AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-225	6/18/2021	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
Bright Data Ltd	NetNut Ltd.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,257,319	4/9/2019	BRIGHT DATA LTD.
2	10,484,510	11/19/2019	BRIGHT DATA LTD.
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

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☐ Trademarks or ☑ Patents. (☑ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:20-cv-00073-JRG	3/5/2020	for the Eastern District of Texas

PLAINTIFF	DEFENDANT
Teso LT, UAB, Metacluster LT, UAB, and Code200, UAB	Luminati Networks Ltd. and EMK Capital LLP

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,241,044	1/19/2016	Luminati Networks Ltd.
2	9,742,866	8/22/2017	Luminati Networks Ltd.
3	10,469,614	11/19/2019	Luminati Networks Ltd.
4	10,484,510	11/19/2019	Luminati Networks Ltd.
5	10,257,319	11/19/2019	Luminati Networks Ltd.

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INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading

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DECISION/JUDGEMENT

Order dated April 20, 2021 dismissing all claims and counterclaims with prejudice pursuant to Joint Stipulation and Motion to Dismiss Case in its Entirety.

CLERK	(BY) DEPUTY CLERK	DATE
David A. O'Toole		4/29/21

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Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049

Trials@uspto.gov
571-272-7822

Paper 18
Entered: December 23, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CODE200, UAB; TESO LT, UAB; METACLUSTER LT, UAB; AND OXYSALES, UAB,
Petitioner,

v.

LUMINATI NETWORKS LTD.,
Patent Owner.

IPR2020-01266
Patent 10,257,319 B2

Before THOMAS L. GIANNETTI, SHEILA F. MCSHANE, and RUSSELL E. CASS, *Administrative Patent Judges.*

GIANNETTI, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Petitioner (collectively, Code200, UAB; Teso LT, UAB; Metacluster LT, UAB; and Oxysales, UAB) filed a Petition (Paper 5, "Pet.") requesting an *inter partes* review of claims 1, 2, 14, 15, 17–19, 21, 22, and 24–29 ("the challenged claims") of U.S. Patent No. 10, 257,319 B2 (Ex. 1001, "the '319 patent"). Patent Owner, Luminati Networks, LTD, filed a Corrected Preliminary Response (Paper 16, "Prelim. Resp.").[1]

The Board has authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314; 37 C.F.R. § 42.4(a). Under 35 U.S.C. § 314(a), we may not authorize an *inter partes* review unless the information in the petition and the preliminary response "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

The Board, however, has discretion to deny a petition even when a petitioner meets that threshold. *Id.*; *see, e.g., Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016) ("[T]he agency's decision to deny a petition is a matter committed to the Patent Office's discretion."); *NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential).

Both the Petition and Preliminary Response address the issue of discretionary denial under 35 U.S.C. § 314(a). Pet. 6–9; Prelim. Resp. 4–14.

For the reasons that follow, we exercise our discretion under 35 U.S.C. § 314(a) to deny institution of *inter partes* review.

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[1] The Board authorized a Corrected Preliminary Response providing citations to a stipulation entered after the original preliminary response was filed. Paper 15.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
5 of 455

II. BACKGROUND

A. Real Parties-in-Interest

Petitioner identifies the following as the real parties-in-interest: Code200, UAB; Teso LT, UAB; Metacluster LT, UAB; Oxysales, UAB; and coretech lt, UAB. Pet. 2.

Patent Owner identifies Luminati Networks LTD as the real party-in-interest. Paper 7, 2.

B. Related Proceedings

The parties identify the following litigation in the Eastern District of Texas involving the '319 patent: *Luminati Networks Ltd. v. Teso LT, UAB et al.*, 2:19-cv-00395-JRG (E.D. Tex.) ("the Texas Litigation"). Pet. 2; Paper 7, 2. The parties identify other proceedings involving patents related to the '319 patent, including other litigations in the Eastern District of Texas, other petitions for *inter partes* review, and numerous pending applications. Pet. 3; Paper 7, 2–3.

