PHINNEY BASS & GREEN, PA
c/o PETER NIEVES
1000 ELM STREET
MANCHESTER, NH 03105-3701

NOTICE

OC000000064086531

Date Mailed: 10/07/2013

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Derry Shribman
  Ofer Vilenski

  Applicant may submit the inventor's oath or declaration at any time before the Notice of Allowance and Fee(s) Due, PTOL-85, is mailed.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
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PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Derry Shribman
Art Unit	
Examiner Name	
Attorney Docket Number	19459-6105P

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7865585		2011-01-04	Samuels et al	
	2	7120666		2006-10-10	McCanne et al	
	3	7203741		2007-04-10	Marco et al	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20110087733	A1	2011-04-14	Shribman et al	
	2	20030174648		2003-09-18	Wang et al	
	3	20080008089		2008-01-10	Bornstein et al	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Derry Shribman
	Art Unit	
	Examiner Name	
	Attorney Docket Number	19459-6105P

	4	20040088646		2004-05-06	Yeager et al	
	5	20030009583		2003-01-09	Chan et al	
	6	20080109466		2008-05-08	Wang Matrix XIN	
	7	20070156855		2007-07-05	Johnson Moses	
	8	20060235391		2006-09-25	Painter, Christopher et al	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2028
718 of 789

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Derry Shribman
	Art Unit	
	Examiner Name	
	Attorney Docket Number	19459-6105P

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Derry Shribman
	Art Unit	
	Examiner Name	
	Attorney Docket Number	19459-6105P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Peter A. Nieves/	Date (YYYY-MM-DD)	2013-09-12
Name/Print	Peter A. Nieves	Registration Number	48173

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Filer:	Peter Anthony Nieves/Karen Morin
Attorney Docket Number:	19459-6105P

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Pages:				
Claims:				
Claims in excess of 20	2202	5	40	200
Independent Claims in Excess of 3	2201	1	210	210
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Late Filing Fee for Oath or Declaration	2051	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1210**

Electronic Acknowledgement Receipt

EFS ID:	16836738
Application Number:	14025109
International Application Number:	
Confirmation Number:	6194
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Customer Number:	57449
Filer:	Peter Anthony Nieves/Karen Morin
Filer Authorized By:	Peter Anthony Nieves
Attorney Docket Number:	19459-6105P
Receipt Date:	12-SEP-2013
Filing Date:	
Time Stamp:	14:54:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1210
RAM confirmation Number	1334
Deposit Account	501304
Authorized User	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		S0261132.pdf	195030 b628509c396b319f5d935dd9f4c434ae6fec3dd5	yes	42

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Specification	1	33
	Claims	34	41
	Abstract	42	42

Warnings:

Information:

2	Drawings-only black and white line drawings	S0257719.pdf	652512 73e5803d8e0e605fa2c3d1bd4608832b1db68bda	no	15

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Information:

3	Application Data Sheet	S0261127.pdf	509401 d0a4178e28c4d5bd7fa1ea59c8c1fe1171cb4e4d	no	6

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4	Information Disclosure Statement (IDS) Form (SB08)	S0261128.pdf	340681 90af346cf32f544c3402c7a1c2c0da45a692d3df	no	5

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Information:

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5	Fee Worksheet (SB06)	fee-info.pdf	39706 c0b89ff30732eb7680a0922387 8e87a6f3d5a485	no	2

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Information:

Total Files Size (in bytes):	1737330

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a divisional application of copending U.S. non-provisional patent application entitled "SYSTEM AND METHOD FOR PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION" having serial number 12/836,059, filed July 14, 2010, and claims priority to U.S. provisional patent application entitled "SYSTEM AND METHOD FOR REDUCING INTERNET CONGESTION," having serial number 61/249,624, filed October 8, 2009, both of which are hereby incorporated herein by reference in their entirety.

FIELD OF THE INVENTION

The present invention is related to Internet communication, and more particularly, to improving data communication speed and bandwidth efficiency on the Internet.

BACKGROUND OF THE INVENTION

There are several trends in network and Internet usage, which tremendously increase the bandwidth that is being used on the Internet. One such trend is that more and more video is being viewed on demand on the Internet. Such viewing includes the viewing of both large and short video clips. In addition, regular shows and full-featured films may be viewed on the Internet. Another trend that is increasing the traffic on the Internet is that Web sites (such as shopping portals, news portals, and social networks) are becoming global, meaning that the Web sites are serving people in many diverse places on the globe, and thus the data is traversing over longer stretches of the Internet, increasing the congestion.

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The increase in bandwidth consumption has created several major problems, a few of which are described below:

The problem for users – the current Internet bandwidth is not sufficient, and thus the effective 'speed' experienced by users is slow;

The problem for content owners – the tremendous amount of data being viewed by users is costing large amounts of money in hosting and bandwidth costs; and

The problem for Internet Service Providers (ISPs) – the growth in Internet traffic is requiring the ISPs to increase the infrastructure costs (communication lines, routers, etc.) at tremendous financial expense.

The need for a new method of data transfer that is fast for the consumer, cheap for the content distributor and does not require infrastructure investment for ISPs, has become a major issue which is yet unsolved.

There have been many attempts at making the Internet faster for the consumer and cheaper for the broadcaster. Each such attempt is lacking in some aspect to become a widespread, practical solution, or is a partial solution in that it solves only a subset of the major problems associated with the increase in Internet traffic. Most of the previous solutions require billions of dollars in capital investment for a comprehensive solution. Many of these attempts are lacking in that much of the content on the Internet has become dynamically created per the user and the session of the user (this is what used to be called the "Web2.0" trend). This may be seen on the Amazon Web site and the Salesforce Web site, for example, where most of the page views on these Web sites is tailored to the viewer, and is thus different for any two viewers. This dynamic information makes it impossible for most of the solutions offered to date to store the content and provide it to others seeking similar content.

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One solution that has been in use is called a "proxy". FIG. 1 is a schematic diagram providing an example of use of a proxy within a network 2. A proxy, or proxy server 4, 6, 8 is a device that is placed between one or more clients, illustrated in FIG. 1 as client devices 10, 12, 14, 16, 18, 20, that request data, via the Internet 22, and a Web server or Web servers 30, 32, 34 from which they are requesting the data. The proxy server 4, 6, 8 requests the data from the Web servers 30, 32, 34 on their behalf, and caches the responses from the Web servers 30, 32, 34, to provide to other client devices that make similar requests. If the proxy server 4, 6, 8 is geographically close enough to the client devices 10, 12, 14, 16, 18, 20, and if the storage and bandwidth of the proxy server 4, 6, 8 are large enough, the proxy server 4, 6, 8 will speed up the requests for the client devices 10, 12, 14, 16, 18, 20 that it is serving.

It should be noted, however, that to provide a comprehensive solution for Internet surfing, the proxy servers of FIG. 1 would need to be deployed at every point around the world where the Internet is being consumed, and the storage size of the proxy servers at each location would need to be near the size of all the data stored anywhere on the Internet. The abovementioned would lead to massive costs that are impractical. In addition, these proxy solutions cannot deal well with dynamic data that is prevalent now on the Web.

There have been commercial companies, such as Akamai, that have deployed such proxies locally around the world, and that are serving a select small group of sites on the Internet. If all sites on the Web were to be solved with such a solution, the capital investment would be in the range of billions of dollars. In addition, this type of solution does not handle dynamic content.

To create large distribution systems without the large hardware costs involved with a proxy solution, "peer-to-peer file sharing" solutions have been introduced, such as, for example, BitTorrent. FIG. 2 is a schematic diagram providing an example of a peer-to-peer file transfer network 50. In the network 50, files are stored on computers of consumers, referred to herein as

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client devices 60. Each consumer can serve up data to other consumers, via the Internet 62, thus taking the load of serving off of the distributors and saving them the associated costs, and providing the consumer multiple points from which to download the data, referred to herein as peers 70, 72, 74, 76, 78, thus increasing the speed of the download. However, each such peer-to-peer solution must have some sort of index by which to find the required data. In typical peer-to-peer file sharing systems, because the index is on a server 80, or distributed among several servers, the number of files available in the system is not very large (otherwise, the server costs would be very large, or the lookup time would be very long).

The peer-to-peer file sharing solution is acceptable in file sharing systems, because there are not that many media files that are of interest to the mass (probably in the order of magnitude of millions of movies and songs that are of interest). Storing and maintaining an index of millions of entries is practical technically and economically. However, if this system were to be used to serve the hundreds of billions of files that are available on the Internet of today, the cost of storing and maintaining such an index would be again in the billions of dollars. In addition, these types of peer-to-peer file sharing systems are not able to deal with dynamic HTTP data.

In conclusion, a system does not exist that enables fast transmission of most of the data on the Internet, that does not incur tremendous costs, and/or that provides only a very partial solution to the problem of Internet traffic congestion. Thus, a heretofore unaddressed need exists in the industry to address the aforementioned deficiencies and inadequacies.

SUMMARY OF THE INVENTION

The present system and method provides for faster and more efficient data communication within a communication network. Briefly described, in architecture, one embodiment of the system, among others, can be implemented as follows. A network is provided

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for accelerating data communication, wherein the network contains: at least one client communication device for originating a data request for obtaining the data from a data server; at least one agent communication device which is assigned to the data server for receiving the data request from the client communication device, wherein the agent keeps track of which client communication devices have received responses to data requests from the assigned data server; at least one peer communication device for storing portions of data received in response to the data request by the at least one client communication device, wherein the portions of data may be transmitted to the at least one client communication device upon request by the client communication device; and at least one acceleration server for deciding which agent communication device is to be assigned to which data server and providing this information to the at least one client communication device.

The present system and method also provides a communication device within a network, wherein the communication device contains: a memory; and a processor configured by the memory to perform the steps of: originating a data request for obtaining data from a data server; being assigned to a data server, referred to as an assigned data server; receiving a data request from a separate device within the network, and keeping track of which client communication devices within the network have received responses to data requests from the assigned data server; and storing portions of data received in response to the originated data request, wherein the portions of data may be transmitted to communication device upon request by the communication device.

Other systems, methods, features, and advantages of the present invention will be or become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description, be within the scope of the present invention, and be protected by the accompanying claims.

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BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the invention can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present invention. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. 1 is a schematic diagram providing a prior art example of use of a proxy within a network.

FIG. 2 is a schematic diagram providing a prior art example of a peer-to-peer file transfer network.

FIG. 3 is a schematic diagram providing an example of a communication network in accordance with the present invention.

FIG. 4 is a schematic diagram further illustrating a communication device of the communication network of FIG. 3.

FIG. 5 is a schematic diagram further illustrating the memory of FIG. 4.

FIG. 6 is a schematic diagram further illustrating elements of the acceleration application of FIG. 5, as well as communication paths of the acceleration application.

FIG. 7 is a chart further illustrating two of the main databases utilized within the communication network.

FIG. 8 is a flowchart illustrating operation of the acceleration system initializer module.

FIG. 9 is a flowchart further illustrating communication between different elements of the communication network.

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FIG. 10 is a flowchart continuing the flowchart of FIG. 9 and focused on agent response to the HTTP request.

FIG. 11 is a flowchart continuing the flowchart of FIG. 10, which illustrates actions taken upon receipt of the list of peers, or single peer listing, from the agent.

FIG. 12 is a flowchart illustrating steps taken by an agent, client, or peer to determine whether a certain HTTP request is still valid.

FIG. 13 is a flowchart outlining operation of the acceleration server.

FIG. 14 is a flowchart further illustrating TCPIP acceleration in accordance with an alternative embodiment of the invention.

FIG. 15 is a flowchart further illustrating TCPIP acceleration in accordance with an alternative embodiment of the invention, detailing the communication between the client and the TCPIP server (read and write commands) after the connect phase has completed successfully.

DETAILED DESCRIPTION

The present system and method provides for faster and more efficient data communication within a communication network. An example of such a communication network 100 is provided by the schematic diagram of FIG. 3. The network 100 of FIG. 3 contains multiple communication devices. Due to functionality provided by software stored within each communication device, which may be the same in each communication device, each communication device may serve as a client, peer, or agent, depending upon requirements of the network 100, as is described in detail herein. It should be noted that a detailed description of a communication device is provided with regard to the description of FIG. 4.

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Returning to FIG. 3, the exemplary embodiment of the network 100 illustrates that one of the communication devices is functioning as a client 102. The client 102 is capable of communication with one or more peers 112, 114, 116 and one or more agents 122. For exemplary purposes, the network contains three peers and one agent, although it is noted that a client can communicate with any number of agents and peers.

The communication network 100 also contains a Web server 152. The Web server 152 is the server from which the client 102 is requesting information and may be, for example, a typical HTTP server, such as those being used to deliver content on any of the many such servers on the Internet. It should be noted that the server 152 is not limited to being an HTTP server. In fact, if a different communication protocol is used within the communication network, the server may be a server capable of handling a different protocol. It should also be noted that while the present description refers to the use of HTTP, the present invention may relate to any other communication protocol and HTTP is not intended to be a limitation to the present invention.

The communication network 100 further contains an acceleration server 162 having an acceleration server storage device 164. As is described in more detail herein, the acceleration server storage device 164 has contained therein an acceleration server database. The acceleration server database stores Internet protocol (IP) addresses of communication devices within the communication network 100 having acceleration software stored therein. Specifically, the acceleration server database contains stored therein a list of communication devices having acceleration software stored therein that are currently online within the communication network 100. For each such agent, the acceleration server assigns a list of IP addresses.

In the communication network 100 of FIG. 3, the application in the client 102 is requesting information from the Web server 152, which is why the software within the communication device designated this communication device to work as a client. In addition, since the agent 122 receives the request from the client 102 as the communication device closest

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to the Web server 152, functionality of the agent 122, as provided by the software of the agent 122, designates this communication device to work as an agent. It should be noted, that in accordance with an alternative embodiment of the invention, the agent need not be the communication device that is closest to the Web server. Instead, a different communication device may be selected to be the agent.

Since the peers 112, 114, 116 contain at least portions of the information sought by the client 102 from the Web server 152, functionality of the peers 112, 114, 116, as provided by the software of the peers 112, 114, 116, designates these communication devices to work as peers. It should be noted that the process of designating clients, agents, and peers is described in detail herein. It should also be noted that the number of clients, agents, peers, acceleration servers, Web servers, and other components of the communication network 100 may differ from the number illustrated by FIG. 3. In fact, the number of clients, agents, peers, acceleration servers, Web servers, and other components of the communication network 100 are not intended to be limited by the current description.

Prior to describing functionality performed within a communication network 100, the following further describes a communication device 200, in accordance with a first exemplary embodiment of the invention. FIG. 4 is a schematic diagram further illustrating a communication device 200 of the communication network 100, which contains general components of a computer. As previously mentioned, it should be noted that the communication device 200 of FIG. 4 may serve as a client, agent, or peer.

Generally, in terms of hardware architecture, as shown in FIG. 4, the communication device 200 includes a processor 202, memory 210, at least one storage device 208, and one or more input and/or output (I/O) devices 240 (or peripherals) that are communicatively coupled via a local interface 250. The local interface 250 can be, for example but not limited to, one or more buses or other wired or wireless connections, as is known in the art. The local interface 250

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may have additional elements, which are omitted for simplicity, such as controllers, buffers (caches), drivers, repeaters, and receivers, to enable communications. Further, the local interface 250 may include address, control, and/or data connections to enable appropriate communications among the aforementioned components.