C. The '319 Patent

The '319 patent is directed to a system for increasing network communication speed for users, while lowering network congestion for content owners and internet service providers (ISPs). Ex. 1001, (57). 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. *Id.* 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. *Id.*

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
6 of 455

The communication request is sent to the agents. Onc 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). *Id.* 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. *Id.*

D. Illustrative Claim

Claim 1 is the only independent claim, and is illustrative of the challenged claims. Claim 1 recites:

> 1. A method for use with a first client device, for use with a first server that comprises a web server that is a Hypertext Transfer Protocol (HTTP) server that responds to HTTP requests, the first server stores a first content identified by a first content identifier, and for use with a second server, the method by the first client device comprising:
>
> receiving, from the second server, the first content identifier;
>
> sending, to the first server over the Internet, a Hypertext Transfer Protocol (HTTP) request that comprises the first content identifier;
>
> receiving, the first content from the first server over the Internet in response to the sending of the first content identifier; and
>
> sending, the first content by the first client device to the second server, in response to the receiving of the first content identifier.

Ex. 1001, 19:16–32.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
7 of 455

E. Prior Art

Petitioner relies on the following prior art:

1. Michael Reiter & Aviel Rubin, *Crowds: Anonymity for Web Transactions,* ACM Transactions on Information and System Security, Vol. 1, No. 1, Nov. 1998, at 66-92 (Ex. 1011, "Crowds");

2. Marc Rennhard, *MorphMix – A Peer-to-Peer-based System for Anonymous Internet Access* (2004) (Doctoral Thesis) (Ex. 1013, "MorphMix");

3. Border et al. United States Patent No. 6,795,848 (Ex, 1017, "Border");

4. Network Working Group, RFC 2616 (Ex. 1018).

F. The Asserted Grounds

Petitioner challenges claims 1, 2, 14, 15, 17–19, 21, 22, and 24–29 of the '319 patent on the following grounds (Pet. 5–6):

Claims Challenged	35 U.S.C. §	References
1, 2, 21, 22, 24–27	102(b)	Crowds
1, 2, 14, 15, 17, 18, 21, 22, 24–27	103(a)[2]	Crowds, RFC 2616
1, 12, 14, 21, 22, 24, 25, 27–29	102(b)	Border
1, 12, 14, 15, 17, 18, 21, 22, 24–29	103(a)	Border, RFC 2616
1, 2, 17, 19, 21, 22, 24–27	102(b)	MorphMix
1, 2, 14, 15, 17–19, 21, 22, 24–27	103(a)	MorphMix, RFC 2616

[2] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the '319 patent was filed before March 16, 2013 (the effective date of the relevant amendments), the pre-AIA version of § 103 applies.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
8 of 455

III. ANALYSIS

Patent Owner contends we should exercise our discretion to deny institution under 35 U.S.C. § 314(a), relying on the Board's precedential decision in *Apple Inc. v. Fintiv Inc.*, IPR2020-00019, Paper 11 (PTAB March 20, 2020) ("*Fintiv*"). Prelim. Resp. 4–14. Patent Owner contends the parallel Texas Litigation, which asserts the same prior art as the Petition, begins jury selection over seven months before a final determination would be expected in this proceeding. Prelim. Resp. 4. Anticipating Patent Owner's challenge, Petitioner addresses the §314(a) issue in its Petition. Pet. 6–9.

A. Fintiv Factors

Fintiv identifies a non-exclusive list of factors parties may consider addressing where there is a related, parallel district court action to determine whether such action provides any basis for discretionary denial. *Fintiv*, Paper 11 at 5–16. Those factors include:

> 1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
>
> 2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
>
> 3. investment in the parallel proceeding by the court and the parties;
>
> 4. overlap between issues raised in the petition and in the parallel proceeding;
>
> 5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
>
> 6. other circumstances that impact the Board's exercise of discretion, including the merits.

Id. at 5–6.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
9 of 455

In evaluating the factors, we take a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review. *Fintiv*, Paper 11 at 6.

B. The Texas Litigation

The Texas Litigation is pending before District Judge Rodney Gilstrap, in the United States District Court for the Eastern District of Texas, Marshall Division. Judge Gilstrap has entered a Docket Control Order setting December 14, 2020, as the deadline for completing fact discovery, January 21, 2021, as the deadline for completing expert discovery, and May 3, 2021, for jury selection and trial. Ex. 1004, 1, 3. The parties have advised us that the date for jury selection has been moved to May 10, 2021.

The Court has conducted a *Markman* hearing, and on December 7, 2020, issued a Claim Construction Opinion and Order. Paper 17; Ex. 2016.