The processor 202 is a hardware device for executing software, particularly that stored in the memory 210. The processor 52 can be any custom made or commercially available processor, a central processing unit (CPU), an auxiliary processor among several processors associated with the communication device 200, a semiconductor based microprocessor (in the form of a microchip or chip set), a macroprocessor, or generally any device for executing software instructions.

The memory 210, which is further illustrated and described by the description of FIG. 5, can include any one or combination of volatile memory elements (*e.g.*, random access memory (RAM, such as DRAM, SRAM, SDRAM, *etc.*)) and nonvolatile memory elements (*e.g.*, ROM, hard drive, tape, CDROM, *etc.*). Moreover, the memory 210 may incorporate electronic, magnetic, optical, and/or other types of storage media. Note that the memory 210 can have a distributed architecture, where various components are situated remote from one another, but can be accessed by the processor 202.

The software 212 located within the memory 210 may include one or more separate programs, each of which contains an ordered listing of executable instructions for implementing logical functions of the communication device 200, as described below. In the example of FIG. 4, the software 212 in the memory 210 at least contains an acceleration application 220 and an Internet browser 214. In addition, the memory 210 may contain an operating system (O/S) 230. The operating system 230 essentially controls the execution of computer programs and provides scheduling, input-output control, file and data management, memory management, and communication control and related services. It should be noted that, in addition to the

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acceleration application 220, Internet browser 214, and operating system 230, the memory 210 may contain other software applications.

While the present description refers to a request from the client originating from an Internet browser, the present invention is not limited to requests originating from Internet browsers. Instead, a request may originate from an email program or any other program that would be used to request data that is stored on a Web server, or other server holding data that is requested by the client device.

Functionality of the communication device 200 may be provided by a source program, executable program (object code), script, or any other entity containing a set of instructions to be performed. When a source program, then the program needs to be translated via a compiler, assembler, interpreter, or the like, which may or may not be included within the memory 210, so as to operate properly in connection with the operating system 230. Furthermore, functionality of the communication device 200 can be written as (a) an object oriented programming language, which has classes of data and methods, or (b) a procedure programming language, which has routines, subroutines, and/or functions.

The I/O devices 240 may include input devices, for example but not limited to, a keyboard, mouse, scanner, microphone, *etc.* Furthermore, the I/O devices 240 may also include output devices, for example but not limited to, a printer, display, *etc.* Finally, the I/O devices 240 may further include devices that communicate via both inputs and outputs, for instance but not limited to, a modulator/demodulator (modem; for accessing another device, system, or network), a radio frequency (RF) or other transceiver, a telephonic interface, a bridge, a router, *etc.*

When the communication device 200 is in operation, the processor 202 is configured to execute the software 212 stored within the memory 210, to communicate data to and from the memory 210, and to generally control operations of the communication device 200 pursuant to

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the software 212. The software 212 and the O/S 230, in whole or in part, but typically the latter, are read by the processor 202, perhaps buffered within the processor 202, and then executed.

When functionality of the communication device 200 is implemented in software, as is shown in FIG. 4, it should be noted that the functionality can be stored on any computer readable medium for use by or in connection with any computer related system or method. In the context of this document, a computer readable medium is an electronic, magnetic, optical, or other physical device or means that can contain or store a computer program for use by or in connection with a computer related system or method. The functionality of the communication device 200 can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

The computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a non-exhaustive list) of the computer-readable medium would include the following: an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (electronic), a read-only memory (ROM) (electronic), an erasable programmable read-only memory (EPROM, EEPROM, or Flash memory) (electronic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for instance optical scanning of the paper or other medium, then

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compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.

In an alternative embodiment, where the functionality of the communication device 200 is implemented in hardware, the functionality can be implemented with any or a combination of the following technologies, which are each well known in the art: a discrete logic circuit(s) having logic gates for implementing logic functions upon data signals, an application specific integrated circuit (ASIC) having appropriate combinational logic gates, a programmable gate array(s) (PGA), a field programmable gate array (FPGA), *etc.*

The at least one storage device 208 of the communication device 200 may be one of many different categories of storage device. As is described in more detail herein, the storage device 208 may include a configuration database 280 and a cache database 282. Alternatively, the configuration database 280 and cache database 282 may be located on different storage devices that are in communication with the communication device 200. The description that follows assumes that the configuration database 280 and cache database 282 are located on the same storage device, however, it should be noted that the present invention is not intended to be limited to this configuration.

The configuration database 280 stores configuration data that is common to all elements of the communication network 100 and is used to provide set up and synchronization information to different modules of the acceleration application 220 stored within the memory 210, as is described in further detail herein. The cache database 282 stores responses to HTTP requests that the communication device 200 has dispatched, either for its own consumption or on behalf of other elements of the communication network 100. As is explained in additional detail herein, the responses to HTTP requests are stored within the cache database 282 for future use by this communication device 200, or for other communication devices within the

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communication network 100 that need to retrieve this information and will use this communication device as either a peer or an agent.

In addition to the abovementioned, as is explained in further detail herein, the cache database 282 has stored therein a list of URLs that the communication device is aware of (i.e., has seen requests for). For each URL, the cache database 282 has stored therein the URL itself, HTTP headers returned by the Web Server for this URL, when the last time was that the contents of this URL was loaded directly from the Web Server, when the contents of the URL had last changed on the Web Server, as well as a list of chunks that contain the contents of this URL, and the chunks of data themselves. Chunks in the present description are defined as equally sized pieces of data that together form the whole content of the URL. It should be noted that while the present description provides for chunks being equally sized pieces of data, in accordance with an alternative embodiment of the invention, the chunks may instead be of different size.

FIG. 5 is a schematic diagram further illustrating the memory 210 of FIG. 4. As shown by FIG. 5, the memory 210 may be separated into two basic levels, namely, an operating system level 260 and an application level 270. The operating system level 260 contains the operating system 230, wherein the operating system 230 further contains at least one device driver 262 and at least one communication stack 264. The device drivers 262 are software modules that are responsible for the basic operating commands for various hardware devices of the communication device 200, such as the processor 202, the storage device 208 and the I/O devices 240. In addition, the communication stacks 264 provide applications of the communication device 200 with a means of communicating within the network 100 by implementing various standard communication protocols.

The application level 270 includes any application that is running on the communication device 200. As a result, the application level 270 includes the Internet browser 214, which is used to view information that is located on remote Web servers, the acceleration application 220,

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as described in more detail below, and any other applications 216 stored on the communication device 200.

As is explained in additional detail below, the acceleration application 220 intercepts the requests being made by applications of the communication device (client) that use the Internet, in order to modify the requests and route the requests through the communication network. There are various methods that may be used to intercept such requests. One such method is to create an intermediate driver 272, which is also located within the memory 210, that attaches itself to all communication applications, intercepts outgoing requests of the communication applications of the communication device 200, such as the Internet browser 214, and routes the requests to the acceleration application 220. Once the acceleration application 220 modifies the requests, routes the requests to other system elements on the communication network 100, and receives replies from other system elements of the communication network 100, the acceleration application 220 returns the replies to the intermediate driver 272, which provides the replies back to the requesting communication application.

FIG. 6 is a schematic diagram further illustrating elements of the acceleration application 220, as well as communication paths of the acceleration application 220. The acceleration application 220 contains an acceleration system initializer module 222, which is called when the acceleration application 220 is started. The acceleration system initializer module 222 is capable of initializing all elements of the communication device 200 The acceleration application 220 also contains three separate modules that run in parallel, namely, a client module 224, a peer module 226, and an agent module 228, each of which comes into play according to the specific role that the communication device 200 is partaking in the communication network 100 at a given time. The role of each module is further described herein.

The client module 224 provides functionality required when the communication device 200 is requesting information from the Web server 152, such as, for example, but not limited to,

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Web pages, data, video, or audio. The client module 224 causes the communication device 200 having the client module 224 therein to intercept the information request and pass the information request on to other elements of the communication network 100, such as, servers, agents or peers. This process is further described in detail herein.

The peer module 226 provides functionality required by the communication device 200 when answering other clients within the communication network 100 and providing the other clients with information that they request, which this communication device 200, having this peer module 226 therein, has already downloaded at a separate time. This process is further described in detail herein.

The agent module 228 provides functionality required when other communication devices of the communication network 100 acting as clients query this communication device 200, having this agent module 228 therein, as an agent, to obtain a list of peers within the communication network 100 that contain requested information. This process is further described in detail herein.

The acceleration application 220 interacts with both the configuration database 280 and the cache database 282 of the storage device 208. As previously mentioned herein, the configuration database 280 stores configuration data that may be common to all communication devices of the communication network 100 and is used to provide setup and synchronization information to different modules 222, 224, 226, 228 of the acceleration application 220 stored within the memory 210.

The cache database 282 stores responses to information requests, such as, for example, HTTP requests, that the communication device 200 has dispatched, either for its own consumption or on behalf of other elements of the communication network 100. The responses to HTTP requests are stored within the cache database 282 for future use by this communication device 200, or for other communication devices within the communication network 100 that

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need to retrieve this same information and will use this communication device 200 as either a peer or an agent. This process is described in detail herein.

Information stored within the cache database 282 may include any information associated with a request sent by the client. As an example, such information may include, metadata and actual requested data. For example, for an HTTP request for a video, the metadata may include the version of the Web server answering the request from the client and the data would be the requested video itself. In a situation where there is no more room for storage in the cache database, the software of the associated communication device may cause the communication device to erase previous data stored in order to clear room for the new data to store in the cache database. As an example, such previous data may include data that is most likely not to be used again. Such data may be old data or data that is known to no longer be valid. The communication device may choose to erase the least relevant data, according to any of several methods that are well known in the art.

FIG. 7 is a chart further illustrating two of the main databases utilized within the communication network 100, namely, the acceleration server database 164 and the cache database 282. As previously mentioned, the acceleration server database 164 stores IP addresses of communication devices located within the communication network 100, which have acceleration software stored therein. Specifically, the acceleration server database 164 contains stored therein a list of communication devices having acceleration software stored therein that are currently online within the communication network 100. The acceleration server assigns a list of IP addresses to each communication device functioning as an agent. Each communication device will be the agent for any Web servers whose IP address is in the range 'owned' by that communication device. As an example, when a first ever communication device goes online, namely, the first communication device as described herein having the acceleration application 220 therein, the acceleration server assigns all IP addresses in the world to this communication device, and this communication device will be the agent for any Web server. When a second

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communication device goes online it will share the IP address list with the first communication device, so that each of the communication devices will be responsible for a different part of the world wide web servers.

The cache database 282 of the communication device 200 has stored therein a list of URLs 286 of which the communication device 200 is aware. The communication device 200 becomes aware of a URL each time that the communication device 200 receives a request for information located at a specific URL. As shown by FIG. 7, for each URL 288 within the list of URLs 286, the cache database 282 stores: the URL itself 290; HTTP headers 292 returned by the Web Server 152 for this URL; when the last time 294 was that the contents of this URL were loaded directly from the Web Server 152; when the contents of the URL last changed 296 on the Web Server 152; and a list of chunks 298 that contain the contents of this URL, and the content of the chunk. As previously mentioned, chunks, in the present description, are defined as equally sized pieces of data that together form the entire content of the URL, namely, the entire content whose location is described by the URL. As a non-limiting example, a chunk size of, for example, 16KB can be used, so that any HTTP response will be split up into chunks of 16KB. In accordance with an alternative embodiment of the invention, if the last chunk of the response is not large enough to fill the designated chunk size, such as 16KB for the present example, the remaining portion of the chunk will be left empty.

For each such chunk 300, the cache database 282 includes the checksum of the chunk 302, the data of the chunk 304 itself, and a list of peers 306 that most likely have the data for this chunk. As is described in additional detail herein, the data for the chunk may be used by other clients within the communication network 100 when other communication devices of the communication network 100 serve as peers to the clients, from which to download the chunk data.

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For each chunk, a checksum is calculated and stored along side of the chunk itself. The checksum may be calculated in any of numerous ways known to those in the art. The purpose of having the checksum is to be able to identify data uniquely, whereas the checksum is the "key" to the data, where the data is the chunk. As an example, a client may want to load the contents of a URL, resulting in the agent that is servicing this request sending the checksums of the chunks to the client, along with the peers that store these chunks. It is to be noted that there could be a different peer for every different chunk. The client then communicates with each such peer, and provides the checksum of the chunk that it would like the peer to transmit back to the client. The peer looks up the checksum (the key) in its cache database, and provides back the chunk (data) that corresponds to this checksum (the key). As shown by FIG. 7, for each peer 308 within the list of peers 306, the cache database 282 includes the peer IP address 310, as well as the connection status 312 of the peer, which represents whether the peer 308 is online or not.

In accordance with one embodiment of the invention, the cache database 282 may be indexed by URL and by Checksum. Having the cache database indexed in this manner is beneficial due to the following reason. When the agent is using the cache database, the agent receives a request from a client for the URL that the client is looking for. In such a case the agent needs the cache database to be indexed by the URL, to assist in finding a list of corresponding peers that have the chunks of this URL. When the peers are using this cache database, the peers obtain a request from the client for a particular checksum, and the peers need the database to be indexed by the checksum so that they can quickly find the correct chunk. Of course, as would be understood by one having ordinary skill in the art, the cache database may instead be indexed in any other manner.

Having described components of the communication network 100, the following further describes how such components interact and individually function. FIG. 8 is a flowchart 300 illustrating operation of the acceleration system initializer module 222 (hereafter referred to as the initializer 222 for purposes of brevity). It should be noted that any process descriptions or

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blocks in flowcharts should be understood as representing modules, segments, portions of code, or steps that include one or more instructions for implementing specific logical functions in the process, and alternative implementations are included within the scope of the present invention in which functions may be executed out of order from that shown or discussed, including substantially concurrently or in reverse order, depending on the functionality involved, as would be understood by those reasonably skilled in the art of the present invention.

The initializer 222 is the first element of the communication device 200 to operate as the communication device 200 starts up (block 302). As the initializer 222 starts, it first communicates with the acceleration server 162 to sign up with the acceleration server 162. This is performed by providing the acceleration server 162 with the hostname, and all IP addresses and media access control (MAC) addresses of the interfaces on the communication device 200 having the initializer 222 thereon.

In accordance with an alternative embodiment of the invention, as shown by block 304, the initializer 222 checks with the acceleration server 162 whether a more updated version of the acceleration application software is available. This may be performed by any one of many known methods, such as, but not limited to, by providing the version number of the acceleration application software to the acceleration server 162. The message received back from the acceleration server 162 indicates whether there is a newer version of the acceleration application software or not. If a newer version of the acceleration application software exists, the initializer 222 downloads the latest version of the acceleration application software from the acceleration server 162, or from a different location, and installs the latest version on the communication device 200. In addition to the abovementioned, the initializer 222 may also schedule additional version checks for every set period of time thereafter. As an example, the initializer 222 may check for system updates every two days.

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As shown by block 306, the initializer 222 then redirects outgoing network traffic from the communication device 200 to flow through the acceleration application 162. As previously mentioned, one way to redirect the outgoing network traffic is to insert an intermediate driver 212 that intercepts and redirects the traffic. It should be noted that there are many other ways to implement this redirection, which are well known to those having ordinary skill in the art.

As shown by block 308, the initializer 222 then launches the client module 224 of the communication device 200, and configures the client module 224 of the communication device 200 to intercept to all outgoing network communications of the communication device 200 and route the outgoing network communications to the client module 224, from the intermediate driver 272 or other routing method implemented. This is performed so that the client module 224 is able to receive all network traffic coming from the network applications, modify the network traffic if necessary, and re-route the traffic. As is known by those having ordinary skill in the art, in order to re-route the traffic, the traffic needs to be modified, as an example, to change the destination of requests.

As shown by block 310, the initializer 222 then launches the agent module 228 and the peer module 226 to run on the communication device 200. The agent module 228 and peer module 226 listen on pre-determined ports of the communication device 200, so that incoming network traffic on these ports gets routed to the agent module 228 and peer module 226. As is explained in further detail herein, the abovementioned enables the communication device 200 to function as an agent and as a peer for other communication devices within the communication network 100, as needed.

FIG. 9 is a flowchart 350 further illustrating communication between different elements of the communication network 100, in accordance with the present system and method for providing faster and more efficient data communication.

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As shown by block 352, an application running on the client 200 initiates a request for a resource on a network. Such a request may be, for example, "GET http://www.aol.com/index.html HTTP/1.1". The request may come from an Internet browser 214 located on the client 200, where the Internet browser 214 is loading a page from the Internet, an application that wants to download information from the Internet, fetch or send email, or any other network communication request.

Through the intermediate driver 272, or other such mechanism as may be implemented that is re-routing the communication to the client module 224 of the client 200, the resource request is intercepted by the client module 224 that is running on the client 200 (block 354). The client module 224 then looks up the IP address of the server 152 that is the target of the resource request (e.g., the IP address of the Web server that is the host of www.aol.com in the example above), and sends this IP address to the acceleration server 162 (block 356) in order to obtain a list of communication devices that the client 200 can use as agents (hereafter referred to as agents). It should be noted that the process of performing an IP lookup for a server is known by one having ordinary skill in the art, and therefore is not described further herein.

In response to receiving the IP address of the server 152, the acceleration server 162 prepares a list of agents that may be suitable to handle the request from this IP address (block 358). The size of the list can differ based on implementation. For exemplary purposes, the following provides an example where a list of five agents is prepared by the acceleration server 162. The list of agents is created by the acceleration server 162 by finding the communication devices of the communication network 100 that are currently online, and whose IP address is numerically close to the IP of the destination Web server 152. A further description of the abovementioned process is described here in.

As shown by block 360, the client module 224 then sends the original request (e.g., "GET http://www.aol.com/index.html HTTP/1.1") to all the agents in the list received from the

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acceleration server 162 in order to find out which of the agents in the list is best suited to be the one agent that will assist with this request.

It should be noted that, in accordance with an alternative embodiment of the invention, the communication device 200 may be connected to a device that is actually requesting data. In such an alternative embodiment, the communication device would be a modular device connected to a requesting device, where the requesting device, such as, for example, a personal data assistant (PDA) or other device, would request data, and the communication device connected thereto, either through a physical connection, wireless connection, or any other connection, would receive the data request and function as described herein. In addition, as previously mentioned, it should be noted that the HTTP request may be replaced by any request for resources on the Web.

FIG. 10 is a flowchart continuing the flowchart 380 of FIG. 9 and focused on agent response to the request. As shown by block 382, upon receiving the request from the client 200, each agent that received the request from the client responds to the client 200 with whether it has information regarding the request, which can help the client to download the requested information from peers in the network. Specifically, each agent responds with whether the agent has seen a previous request for this resource that has been fulfilled. In such a case, the agent may then provide the client with the list of peers and checksums of the chunks that each of them have.

As shown by block 384, the client then decides which of the agents in the list to use as its agent for this particular information request. To determine which agent in the list to use as its agent for the particular information request, the client may consider multiple factors, such as, for example, factoring the speed of the reply by each agent and whether that agent does or does not have the information required. There are multiple ways to implement this agent selection, one practical way being to start a timer of a small window of time, such as, for example, 5ms, after receiving the first response from the agents, and after the small window, choosing from the list

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of agents that responded, the agent that has the information about the request, or in the case that none of the agents responded, to choose the first agent from the list received from the acceleration server 162.

As shown by block 386, after selecting an agent, the client notifies the selected agent that it is going to use it for this request, and notifies the other agents that they will not be used for this request. The client then sends the selected agent a request for the first five chunks of data of the original information request (block 388). By specifying to the selected agent the requested chunks by their order in the full response, the client receives the peer list and checksums of the requested chunks from the selected agent. As an example, for the first five chunks the client will ask the selected agent for chunks one through five, and for the fourth batch of five chunks the client will ask the agent for chunks sixteen through twenty. As previously mentioned, additional or fewer chunks may be requested at a single time.

As shown by block 390, after receiving the request from the client, the selected agent determines whether it has information regarding the requested chunks of data by looking up the request in its cache database and determining if the selected agent has stored therein information regarding peers of the communication network that have stored the requested data of the request, or whether the selected agent itself has the requested data of the request stored in its memory. In addition to determining if the selected agent contains an entry for this request in its database, the selected agent may also determine if this information is still valid. Specifically, the selected agent determines whether the data that is stored within the memory of the selected agent or the memory of the peers, still mirrors the information that would have been received from the server itself for this request. A further description of the process utilized by the selected agent to determine if the information is still valid, is described in detail herein.

As shown by block 392, if the information (requested data of the request) exists and is still valid, then the agent prepares a response to the client, which includes for each of the chunks:

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(i) the checksum of the chunk; (ii) a list of peers that according to the database of the selected agent contains these chunks; and (iii) if these are the first five chunks of the information, then the selected agent also provides the specific protocol's headers that would have been received from the server, had the initial request from the client been made directly to the server.

As shown by block 394, the list of peers for each chunk is sorted by geographical proximity to the requesting client. In accordance with the present example, only the five closest peers are kept in the list for every chunk, and the rest of the peers are discarded from this list. As shown by block 396, the prepared response, namely, the list of closest peers, is sent back to the client. It should be noted that, if this were the last set of chunks to be provided for this request, then it would be beneficial to include information about this to the client.

If the selected agent discovers that it does not have information about this request, or if the selected agent discovers that the information it has is no longer valid, the selected agent needs to load the information directly from the server in order to be able to provide an answer to the requesting client. As shown by block 400, the selected agent then sends the request directly to the server. The selected agent then stores the information it receives from the server (both the headers of the request, as well as chunks of the response itself) in its database, for this particular response to the client, as well as for future use to other clients that may request this data (block 402). The selected agent then prepares a response (list) for the client, where the response includes the protocol headers (if these are the first five chunks), and the checksums of the five chunks, and provides itself as the only peer for these chunks (block 404). This list is then sent back to the client (block 406).

FIG. 11 is a flowchart 420 continuing the flowchart of FIG. 10, which illustrates actions taken upon receipt of the list of peers, or single peer listing, from the agent. As shown by block 422, the client receives the response from the agent (including the list of chunks and their corresponding data, including peers and other information previously mentioned) and, for each

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of the five chunks, the client sends a request to each of the peers listed for the chunk to download the chunk. The chunk request that the client sends to each of the peers is the checksum of the data that the client seeks to receive, which is the key (identifier) of the chunk.

As shown by block 424, the peers then respond regarding whether they still have the data of the chunk. As an example, some of the peers may not currently be online, some may be online but may have discarded the relevant information, and some may still have the relevant information, namely, the chunk. As shown by block 426, the client then selects the quickest peer that responds with a positive answer regarding the requested information, the client lets that peer know that it is chosen to provide the client with the chunk, and the client notifies the other peers that they are not chosen.

As shown by block 428, the chosen peer then sends the chunk to the client. It should be noted that if no peers answer the request of the client, the client goes back to the agent noting that the peers were all negative, and the agent either provides a list of 5 other agents, if they exist, or the agent goes on to download the information directly from the Web server as happens in the case where no peers exist as described above.

The client then stores the chunks in its cache for future use (block 430), when the client may need to provide the chunks to a requesting communication device when acting as a peer for another client that is looking for the same information. As shown by block 432, if some of the chunks were not loaded from any of the peers, the client requests the chunks again from the agent in a next round of requests, flagging these chunks as chunks that were not loadable from the client list of peers. In this situation, the agent will load the data directly from the server and provide it back to the client.

The client then acknowledges to the agent which of the chunks it received properly (block 434). The agent then looks up these chunks in the database of the agent, and adds the

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client to the list of peers for these chunks, specifically, since this client is now storing these chunks, and can provide these chunks to other clients that turn to it as a peer (block 436).

As shown by block 438, the client then passes the data on to the Web browser or other application of the client that made the original request, for it to use as it had originally intended. The client then checks whether all of the chunks for this request were received (block 440), by checking the flag set by the agent. Specifically, when the agent is providing the list of the last 5 chunks, the agent includes that information as part of its reply to the client, which is referred to herein as a flag. This information is what enables the client to know that all information has been received for a particular resource request.

If the last received chunks were not the last chunks for this request, the processing flow of the client continues by returning to the functionality of block 384 of FIG. 10, but instead sending the chosen agent a request for the next five chunks of data of the original information request. Alternatively, if all chunks for this request were received, the request is complete, and the flow starts again at block 352 of FIG. 9.

FIG. 12 is a flowchart 500 illustrating steps taken by an agent, client, or peer to determine whether a certain HTTP request is still valid. Specifically, the following provides an example of how the agent, client, or peer can determine whether particular data that is stored within the memory of the agent, or the memory of a peer or client, still mirrors the information that is currently on the Web server. As shown by block 502, the HTTP request is looked up in the cache database of the agent, client or peer that is checking the validity of the HTTP request. As an example, the HTTP protocol, defined by RFC 2616, outlines specific methods that Web servers can define within the HTTP headers signifying the validity of certain data, such as, but not limited to, by using HTTP header information such as "max age" to indicate how long this data may be cached before becoming invalid, "no cache" to indicate that the data may never be cached, and using other information.

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As shown by block 504, these standard methods of validation are tested on the HTTP request information in question. As shown by block 506, a determination is made whether the requested information that is stored is valid or not. If the requested information is valid, a "VALID" response is returned (block 508). Alternatively, if the requested information is not valid, an HTTP conditional request is sent to the relevant Web server, to determine if the data stored for this request is still valid (block 510). If the data stored for this request is still valid, a "VALID" response is returned (block 508). Alternatively, if the data stored for this request is not valid, an "INVALID" response is returned (block 514). It should be noted, that the abovementioned description with regard to FIG. 12 is an explanation of how to check if HTTP information is still valid. There are similar methods of determining validity for any other protocol, which may be utilized, and which those having ordinary skill in the art would appreciate and understand.

FIG. 13 is a flowchart 550 outlining operation of the acceleration server, whose main responsibility in the present system and method is to provide clients with information regarding which agents serve which requests, and to keep the network elements all up to date with the latest software updates. As shown by block 552, the acceleration server sends "keep alive" signals to the network elements, and keeps track within its database as to which network elements are online. As shown by block 554, the acceleration server continues to wait for a client request and continues to determine if one is received.

Once a request is received, the acceleration server tests the type of request received (block 556). If the client request is to sign up the client within the network, an event that happens every time that the client starts running on its host machine, then that client is added to the list of agents stored on the acceleration server, sorted by the IP address of the client (block 558).

If the request is to find an agent to use for a particular request, the acceleration server creates a new agent list, which is empty (block 560). The acceleration server then searches the

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agent database for the next 5 active agents whose IP address is closest to the IP address of the server who is targeted in the request (block 562). In this context, 192.166.3.103 is closer to 192.166.3.212 than to 192.167.3.104. The acceleration server then sends this agent list to the client (block 564).

If instead, the request is to check the version of the latest acceleration software then the acceleration server sends that network element (client, peer or agent) the version number of the latest existing acceleration software version, and a URL from where to download the new version, for the case that the element needs to upgrade to the new version (block 566).

While the abovementioned example is focused on HTTP requests for data, as previously mentioned, other protocol requests are equally capable of being handled by the present system and method. As an example, in separate embodiments the acceleration method described may accelerate any communication protocol at any OSI layer (SMTP, DNS, UDP, ETHERNET, etc.). In the following alternative embodiment, it is illustrated how the acceleration method may accelerate TCPIP. As is known by those having ordinary skill in the art, TCPIP is a relatively low-level protocol, as opposed to HTTP, which is a high level protocol. For purposes of illustration of TCPIP communication, reference may be made to FIG. 3, wherein the Web server is a TCPIP server.

In TCPIP there are three communication commands that are of particular interest, namely, connect, write, and read. Connect is a command issued by an application in the communication device that is initiating the communication to instruct the TCPIP stack to connect to a remote communication device. The connect message includes the IP address of the communication device, and the port number to connect to. An application uses the write command to instruct the TCPIP stack to send a message (i.e., data) to a communication device to which it is connected. In addition, an application uses the read command to ask the TCPIP stack to provide the message that was sent from the remote communication device to which it is

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connected. A communication session typically exists of a connect, followed by a read and write on both sides.

FIG. 14 is a flowchart 600 further illustrating TCPIP acceleration in accordance with this alternative embodiment of the invention. As shown by blocks 601 and 602 when an application of the communication device makes a request to the communications stack to connect with the TCPIP server, that communication is intercepted by the acceleration application.

To find an agent, upon receiving that connect message from the communication device application, which includes the IP address of the TCPIP server and the port to connect to, the acceleration application in the client makes a request to the acceleration server to find out who the agent for the communication with the TCPIP server is. This step is performed in a similar manner to that described with regard to the main HTTP embodiment of the invention (block 604). As shown by block 606, the server then provides the client with a list of agents, for example, a primary agent and four others.

To establish a connection, as shown by block 608, the client issues a TCPIP connect with the primary agent or one of the other agents if the primary agent does not succeed, to create a connection with the agent. The client then sends to the agent the IP address of the TCPIP server and connection port that were provided by the communication device application (block 610). As shown by block 612, that agent in turn issues a TCPIP connect to the TCPIP server to the port it received from the client, to create a connection with the agent.

FIG. 15 is a flowchart 800 further illustrating TCPIP acceleration in accordance with this alternative embodiment of the invention, detailing the communication between the client and the TCPIP server (read and write commands) after the connect phase has completed successfully.

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As shown by block 802, if the network application within the client wants to send a message to the TCPIP server, the network application within the client writes the message to the TCPIP stack in the operating system of the client. This WRITE command is received by the acceleration application of the client and handled in the manner described below. If the TCPIP server wants to send a message to the client, the TCPIP server writes the message to the TCPIP stack of TCPIP operating system, on the connection to the agent, since this agent is where the server received the original connection. This WRITE command is received by the acceleration application of the agent and handled in the manner described below.

When the acceleration application of the client receives a message from the network application of the client to be sent to the agent, or when the acceleration application of the agent receives a message from the connection to the TCPIP server that is to be sent to the client, the acceleration application proceeds to send the message to the communication device on the other side. For instance, if the client has intercepted the message from the communication application, the client sends the message to the agent, and if it is the agent that intercepted the message from the connection to the TCPIP server, such as the TCPIP server sending a message that is intended for the communication with client, the agent sends the message to the client in the following manner:

As shown by block 804, the acceleration application breaks up the content of the message to chunks and calculates the corresponding checksums, in the same manner as in the main embodiment described herein. The acceleration application then looks up each checksum in its cache database (block 806). As shown by block 808, the acceleration application checks if the checksum exists in the cache database. If it does, then, as shown by block 810, the acceleration

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application prepares a list of peers that have already received the chunk of the checksum in the past (if any), and adds the communication device of the other side to the list of communication devices that have received this chunk (adds it to the peer list of the checksum in its database), to be provided to other communication devices requesting this information in the future. As shown by block 812, the list of peers is sent to the receiving communication device, which, as shown by block 814 retrieves the chunks from the peers in the list received, in the same manner as in the main embodiment.