Petitioner advised us (and we have independently confirmed) that in other cases before him, Judge Gilstrap has continued jury trial dates in cases scheduled for trial from December 2020 through February 2021 due to the COVID-19 pandemic. *See. e.g.,* Ex. 3001. However, we have not been informed of any change in the May 10, 2021 jury selection date in the Texas Litigation.

C. Analysis of the Fintiv Factors

Both Petitioner and Patent Owner address the *Fintiv* factors in their submissions. We conclude that overall, the factors favor exercising our discretion to decline to institute a trial. Our reasoning follows.

i. Stay in the Texas Litigation

Neither party asserts that the Texas Litigation has been stayed. Pet. 7; Prelim, Resp. 5. In the Petition, Petitioner contends this factor is neutral

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
10 of 455

because "No party has requested a stay of the Lawsuit pending the IPR." Pet. 7. Patent Owner contends that on October 1, 2020, after the Petition was filed, "Petitioners filed a sealed opposed motion to stay the 395 District Court case pending the *inter partes* reviews in which they concede as a general rule that such stays are not granted." Prelim. Resp. 5 (citing Ex. 2001). Patent Owner contends Judge Gilstrap "would not likely grant a stay given the lateness of the Petition." *Id.* at 6. The parties have not informed us of any ruling by Judge Gilstrap on Petitioner's motion to stay.

In the absence of any specific information from the parties about a stay by the district court, we decline to speculate on the likelihood of a stay. *See Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 at 12 (PTAB May 13, 2020) (informative) ("We decline to infer, based on actions taken in different cases with different facts, how the District Court would rule should a stay be requested by the parties in the parallel case here."). Thus, we find this factor is neutral.

ii. Trial Date in the Texas Litigation

Patent Owner notes that jury selection in the Texas Litigation is set to occur over seven months before the final written decision is due. Prelim. Resp. 6–7. According to Patent Owner, the possibility that the trial date will be delayed due to the COVID-19 pandemic is "sheer speculation." *Id.* at 7–8. Thus, Patent Owner contends that this factor "strongly favors denial of institution." *Id.* at 8. Petitioner contends that in previous lawsuits, "Luminati has previously sought to abandon its trial dates as the 'day of reckoning' approaches." Pet. 7. Petitioner argues that "[i]n view of Luminati's history and the potential for COVID-related delays (which are more likely to affect a jury trial)," this factor "is neutral." *Id.* at 8.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
11 of 455

The trial in the Texas Litigation is currently set to occur at least seven months before a Final Written Decision in this case will issue if trial is instituted. Although district court trial delays are always a possibility, we have no hard evidence before us that would indicate the likelihood of a trial postponement in the Texas Litigation, due to COVID-19 or otherwise. Thus, based on the current record, this factor favors exercising discretion to deny institution of *inter partes* review.

iii. Investment by the Court and the Parties in the Texas Litigation

Petitioner contends that the Texas Litigation "is at a very early stage." Pet. 8. Patent Owner disagrees and points to the efforts of the parties and the Court in connection with the *Markman* proceedings. Prelim. Resp. 8–10. As noted *supra*, those efforts have now resulted in a *Markman* claim construction order. Ex. 2016. Moreover, according to the most recent Docket Control Order that the parties have submitted from the Texas Litigation, fact discovery closed on December 14, 2020, and expert discovery will close on January 21, 2021. Ex. 1004, 3. The parties have not informed us of any delays that impacted or would impact these dates.

Based on the evidence of record, we agree with Patent Owner that the investment of time and effort in the Texas Litigation has been substantial and that this factor favors denial of institution. Prelim. Resp. 10.

iv. Overlap of the Issues

Patent Owner contends the overlap in issues between the Petition and the Texas Litigation "is substantial." Prelim. Resp. 10. Petitioner identified all four references relied on in this proceeding (Crowds, Border, MorphMix,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
12 of 455

and RFC 2616) in its invalidity contentions in the Texas Litigation. Paper 14, ¶¶ 1–2.[3]

In addition, the claims asserted in the Texas Litigation overlap with the claims challenged in this proceeding. Prelim. Resp. 11. Petitioner asserts that because the Petition challenges four claims that are not asserted in the Texas Litigation, this factor "weighs in favor of institution." Pet. 8. But Patent Owner responds that those claims depend from claim 1, the only independent claim in the '319 patent. Prelim. Resp. 11. Patent Owner further contends that two of those dependent claims merely add a "non-transitory computer readable medium containing computer instructions that, when executed by a computer processor, cause the processor to perform the method" of claim 1. *Id.* Thus, Patent Owner argues, "[t]his is not a significant difference." *Id.*