If the checksum does not exist within the cache database of the sending communication device then, as shown by block 820, the acceleration application adds the checksum and chunk to its cache database, sends the chunk to the communication device on the other side, and adds the other communication device to the list of peers for that checksum in its database.

As shown by block 816, a determination is then made as to whether all chunks have been received. If all chunks have not been received, the process continues on again from block 806.

Once all data has been received, as shown by block 818, the acceleration application passes the data on to the requester. Specifically, in the client, the acceleration application passes on the complete data to the communication application, and in the agent, the acceleration application passes on the complete data to the requesting TCPIP server.

It should be emphasized that the above-described embodiments of the present invention are merely possible examples of implementations, merely set forth for a clear understanding of the principles of the invention. Many variations and modifications may be made to the above-described embodiments of the invention without departing substantially from the spirit and principles of the invention. All such modifications and variations are intended to be included

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herein within the scope of this disclosure and the present invention and protected by the following claims.

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CLAIMS

We claim:

1. A network for accelerating and making more efficient data communication; comprising:

at least one client communication device for originating an original data request for obtaining data from a data server;

at least one agent communication device which is assigned to the data server for receiving the data request from the client communication device, wherein the agent keeps track of which client communication devices within the network have received responses to data requests or portions thereof from the assigned data server;

at least one peer communication device having stored therein at least a portion of data received in response to a prior data request by a client communication device, wherein the prior data request was for the same data as requested during the originating data request, and wherein the portion of data may be transmitted from the peer communication device to the at least one client communication device upon request by the client communication device; and

at least one acceleration server for deciding which agent communication device is to be assigned to which data server and providing this information to the at least one client communication device.

2. The network of claim 1, wherein each of the client communication device, peer communication device, and agent communication device contain therein a client module, a peer module, and an agent module, thereby allowing the client communication device, peer

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communication device, and agent communication device to serve as any of a client communication device, a peer communication device, and an agent communication device.

3. The network of claim 1, wherein the acceleration server assigns a list of Internet protocol addresses to each agent communication device.

4. The network of claim 1, wherein the acceleration server has stored therein a list of online communication devices, including client communication devices, agent communication devices, and peer communication devices.

5. The network of claim 1, wherein each client communication device, agent communication device, and peer communication device maintain a list of data requests and data responses that the communication device, agent communication device, and peer communication device, respectively are respectively aware of, as well as in which communication device associated data is stored.

6. The network of claim 1, wherein the data request from the client communication device is an HTTP request, and wherein the server is a Web server.

7. The network of claim 6, wherein each client communication device contains a storage device therein that stores a list of Uniform Resource Locators (URLs) that the client communication device is aware of, each agent communication device contains a storage device

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therein that stores a list of URLs that the agent communication device is aware of, and wherein each peer communication device contains a storage device therein that stores a list of URLs that the peer communication device is aware of.

8. The network of claim 7, wherein within the storage device storing URLs, with each URL, the storage device also has stored therein at least one of the group consisting of HTTP headers returned by the data server for this URL, a list of chunks that contain the contents of the URL, wherein chunks are pieces of data that together form the entire content of the URL, and the content of the chunk.

9. The network of claim 1, wherein each client communication device contains a storage device, wherein the storage device has stored therein at least one of the group consisting of a list of chunks that contain contents associated with the data request, wherein chunks are pieces of data that together form the entire content associated with the data request, and the content of the chunk, wherein the chunks are equally sized.

10. The network of claim 7, wherein within the storage device storing URLs, with each URL, the storage device also has stored therein a list of chunks that contain the contents of the URL, wherein chunks are pieces of data that together form the entire content of the URL, and with each chunk, the data of the chunk itself, a checksum of the chunk, and a list of peers that most likely have the data for this chuck.

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11. The network of claim 1, wherein the network contains multiple peer communication devices, wherein the at least one agent communication device further keeps track of which peer communication devices have at least a portion of the requested data stored therein.

12. The network of claim 1, wherein the at least one acceleration server prepares a list of agent communication devices that may be suitable to handle the data request.

13. The network of claim 12, wherein the list of agent communication devices that may be suitable includes agent communication devices having an IP address that is numerically close to the IP address of the data server.

14. The network of claim 12, wherein the client communication device selects an agent communication device, notifies the selected agent communication device that it is being used for the data request, and notifies any unselected agent communication devices that they are not being used for the data request.

15. The network of claim 1, wherein the agent keeps track of peers and portions of data stored within the peers, and wherein if there is a portion of data necessary to fulfill the original data request, yet the agent is not aware of any peer having the portion of data stored therein, the agent itself queries the server for the missing portion of data and transmits the missing portion of data to the requesting client communication device.

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16. The network of claim 1, wherein the agent keeps track of peers and portions of data stored within the peers, and wherein if the at least one agent knows of a specific peer that has a portion of data necessary to fulfill the original data request stored therein, the agent provides the specific peer as the peer to use for the portion of data necessary for fulfilling the original data request.

17. A communication device within a network, comprising:

a memory; and

a processor configured by the memory to perform the steps of:

originating a data request for obtaining data from a data server;

being assigned to a data server, referred to as an assigned data server;

receiving a data request from a separate device within the network, and keeping track of which client communication devices within the network have received responses to data requests from the assigned data server; and

storing portions of data received in response to the originated data request, wherein the portions of data may be transmitted to communication device upon request by the communication device.

18. The communication device of claim 17, wherein the communication device further comprises a storage device that stores a list of Uniform Resource Locators (URLs) that the communication device is aware of.

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19. The communication device of claim 18, wherein within the storage device storing URLs, with each URL, the storage device also has stored therein at least one of the group consisting of HTTP headers returned by the data server for this URL, a list of chunks that contain the contents of the URL, wherein chunks are pieces of data that together form the entire content of the URL, and the content of the chunk.

20. The communication device of claim 17, wherein the communication device contains a storage device, wherein the storage device has stored therein at least one of the group consisting of a list of chunks that contain contents associated with the data request, wherein chunks are pieces of data that together form the entire content associated with the data request, and the content of the chunk, wherein the chunks are equally sized, wherein the chunks are equally sized.

21. The communication device of claim 18, wherein within the storage device storing URLs, with each URL, the storage device also has stored therein a list of chunks that contain the contents of the URL, wherein chunks are pieces of data that together form the entire content of the URL, and with each chunk, the data of the chunk itself, a checksum of the chunk, and a list of other communication devices that most likely have the data for this chuck.

22. The communication device of claim 17, wherein the data request is an HTTP request, and wherein the data server is a Web server.

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23. The communication device of claim 17, wherein the processor is further configured by the memory to perform the step of keeping track of which other communication devices have at least a portion of the requested data stored therein.

24. A network for accelerating and making more efficient data communication; comprising:

at least one client communication device for originating an original data request for obtaining data from a data server;

at least one agent communication device which is assigned to the data server for receiving the data request from the client communication device, wherein the agent keeps track of which client communication devices within the network have received responses to data requests or portions thereof from the assigned data server; and

at least one acceleration server for deciding which agent communication device is to be assigned to which data server and providing this information to the at least one client communication device.

25. A network for accelerating and making more efficient data communication; comprising:

at least one client communication device for originating an original data request for obtaining data from a data server;

at least one agent communication device which is assigned to the data server for receiving the data request from the client communication device, wherein the

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agent keeps track of which client communication devices within the network have received responses to data requests or portions thereof from the assigned data server; and

at least one peer communication device having stored therein at least a portion of data received in response to a prior data request by a client communication device, wherein the prior data request was for the same data as requested during the originating data request, and wherein the portion of data may be transmitted from the peer communication device to the at least one client communication device upon request by the client communication device.

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ABSTRACT

A system designed for increasing network communication speed for users, while lowering network congestion for content owners and ISPs. The system employs network elements including an acceleration server, clients, agents, and peers, where communication requests generated by applications are intercepted by the client on the same machine. The IP address of the server in the communication request is transmitted to the acceleration server, which provides a list of agents to use for this IP address. The communication request is sent to the agents. One or more of the agents respond with a list of peers that have previously seen some or all of the content which is the response to this request (after checking whether this data is still valid). The client then downloads the data from these peers in parts and in parallel, thereby speeding up the Web transfer, releasing congestion from the Web by fetching the information from multiple sources, and relieving traffic from Web servers by offloading the data transfers from them to nearby peers.

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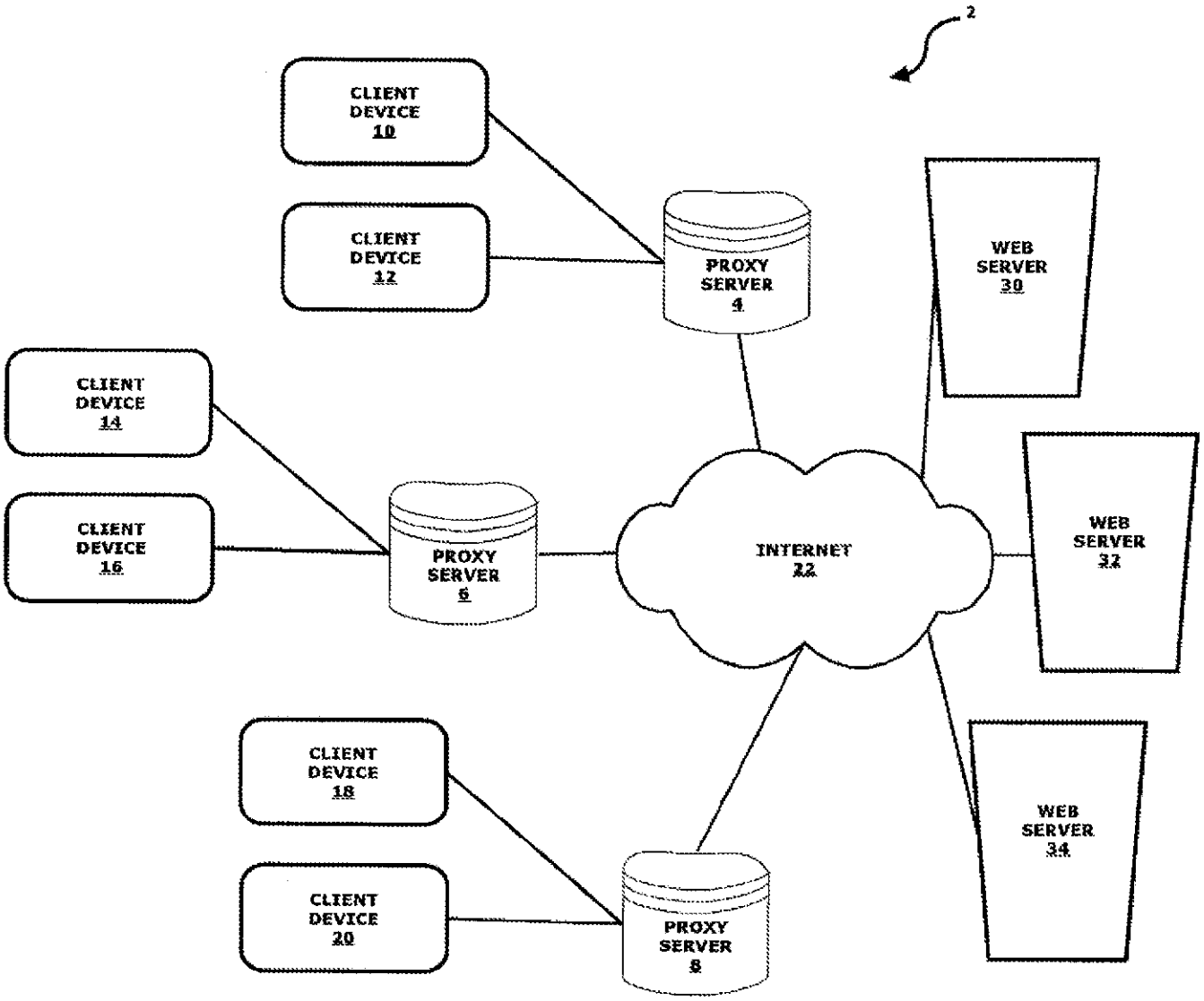

2
CLIENT DEVICE 10
CLIENT DEVICE 12
PROXY SERVER 4
WEB SERVER 30
CLIENT DEVICE 14
CLIENT DEVICE 16
PROXY SERVER 6
INTERNET 22
WEB SERVER 32
CLIENT DEVICE 18
CLIENT DEVICE 20
PROXY SERVER 8
WEB SERVER 34

FIG. 1

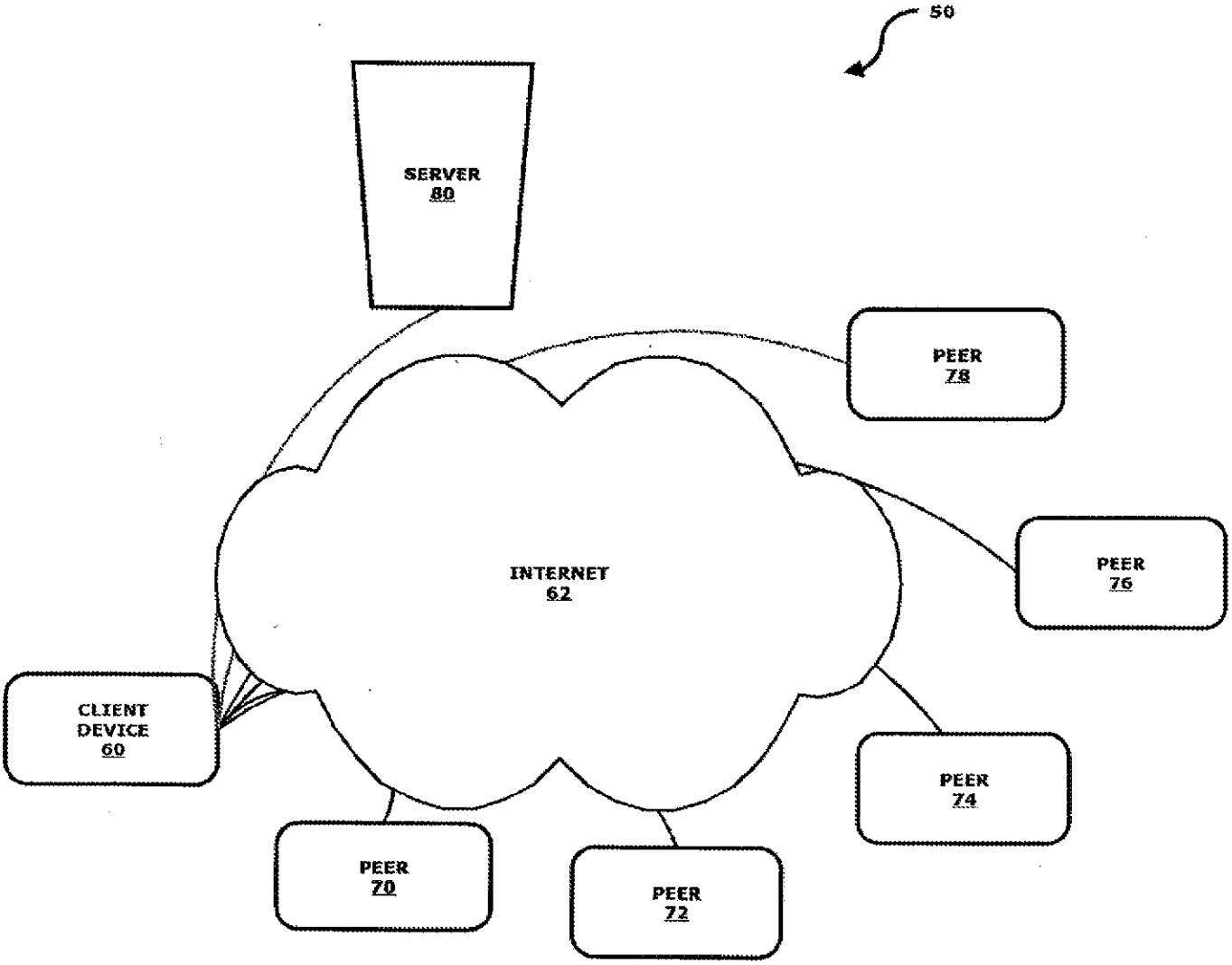

50
SERVER
80
PEER
78
INTERNET
62
PEER
76
CLIENT
DEVICE
60
PEER
74
PEER
70
PEER
72

FIG. 2

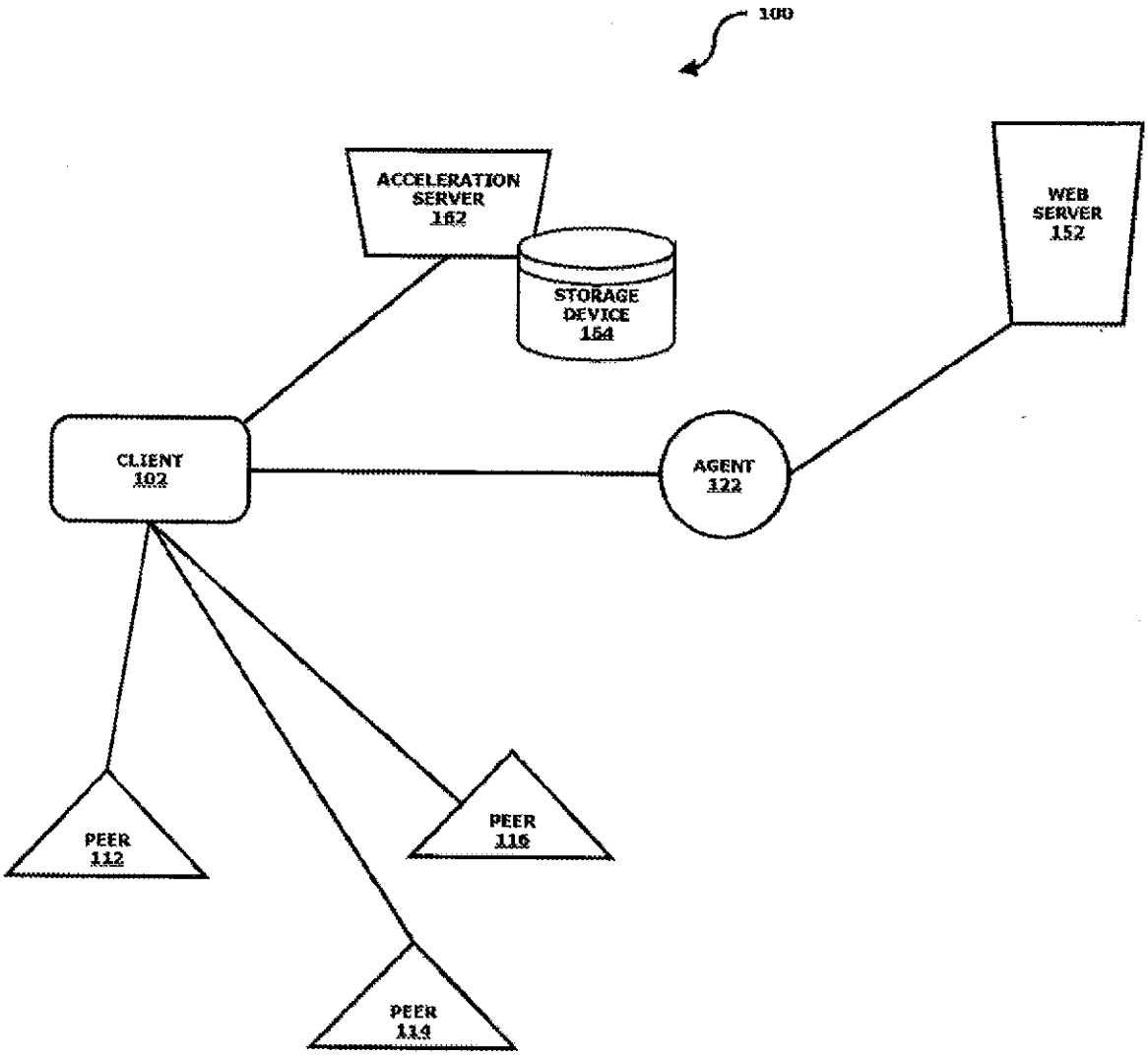

100
ACCELERATION SERVER 162
STORAGE DEVICE 164
WEB SERVER 152
CLIENT 102
AGENT 122
PEER 112
PEER 116
PEER 114

FIG. 3

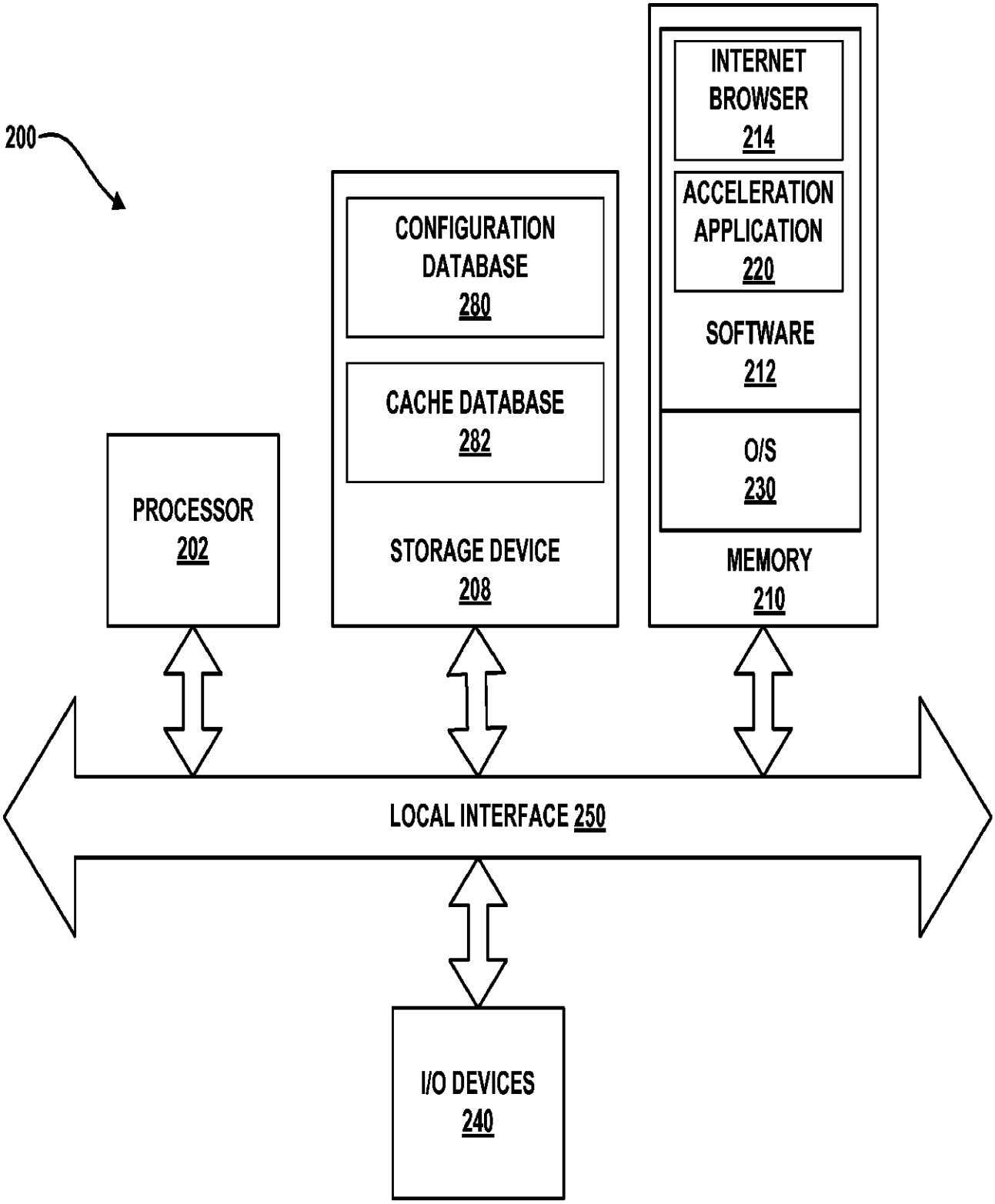

200
INTERNET BROWSER 214
ACCELERATION APPLICATION 220
SOFTWARE 212
O/S 230
MEMORY 210
CONFIGURATION DATABASE 280
CACHE DATABASE 282
STORAGE DEVICE 208
PROCESSOR 202
LOCAL INTERFACE 250
I/O DEVICES 240

FIG. 4

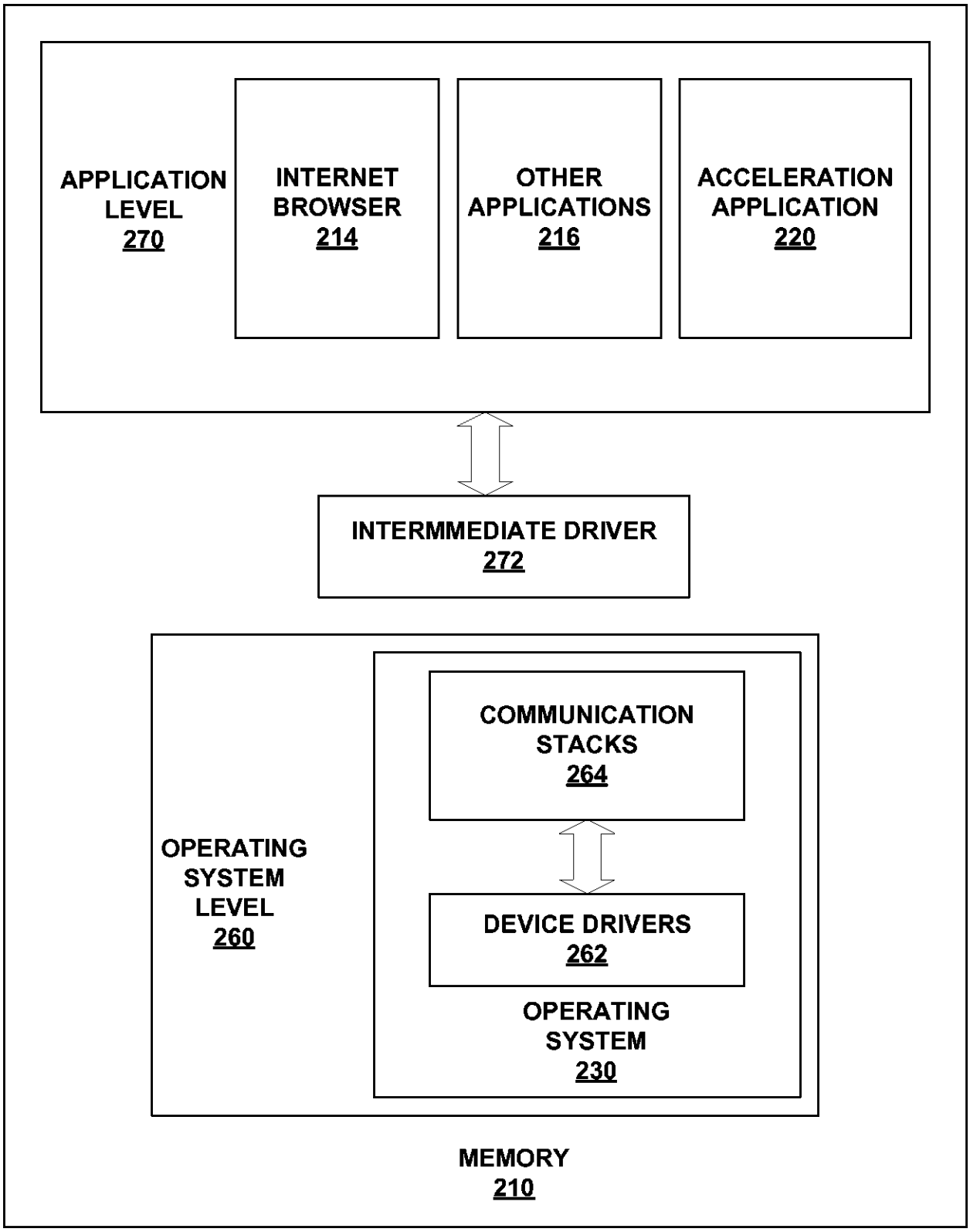

APPLICATION LEVEL 270
INTERNET BROWSER 214
OTHER APPLICATIONS 216
ACCELERATION APPLICATION 220
INTERMMEDIATE DRIVER 272
OPERATING SYSTEM LEVEL 260
COMMUNICATION STACKS 264
DEVICE DRIVERS 262
OPERATING SYSTEM 230
MEMORY 210

FIG. 5

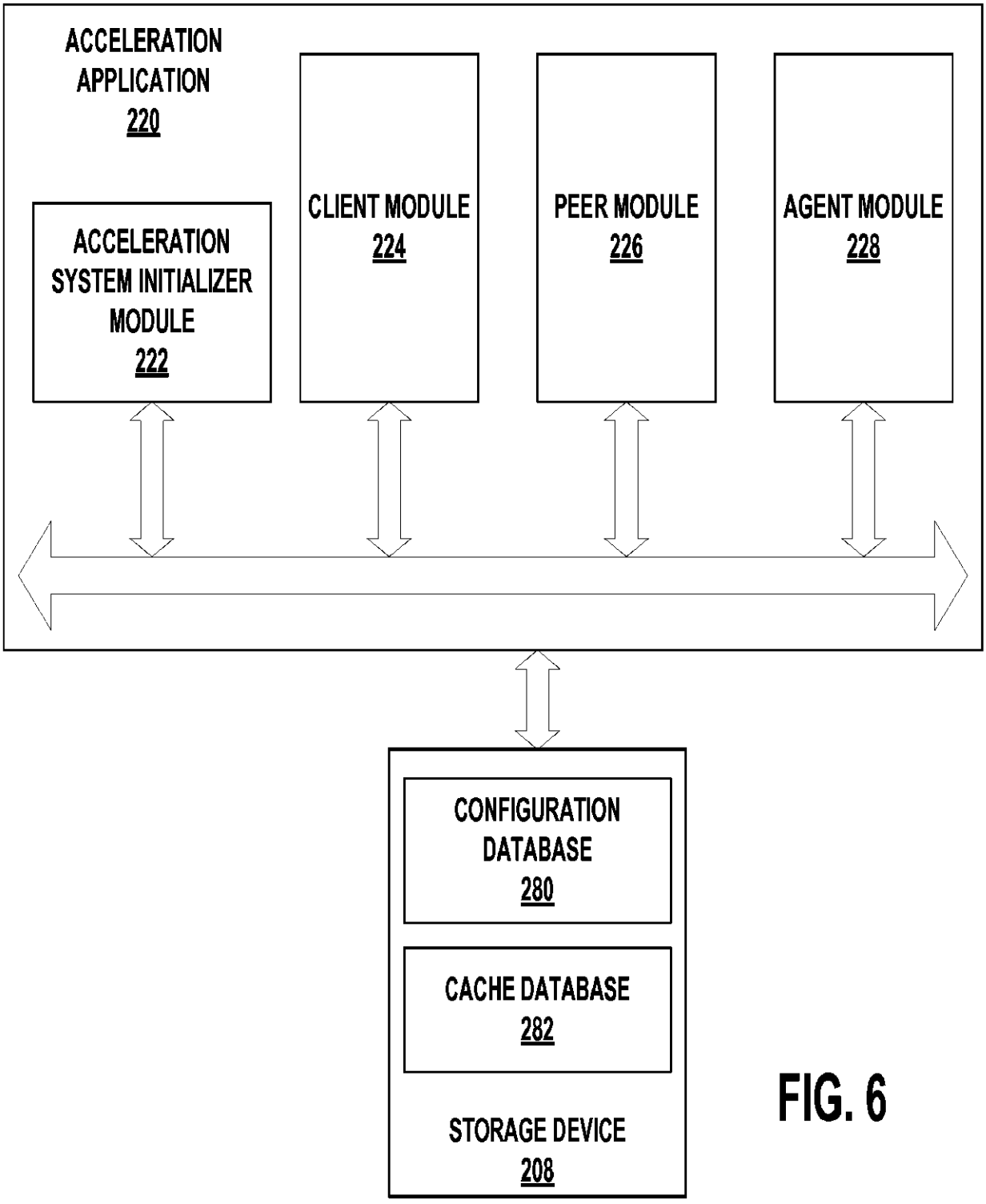

ACCELERATION APPLICATION 220
ACCELERATION SYSTEM INITIALIZER MODULE 222
CLIENT MODULE 224
PEER MODULE 226
AGENT MODULE 228
CONFIGURATION DATABASE 280
CACHE DATABASE 282
STORAGE DEVICE 208