We agree with Patent Owner and find that the overlap of issues with the Texas Litigation is "substantial." Prelim. Resp. 10. We find that this factor strongly favors exercising our discretion to deny institution.

v. Whether Petitioner is Unrelated to the Defendants in the Texas Litigation

"If a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion." *Fintiv*, Paper 11 at 13–14. Three of the four petitioners, namely, Teso LT, Metacluster LT, and Oxysales, are the defendants in the Texas Litigation.

[3] Petitioner and Patent Owner have entered a stipulation acknowledging that these four references have been asserted in Petitioner's invalidity contentions in the Texas Litigation. Paper 14. Petitioner excludes Code 200 from this stipulation, as Code 200 is not a party to the Texas Litigation. *Id.* ¶ 2.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
13 of 455

Prelim. Resp. 12; Ex. 1038. Petitioner argues that because the fourth petitioner, Code200, is not a party to the Texas Litigation, this factor "weighs in favor of institution." Pet. 9. Patent Owner responds that this argument "fails to acknowledge the close corporate relationship between Code200 and the other defendants/petitioners." Prelim. Resp. 12.

After reviewing the corporate structure of the named petitioners, Patent Owner concludes: "Code200 is related to the other petitioners and all of them are under the control of their common parent company." Prelim. Resp. 13 (citing Exs. 2013, 2014). Petitioner does not challenge this assertion.

We find that the overlap between the defendants in the Texas Litigation and petitioners this proceeding, even without considering the relationship of Code 200 to the other petitioners, is substantial, and favors denial of institution.

vi. Other Considerations

The final *Fintiv* factor takes into account any other relevant circumstances. Petitioner contends the '319 patent "is extraordinarily weak." Pet. 9. Patent Owner responds "Petitioners' reading of the claims is unreasonable — an issue that will be resolved by the . . . District Court." Prelim. Resp. 13–14.

Having reviewed Petitioner's unpatentability arguments and Patent Owner's responses, and based on the limited record before us, we do not find that the merits outweigh the other *Fintiv* factors favoring denial of institution.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
14 of 455

D. Conclusion

The decision whether to exercise discretion to deny institution under § 314(a) is based on "a balanced assessment of all relevant circumstances in the case, including the merits." Patent Trial and Appeal Board Consolidated Trial Practice Guide 58 (Nov. 2019), *available at* https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf.

Patent Owner has established that (1) the trial in the Texas Litigation is set to occur at least seven months before a Final Written Decision would be issued here; (2) the court and the parties have invested substantial time and effort in the Texas Litigation; and (3) there is almost complete overlap of issues and parties with this proceeding and the Texas Litigation. Thus, based on the facts and circumstances of this case, we exercise our discretion under 35 U.S.C. § 314(a) to deny *inter partes* review.

IV. ORDER

Accordingly, it is

ORDERED that the Petition is *denied* as to all grounds and all challenged claims of the '319 patent.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
15 of 455

PETITIONER:

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2:19-cv-397	12/6/2019	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
Luminati Networks Ltd	BI Science (2009) Ltd.

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2:19-cv-395	12/06/2019	EASTERN DISTRICT OF TEXAS, MARSHALL DIVISION

PLAINTIFF	DEFENDANT

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1	10,469,614 B2	11/05/2019	LUMINATI NETWORKS LTD.
2	10,257,319 B2	04/09/2019	LUMINATI NETWORKS LTD.
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. í 290 and/or 15 U.S.C. í 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. í 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:19-cv-414	12/31/2019	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
Luminati Networks Ltd.	Tefincom S.A. d/b/a NordVPN

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,469,614 B2	11/05/2019	Luminati Networks Ltd.
2	10,257,319 B2	04/09/2019	Luminati Networks Ltd.
3	10,484,510 B2	11/19/2019	Luminati Networks Ltd.
4	10,484,511 B2	11/19/2019	Luminati Networks Ltd.
5			

In the above´ entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above´ entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1´ Upon initiation of action, mail this copy to Director Copy 3´ Upon termination of action, mail this copy to Director
Copy 2´ Upon filing document adding patent(s), mail this copy to Director Copy 4´ Case file copy