FIG. 6

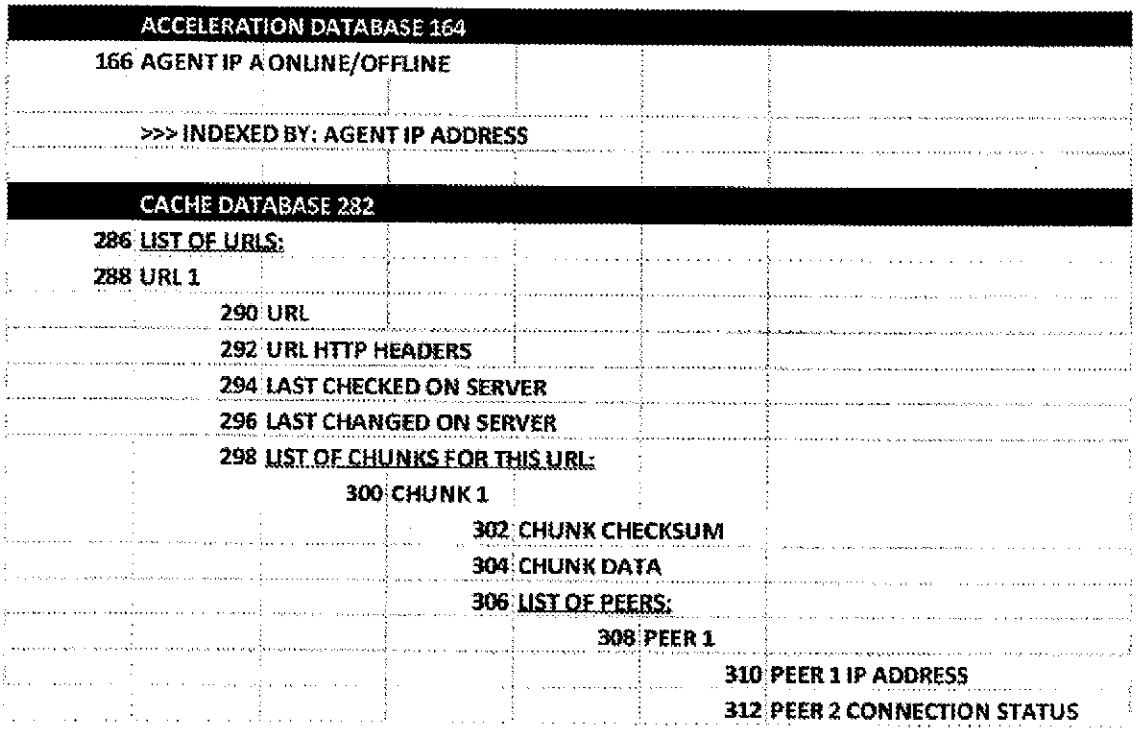

ACCELERATION DATABASE 164
166 AGENT IP A ONLINE/OFFLINE
>>> INDEXED BY: AGENT IP ADDRESS
CACHE DATABASE 282
286 LIST OF URLS:
288 URL 1
290 URL
292 URL HTTP HEADERS
294 LAST CHECKED ON SERVER
296 LAST CHANGED ON SERVER
298 LIST OF CHUNKS FOR THIS URL:
300 CHUNK 1
302 CHUNK CHECKSUM
304 CHUNK DATA
306 LIST OF PEERS:
308 PEER 1
310 PEER 1 IP ADDRESS
312 PEER 2 CONNECTION STATUS
162

FIG. 7

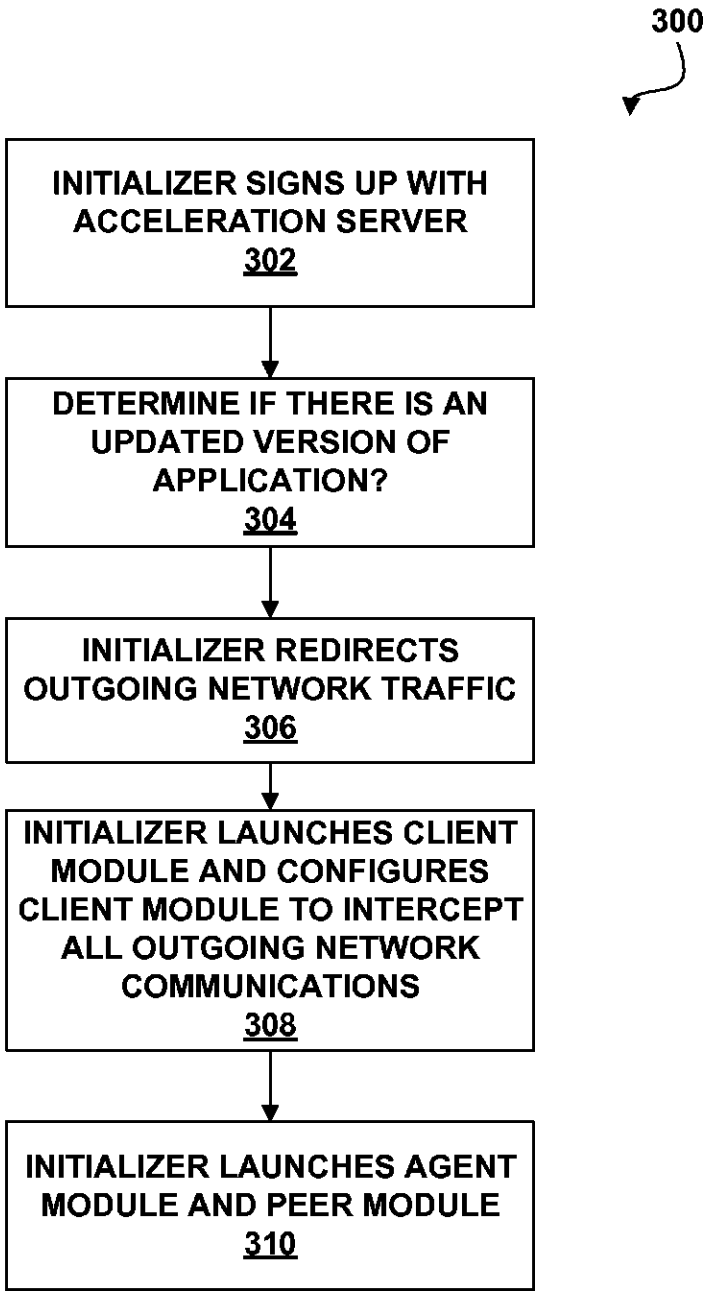

300
INITIALIZER SIGNS UP WITH ACCELERATION SERVER
302
DETERMINE IF THERE IS AN UPDATED VERSION OF APPLICATION?
304
INITIALIZER REDIRECTS OUTGOING NETWORK TRAFFIC
306
INITIALIZER LAUNCHES CLIENT MODULE AND CONFIGURES CLIENT MODULE TO INTERCEPT ALL OUTGOING NETWORK COMMUNICATIONS
308
INITIALIZER LAUNCHES AGENT MODULE AND PEER MODULE
310

FIG. 8

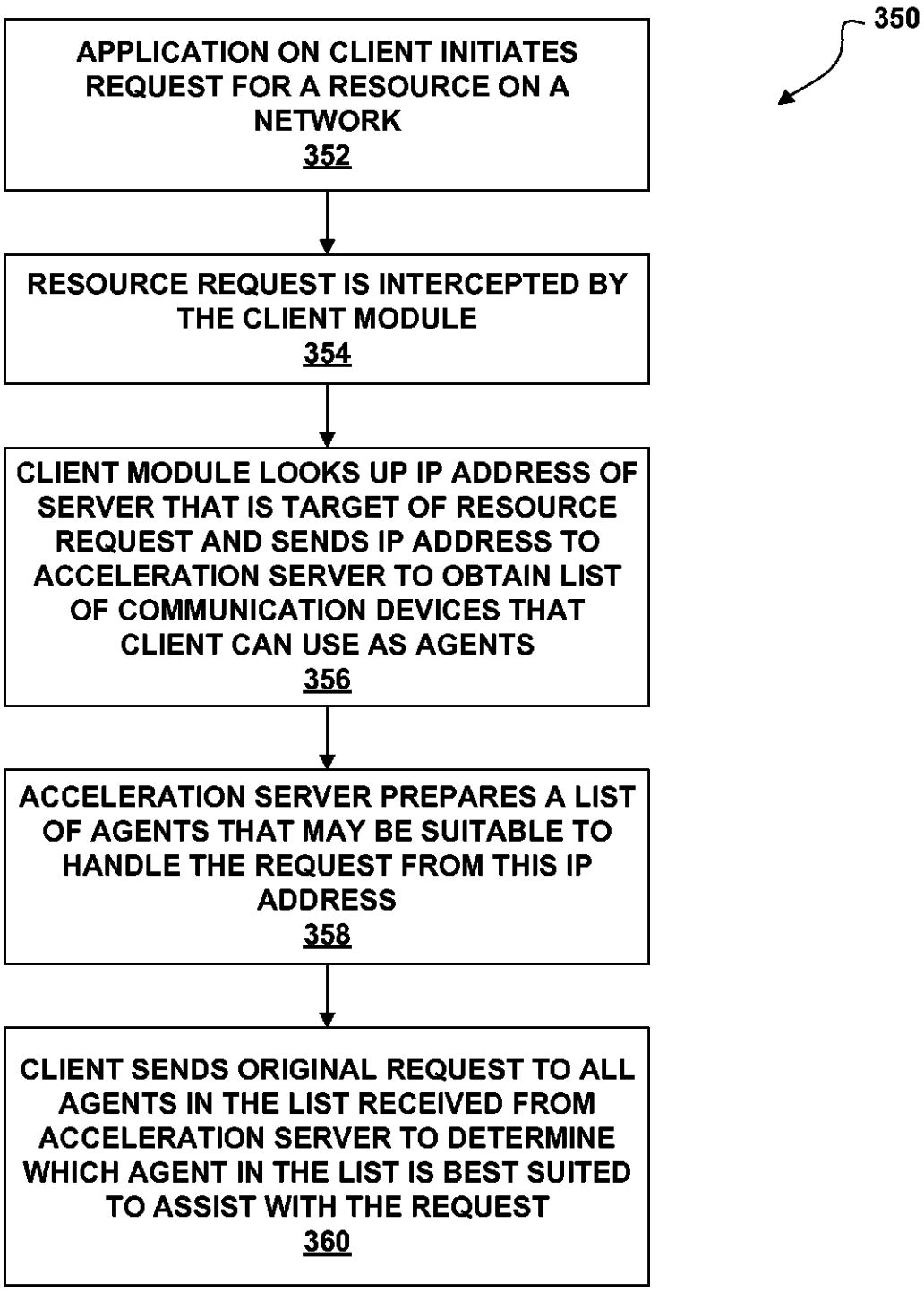

350
APPLICATION ON CLIENT INITIATES REQUEST FOR A RESOURCE ON A NETWORK
352
RESOURCE REQUEST IS INTERCEPTED BY THE CLIENT MODULE
354
CLIENT MODULE LOOKS UP IP ADDRESS OF SERVER THAT IS TARGET OF RESOURCE REQUEST AND SENDS IP ADDRESS TO ACCELERATION SERVER TO OBTAIN LIST OF COMMUNICATION DEVICES THAT CLIENT CAN USE AS AGENTS
356
ACCELERATION SERVER PREPARES A LIST OF AGENTS THAT MAY BE SUITABLE TO HANDLE THE REQUEST FROM THIS IP ADDRESS
358
CLIENT SENDS ORIGINAL REQUEST TO ALL AGENTS IN THE LIST RECEIVED FROM ACCELERATION SERVER TO DETERMINE WHICH AGENT IN THE LIST IS BEST SUITED TO ASSIST WITH THE REQUEST
360