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.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/957,945	04/09/2019	10257319	HOLA-005-US4	7917

131926 7590 03/20/2019

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 0 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):

WEB SPARK LTD., Netanya, ISRAEL;
Derry Shribman, Tel Aviv, ISRAEL;
Ofer Vilenski, Moshav Hadar Am, ISRAEL;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15/957945
	Filing Date	04/20/2018
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	MINH-CHAU NGUYEN
	Attorney Docket Number	HOLA-005-US4

/M.N/	9	4937781	A	1990-06-26	Lee , et al.	
/M.N/	10	7970835	B2	2011-06-28	Robert St. Jacques	

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/ Change(s) applied to document. /C.H.J./ 2/21/2019	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.	
	6	20130166768	A1	2013-06-27	Gouache et al. ~~Thomson Licensing~~	
	7	20020065930	A1	2002-30-05	Rhodes, David L.	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
22 of 455

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. 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

(Not for submission under 37 CFR 1.99)

Application Number	15/957945
Filing Date	04/20/2018
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	MINH-CHAU NGUYEN
Attorney Docket Number	HOLA-005-US4

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, /C.H.J./ 2/21/2019	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.	

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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/957,945	04/20/2018	2459	1235	HOLA-005-US4	29	1

CONFIRMATION NO. 7917

CORRECTED FILING RECEIPT

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

OC000000108167850

Date Mailed: 02/26/2019

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)

WEB SPARK 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 CON of 14/025,109 09/12/2013 PAT 10069936
which 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: Yes

Permission to Access Search Results: Yes

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: 05/14/2018

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
24 of 455

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/957,945**

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).

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
25 of 455

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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. 2049
26 of 455

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.
15/957,945	04/20/2018	Derry Shribman	HOLA-005-US4	7917

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	04/23/2019

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: WEB SPARK 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 506726 (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 February 19, 2019

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.
IPR2020-00126, EX 2049
27 of 455

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:	15957945
Filing Date:	20-Apr-2018
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Filer:	Yehuda Binder/Dorit Binder
Attorney Docket Number:	HOLA-005-US4

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:	35188426
Application Number:	15957945
International Application Number:	
Confirmation Number:	7917
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-US4
Receipt Date:	19-FEB-2019
Filing Date:	20-APR-2018
Time Stamp:	14:52:33
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	022019INTEFSW00001278506726
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	75023 c3c6f46b6736bb49e4ae6a00dcdfd5d9412ba204	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30213 31650b9cbc721c14a34f7b09e9ba7c9154643404	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	105236		

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/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	15/957,945
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:

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. 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	HOLA-005-US4
	Application Number	15/957,945
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-US4	**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		

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	15/957,945
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

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	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	14/025109	2013-09-12

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

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	15/957,945
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

☐ 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.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	15/957,945
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. 2049
37 of 455

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	15/957,945
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 NETWORKS 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)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	15/957,945
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)	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.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. 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	HOLA-005-US4
	Application Number	15/957,945
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. 2049
41 of 455

Electronic Acknowledgement Receipt

EFS ID:	34971371
Application Number:	15957945
International Application Number:	
Confirmation Number:	7917
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-US4
Receipt Date:	28-JAN-2019
Filing Date:	20-APR-2018
Time Stamp:	04:22:36
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-005-15957945.pdf	340979 868354bf92a78db25a31079830cabd087eea556a	no	9

Warnings:

Information:	
This is not an USPTO supplied ADS fillable form	
Total Files Size (in bytes):	340979

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 01/23/2019

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: 01/23/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/957,945	04/20/2018	Derry Shribman	HOLA-005-US4	7917

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	04/23/2019

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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 01/23/2019
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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/957,945	04/20/2018	Derry Shribman	HOLA-005-US4	7917

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	04/23/2019

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 03-09 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

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

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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. _____

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
45 of 455

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/957,945	04/20/2018	Derry Shribman	HOLA-005-US4	7917

131926 7590 01/23/2019

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: 01/23/2019

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
46 of 455

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 30 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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
Page 455

Notice of Allowability	Application No. 15/957,945	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 10/18/2018.
   ☐ 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 1-29 . 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 10/18/2018;01/20/2019.
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

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 October 18, 2018 responding to September 5, 2018 Office Action provided in the rejection of claims 1-29. **Claims 1-29** remain pending in the application and which have been fully considered by the Examiner.

Examiner's Amendment

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

22 (currently amended). The method according to claim ~~22~~ 21, wherein the determining is based on the received HTTP header according to, or based on, IETF RFC 2616.

Reasons for Allowance

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

Claims 1-29 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 claim 1.**

For example, the independent claims contain limitations, *receiving, from the second server, the first content identifier; sending to the first server, which stores a first content identified by a first content identifier, over the Internet, a HTTP request that comprises the first content identifier; receiving, the first content from the first server over the Internet in response to the sending of the first content identifier; and sending, the first content by the first client device to the second server, in response to the receiving of the first content identifier*. 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 and in view of the Applicant's arguments.

Because **claims 2-29** depend directly or indirectly on claim 1, these claims are considered allowable for at least the same reasons noted above with respect to **claim 1.**

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

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/957,945	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)	29	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	22 January 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office

Part of Paper No.: 20190122

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
53 of 455

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/957,945	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:** 29	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459 (Primary Examiner)	22 January 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
54 of 455

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/957,945	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	1	8	10	5	19	28	28								
12	2	9	11	25	20	29	29								
13	3	10	12	14	21										
21	4	17	13	15	22										
22	5	18	14	13	23										
23	6	24	15	26	24										
6	7	2	16	27	25										
11	8	3	17	19	26										
7	9	4	18	20	27										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	29	
/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	22 January 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office

Part of Paper No.: 20190122

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
55 of 455

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/957,945	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	08/21/2018	01/22/2019							
1	1	✓	=							
12	2	✓	=							
13	3	✓	=							
21	4	✓	=							
22	5	✓	=							
23	6	✓	=							
6	7	✓	=							
11	8	✓	=							
7	9	✓	=							
8	10	✓	=							
9	11	✓	=							
10	12	✓	=							
17	13	✓	=							
18	14	✓	=							
24	15	✓	=							
2	16	✓	=							
3	17	✓	=							
4	18	✓	=							
5	19	✓	=							
25	20	✓	=							
14	21	✓	=							
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16	23	✓	=							
26	24	✓	=							
27	25	✓	=							
19	26	✓	=							
20	27	✓	=							
28	28	✓	=							
29	29	✓	=							

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
56 of 455

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/957,945	Shribman et al.
	Examiner	Art Unit
	MINH CHAU N NGUYEN	2459

CPC - Searched*		
Symbol	Date	Examiner
H04L67/42	08/21/2018	MN
H04L41/046	08/21/2018	MN
H04L67/108	08/21/2018	MN
H04L67/22	08/21/2018	MN

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	202	08/21/2018	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	08/21/2018	MN
update search on EAST, google patents	01/22/2019	MN

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
USPAT, USPG-Pub text search	Independent claim search	01/22/2019	MN

/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
57 of 455

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5083	((web near server$1) same servers same (peers clients)) same ((deliver$4 quer$4 inquir$4 retriev$4 search$4 transfer$4 provid$4 transmit$4 send$4 forward$4) with (content$1 document$1 page$1 file$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:11
L2	395	1 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 ((content$1 page$1 document$1) near (identifier$1 address$2))) with (client$1 peer$1 node$1 terminal$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:19
L3	12	2 and (server$1 with (list$1 near3 (node$1 peer$1 terminal$1 device$1) near3 client$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:19
L4	1	3 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:20
L5	1	4 and (server$1 with (select$4 list$4 retriev$4 quer$4 inquir$4) with (client$1 peer$1 node$1 terminal$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:21
L6	1	5 and (server$1 with (stor$4 maintain$4 log$1 storage$1 database$1 kept keep$1) with (identifier$1 address$2 url$1 port$1 id$1) with (content$1 page$1 document$1 file$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:23
L7	0	4 and (server$1 with (select$4 list$4 retriev$4 quer$4 inquir$4) same (geographic$6 location$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:26
L8	0	4 and (server$1 same (select$4 list$4 retriev$4 quer$4 inquir$4) same (geographic$6 location$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:26
L9	0	6 and (((second other another	US-PGPUB;	OR	OFF	2019/01/22