FIG. 9

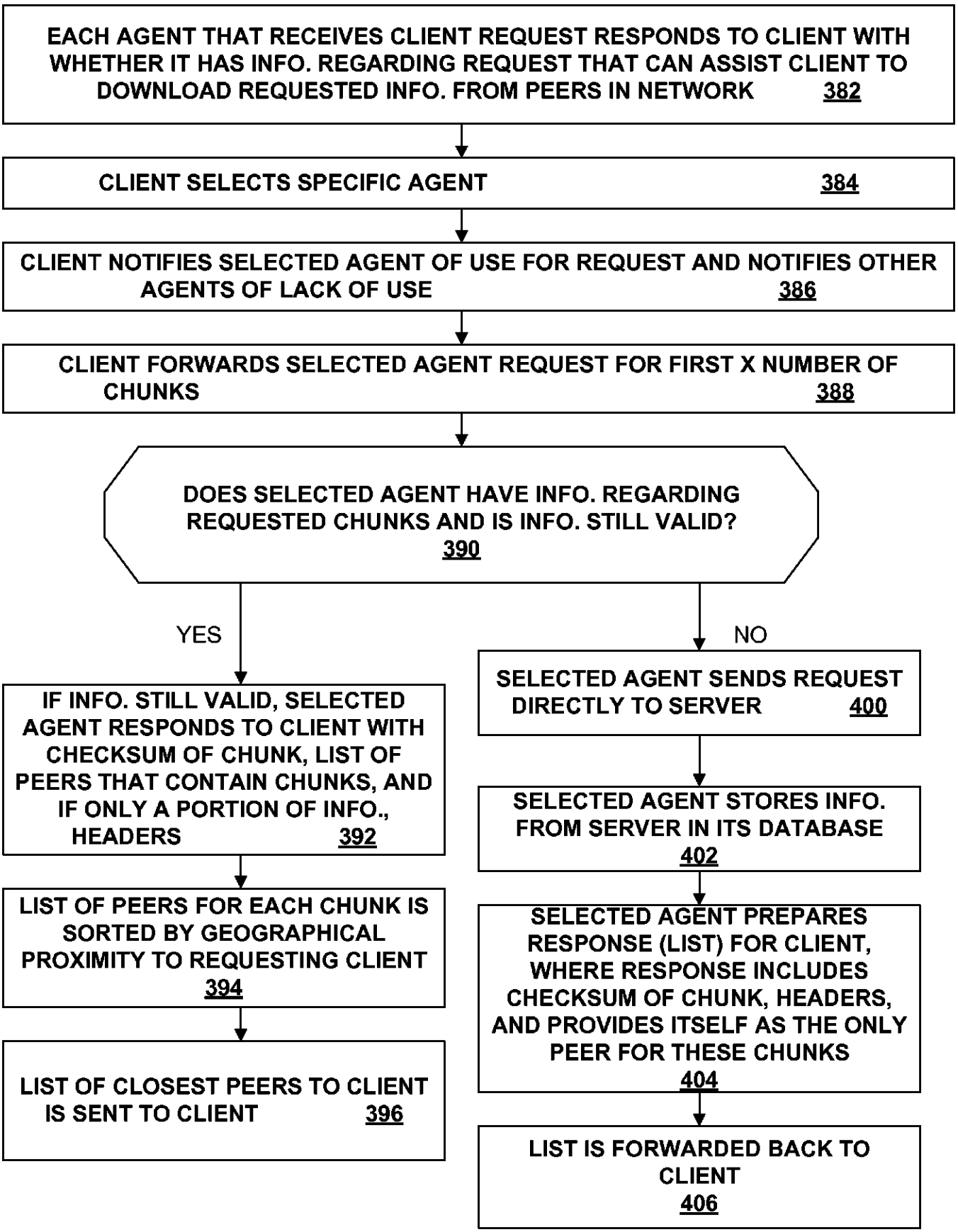

EACH AGENT THAT RECEIVES CLIENT REQUEST RESPONDS TO CLIENT WITH WHETHER IT HAS INFO. REGARDING REQUEST THAT CAN ASSIST CLIENT TO DOWNLOAD REQUESTED INFO. FROM PEERS IN NETWORK 382
CLIENT SELECTS SPECIFIC AGENT 384
CLIENT NOTIFIES SELECTED AGENT OF USE FOR REQUEST AND NOTIFIES OTHER AGENTS OF LACK OF USE 386
CLIENT FORWARDS SELECTED AGENT REQUEST FOR FIRST X NUMBER OF CHUNKS 388
DOES SELECTED AGENT HAVE INFO. REGARDING REQUESTED CHUNKS AND IS INFO. STILL VALID? 390
YES
NO
IF INFO. STILL VALID, SELECTED AGENT RESPONDS TO CLIENT WITH CHECKSUM OF CHUNK, LIST OF PEERS THAT CONTAIN CHUNKS, AND IF ONLY A PORTION OF INFO., HEADERS 392
LIST OF PEERS FOR EACH CHUNK IS SORTED BY GEOGRAPHICAL PROXIMITY TO REQUESTING CLIENT 394
LIST OF CLOSEST PEERS TO CLIENT IS SENT TO CLIENT 396
SELECTED AGENT SENDS REQUEST DIRECTLY TO SERVER 400
SELECTED AGENT STORES INFO. FROM SERVER IN ITS DATABASE 402
SELECTED AGENT PREPARES RESPONSE (LIST) FOR CLIENT, WHERE RESPONSE INCLUDES CHECKSUM OF CHUNK, HEADERS, AND PROVIDES ITSELF AS THE ONLY PEER FOR THESE CHUNKS 404
LIST IS FORWARDED BACK TO CLIENT 406

FIG. 10

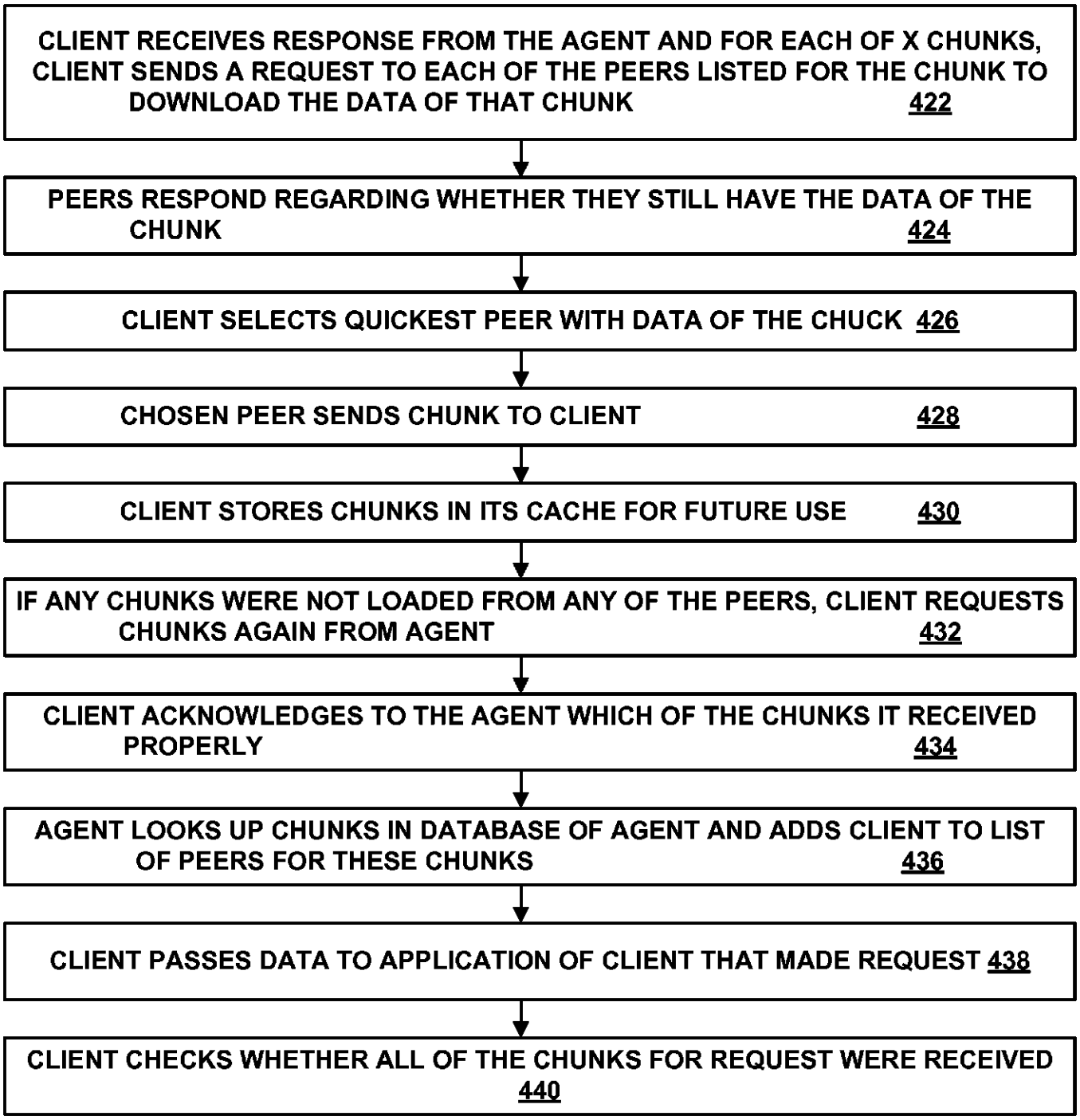

CLIENT RECEIVES RESPONSE FROM THE AGENT AND FOR EACH OF X CHUNKS, CLIENT SENDS A REQUEST TO EACH OF THE PEERS LISTED FOR THE CHUNK TO DOWNLOAD THE DATA OF THAT CHUNK 422
PEERS RESPOND REGARDING WHETHER THEY STILL HAVE THE DATA OF THE CHUNK 424
CLIENT SELECTS QUICKEST PEER WITH DATA OF THE CHUCK 426
CHOSEN PEER SENDS CHUNK TO CLIENT 428
CLIENT STORES CHUNKS IN ITS CACHE FOR FUTURE USE 430
IF ANY CHUNKS WERE NOT LOADED FROM ANY OF THE PEERS, CLIENT REQUESTS CHUNKS AGAIN FROM AGENT 432
CLIENT ACKNOWLEDGES TO THE AGENT WHICH OF THE CHUNKS IT RECEIVED PROPERLY 434
AGENT LOOKS UP CHUNKS IN DATABASE OF AGENT AND ADDS CLIENT TO LIST OF PEERS FOR THESE CHUNKS 436
CLIENT PASSES DATA TO APPLICATION OF CLIENT THAT MADE REQUEST 438
CLIENT CHECKS WHETHER ALL OF THE CHUNKS FOR REQUEST WERE RECEIVED 440

FIG. 11

420

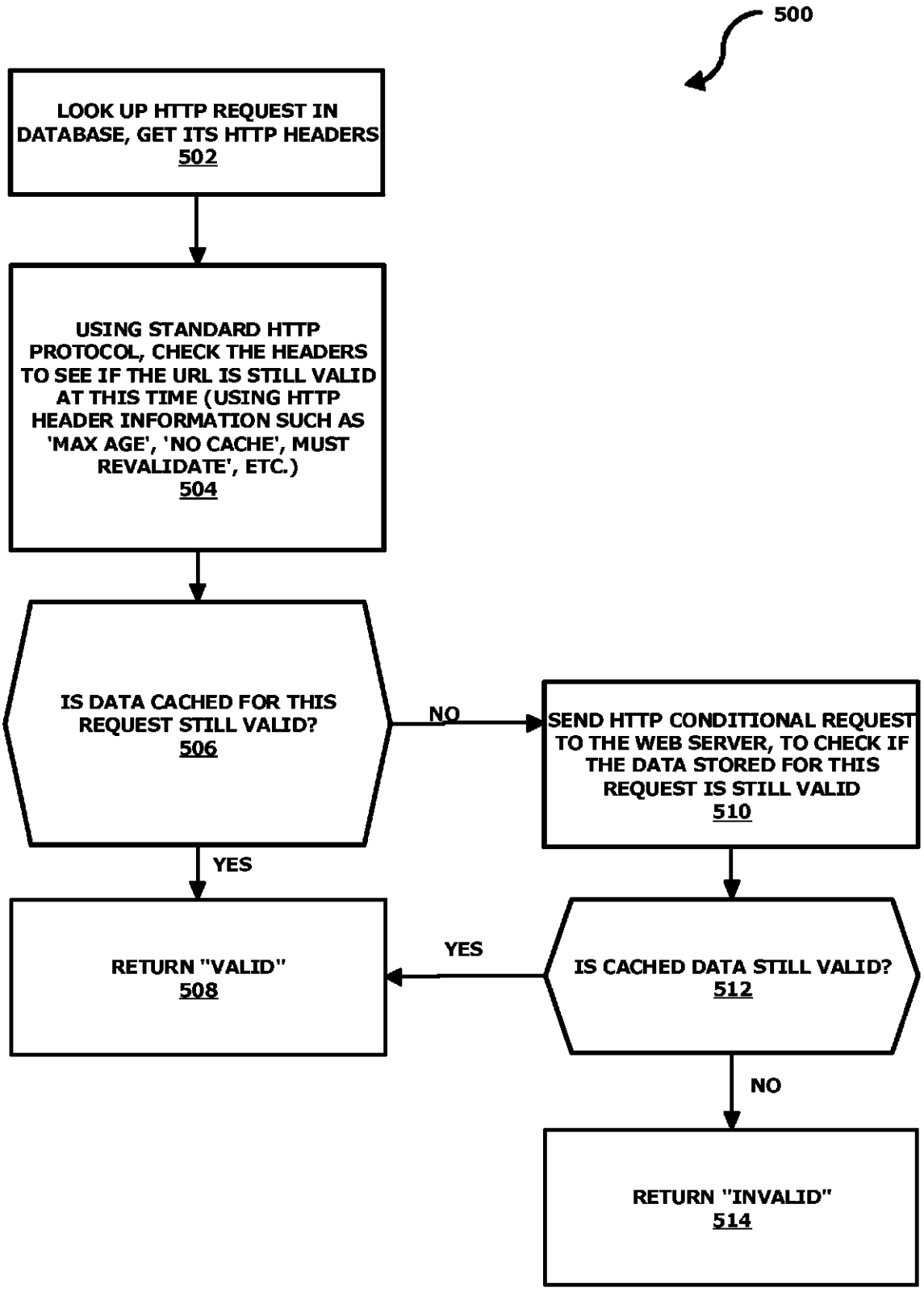

500
LOOK UP HTTP REQUEST IN DATABASE, GET ITS HTTP HEADERS
502
USING STANDARD HTTP PROTOCOL, CHECK THE HEADERS TO SEE IF THE URL IS STILL VALID AT THIS TIME (USING HTTP HEADER INFORMATION SUCH AS 'MAX AGE', 'NO CACHE', MUST REVALIDATE', ETC.)
504
IS DATA CACHED FOR THIS REQUEST STILL VALID?
506
NO
SEND HTTP CONDITIONAL REQUEST TO THE WEB SERVER, TO CHECK IF THE DATA STORED FOR THIS REQUEST IS STILL VALID
510
YES
RETURN "VALID"
508
YES
IS CACHED DATA STILL VALID?
512
NO
RETURN "INVALID"
514

FIG. 12

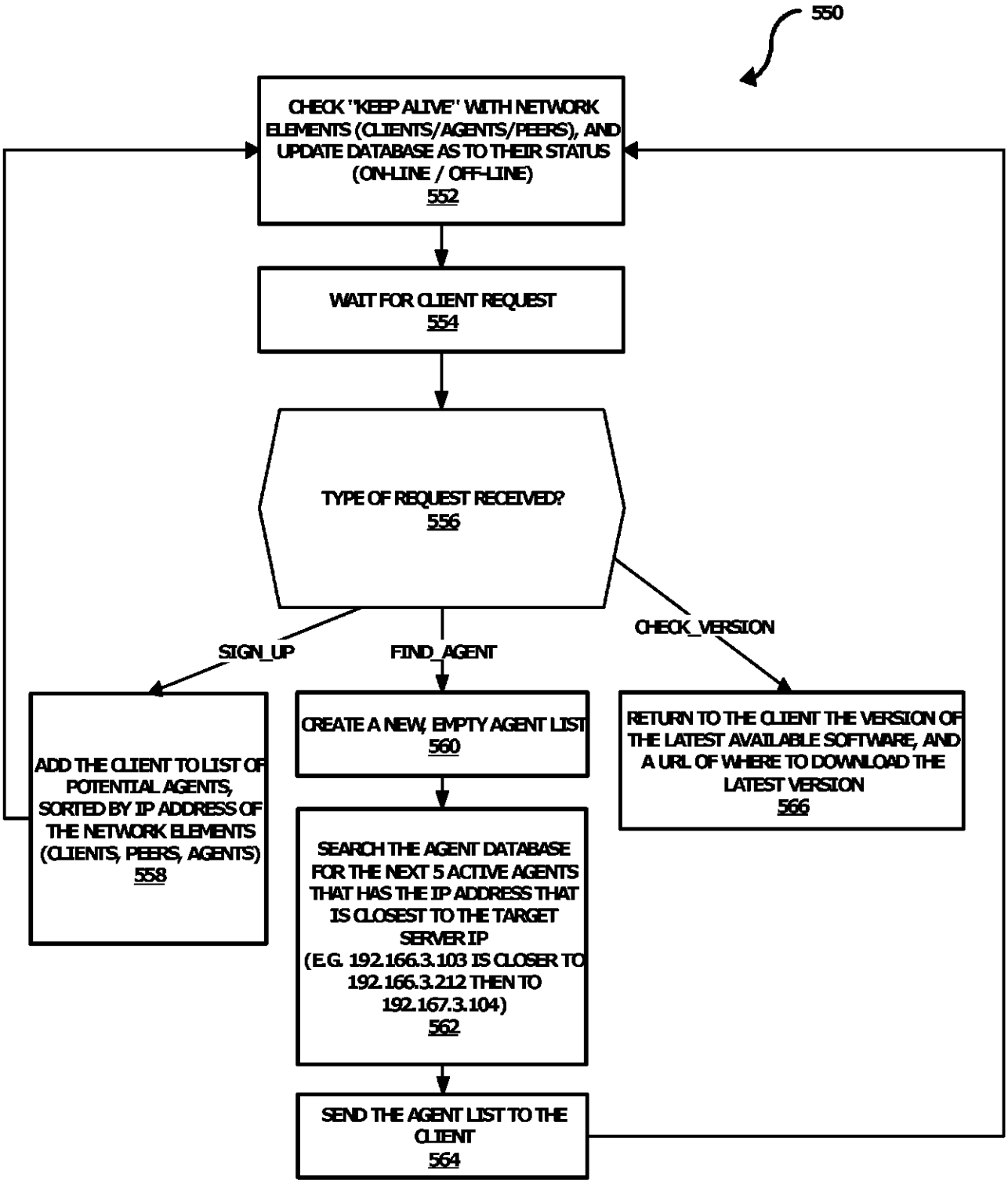

550
CHECK "KEEP ALIVE" WITH NETWORK ELEMENTS (CLIENTS/AGENTS/PEERS), AND UPDATE DATABASE AS TO THEIR STATUS (ON-LINE / OFF-LINE)
552
WAIT FOR CLIENT REQUEST
554
TYPE OF REQUEST RECEIVED?
556
SIGN_UP
FIND_AGENT
CHECK_VERSION
ADD THE CLIENT TO LIST OF POTENTIAL AGENTS, SORTED BY IP ADDRESS OF THE NETWORK ELEMENTS (CLIENTS, PEERS, AGENTS)
558
CREATE A NEW, EMPTY AGENT LIST
560
SEARCH THE AGENT DATABASE FOR THE NEXT 5 ACTIVE AGENTS THAT HAS THE IP ADDRESS THAT IS CLOSEST TO THE TARGET SERVER IP (E.G. 192.166.3.103 IS CLOSER TO 192.166.3.212 THEN TO 192.167.3.104)
562
SEND THE AGENT LIST TO THE CLIENT
564
RETURN TO THE CLIENT THE VERSION OF THE LATEST AVAILABLE SOFTWARE, AND A URL OF WHERE TO DOWNLOAD THE LATEST VERSION
566

FIG. 13

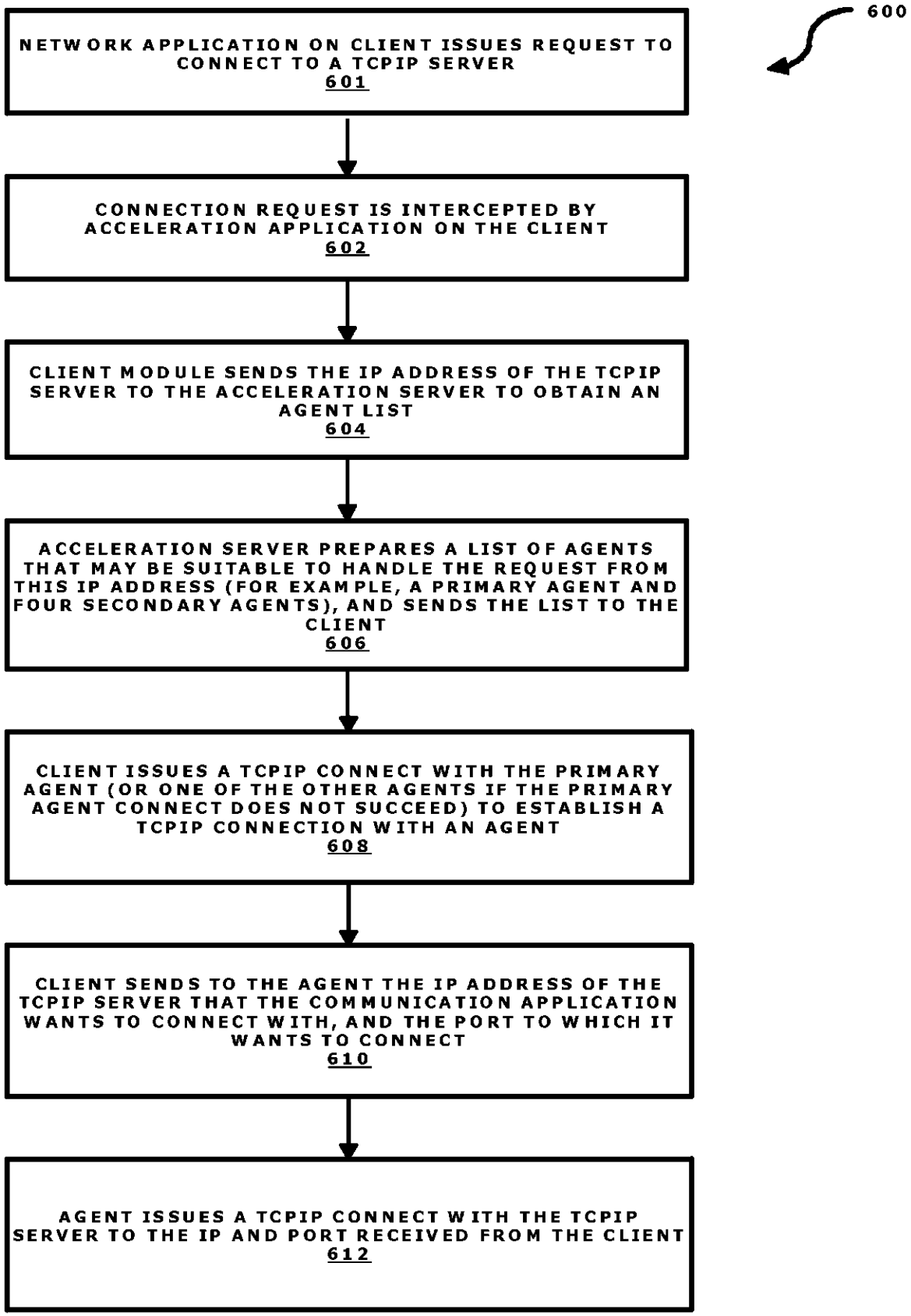

600
NETWORK APPLICATION ON CLIENT ISSUES REQUEST TO CONNECT TO A TCPIP SERVER
601
CONNECTION REQUEST IS INTERCEPTED BY ACCELERATION APPLICATION ON THE CLIENT
602
CLIENT MODULE SENDS THE IP ADDRESS OF THE TCPIP SERVER TO THE ACCELERATION SERVER TO OBTAIN AN AGENT LIST
604
ACCELERATION SERVER PREPARES A LIST OF AGENTS THAT MAY BE SUITABLE TO HANDLE THE REQUEST FROM THIS IP ADDRESS (FOR EXAMPLE, A PRIMARY AGENT AND FOUR SECONDARY AGENTS), AND SENDS THE LIST TO THE CLIENT
606
CLIENT ISSUES A TCPIP CONNECT WITH THE PRIMARY AGENT (OR ONE OF THE OTHER AGENTS IF THE PRIMARY AGENT CONNECT DOES NOT SUCCEED) TO ESTABLISH A TCPIP CONNECTION WITH AN AGENT
608
CLIENT SENDS TO THE AGENT THE IP ADDRESS OF THE TCPIP SERVER THAT THE COMMUNICATION APPLICATION WANTS TO CONNECT WITH, AND THE PORT TO WHICH IT WANTS TO CONNECT
610
AGENT ISSUES A TCPIP CONNECT WITH THE TCPIP SERVER TO THE IP AND PORT RECEIVED FROM THE CLIENT
612

FIG. 14

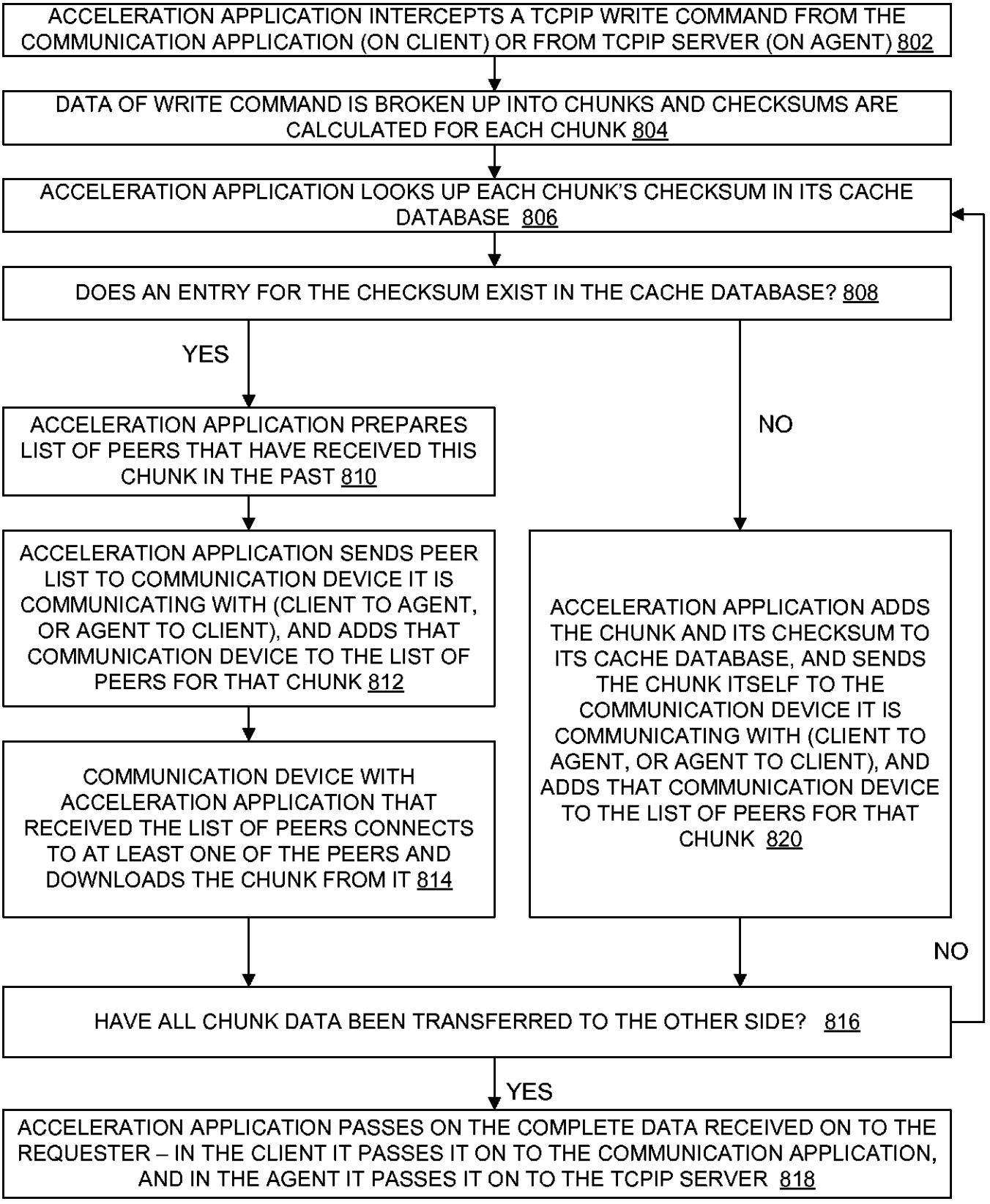

ACCELERATION APPLICATION INTERCEPTS A TCPIP WRITE COMMAND FROM THE COMMUNICATION APPLICATION (ON CLIENT) OR FROM TCPIP SERVER (ON AGENT) 802
DATA OF WRITE COMMAND IS BROKEN UP INTO CHUNKS AND CHECKSUMS ARE CALCULATED FOR EACH CHUNK 804
ACCELERATION APPLICATION LOOKS UP EACH CHUNK'S CHECKSUM IN ITS CACHE DATABASE 806
DOES AN ENTRY FOR THE CHECKSUM EXIST IN THE CACHE DATABASE? 808
YES
NO
ACCELERATION APPLICATION PREPARES LIST OF PEERS THAT HAVE RECEIVED THIS CHUNK IN THE PAST 810
ACCELERATION APPLICATION SENDS PEER LIST TO COMMUNICATION DEVICE IT IS COMMUNICATING WITH (CLIENT TO AGENT, OR AGENT TO CLIENT), AND ADDS THAT COMMUNICATION DEVICE TO THE LIST OF PEERS FOR THAT CHUNK 812
COMMUNICATION DEVICE WITH ACCELERATION APPLICATION THAT RECEIVED THE LIST OF PEERS CONNECTS TO AT LEAST ONE OF THE PEERS AND DOWNLOADS THE CHUNK FROM IT 814
ACCELERATION APPLICATION ADDS THE CHUNK AND ITS CHECKSUM TO ITS CACHE DATABASE, AND SENDS THE CHUNK ITSELF TO THE COMMUNICATION DEVICE IT IS COMMUNICATING WITH (CLIENT TO AGENT, OR AGENT TO CLIENT), AND ADDS THAT COMMUNICATION DEVICE TO THE LIST OF PEERS FOR THAT CHUNK 820
NO
HAVE ALL CHUNK DATA BEEN TRANSFERRED TO THE OTHER SIDE? 816
YES
ACCELERATION APPLICATION PASSES ON THE COMPLETE DATA RECEIVED ON TO THE REQUESTER – IN THE CLIENT IT PASSES IT ON TO THE COMMUNICATION APPLICATION, AND IN THE AGENT IT PASSES IT ON TO THE TCPIP SERVER 818
800

FIG. 15

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	19459-6105P
	Application Number	
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Derry		Shribman	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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City	Netanya	State/Province	
Postal Code	42507	Country i	IL

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ofer		Vilenski	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Address 2	Poleg Industrial Center		
City	Netanya	State/Province	
Postal Code	42507	Country i	IL

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	19459-6105P
	Application Number	
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	57449		
Email Address	ipadm@sheehan.com	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION		
Attorney Docket Number	19459-6105P	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	15	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	57449		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Division of	12836059	2010-07-14
Prior Application Status	Expired	Remove	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	19459-6105P
	Application Number	
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
12836059	non provisional of	61249624	2009-10-08

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	19459-6105P
	Application Number	
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(•) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :	
If the Applicant is an Organization check here.	☒
Organization Name	Hola Networks Ltd.

Mailing Address Information For Applicant:

Address 1	7 Giborei Israel Street, PO BOX 8025		
Address 2	Poleg Industrial Center		
City	Netanya	**State/Province**	
Country	IL	Postal Code	42507
Phone Number		Fax Number	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	19459-6105P
	Application Number	
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

Email Address	

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Assignee Information including Non-Applicant Assignee Information:

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Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication . An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Non-Applicant Assignee:

Address 1	
Address 2	

City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Signature				Date (YYYY-MM-DD)	2013-09-12
First Name	Peter	Last Name	Nieves	Registration Number	48173

Additional Signature may be generated within this form by selecting the Add button.

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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent C o o p eration Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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