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049

		differen$4) near1 server$1) with (return$4 send$4 transmit$4 forward$4 respon$4) with (content$1 page$1 document$1) with (url$1 identifier$1 address$2 identification$1))	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			14:31
L11	290	2 and (server$1 with (select$4 list$4 retriev$4 quer$4 inquir$4) with (client$1 peer$1 node$1 terminal$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:32
L13	137	11 and (server$1 with (stor$4 maintain$4 log$1 storage$1 database$1 kept keep$1) with (identifier$1 address$2 url$1 port$1 id$1) with (content$1 page$1 document$1 file$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:35
L14	87	13 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:36
L15	3	14 and (((second other another differen$4) near1 server$1) with (return$4 send$4 transmit$4 forward$4 respon$4) with (content$1 page$1 document$1) with (url$1 identifier$1 address$2 identification$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:36
L16	0	15 and (server$1 with (select$4 list$4 retriev$4 quer$4 inquir$4) same (geographic$6 location$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:37
L17	0	15 and (keep$4 near3 live$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:39
L18	0	15 and (keep$4 with live$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:39
L19	0	14 and (keep$4 with live$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:39
L20	22	1 and (keep$4 with live$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:40

L21	7	20 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:40
L22	0	21 and (((second other another differen$4) near1 server$1) with (return$4 send$4 transmit$4 forward$4 respon$4) with (content$1 page$1 document$1) with (url$1 identifier$1 address$2 identification$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:40
L23	146707	(H04L67/42 H04L41/046 H04L67/108 H04L67/22 H04L67/02).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:41
L24	2877	23 and ((web near server$1) same servers same (peer$1 client$1)) same ((deliver$4 quer$4 inquir$4 retriev$4 search$4 transfer$4 provid$4 transmit$4 send$4 forward$4) with (content$1 document$1 page$1 file$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:42
L25	1055	24 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:43
L26	23	25 and (((second other another differen$4) near3 server$1) with (return$4 send$4 transmit$4 forward$4 respon$4) with (content$1 page$1 document$1) with (url$1 identifier$1 address$2 identification$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:44
L27	122	25 and ((web near server$1) with (stor$4 maintain$4 log$1 storage$1 database$1 kept keep$1) with (identifier$1 address$2 url$1 port$1 id$1) with (content$1 page$1 document$1 file$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:44
L28	6	27 and (((second other another differen$4) near3 server$1) with (return$4 send$4 transmit$4 forward$4 respon$4) with (content$1 page$1 document$1) with (url$1 identifier$1 address$2 identification$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:45
L29	3	28 and (server$1 same (select$4 list$4 retriev$4 quer$4 inquir$4) same (geographic$6 location$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:45
L30	0	29 and (keep$4 with live$1)	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2019/01/22 14:46

			EPO; JPO; DERWENT; IBM_TDB			
L31	3	29 and (http)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:46
L32	3	31 and (brows$4 e$mail)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:46
L33	3	32 and servers	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/22 14:48

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15957945
Filing Date	2018-04-20
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US4

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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	7788378		2010-08-31	Ravi T. Rao	
	2	9253164		2016-02-02	Christopher S. Gouge	
	3	7890547	B2	2011-02-15	Timo Hotti	
	4	8832179	B2	2014-09-09	Owen , et al.	
	5	7818430	B2	2010-10-19	Gal Zuckerman	
	6	6154782	A	2000-11-28	NAOHISA KAWAGUCHI	
	7	5577243	A	1996-17-11	Sherwood , et al.	
	8	8135912	B2	2012-13-03	Shribman , et al.	

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	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US4

/M.N/	9	8719505	B2	2014-06-05	Shribman , et al.	
	10	9201808	B2	2015-01-12	Shribman , et al.	
	11	9990295	B2	2018-06-05	Shribman , et al.	

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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	Matrix Xin Wang	
	2	20110066924	A1	2011-03-17	Gregory Dorso	
	3	20110128911	A1	2011-06-02	Kamel M. Shaheen	
	4	20130157699	A1	2013-06-20	Mohit Talwar	
	5	20130326607	A1	2013-12-05	Liang Feng	
	6	20030204602	A1	2003-30-10	Hudson, Michael D. ; et al.	

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	Attorney Docket Number	HOLA-005-US4

/M.N/	7	20120124173	A1	2012-17-05	De; Pradipta ; et al.	
	8	20020069241	A1	2002-06-06	Narlikar, Girija ; et al.	
	9	20130201316	A1	2013-08-08	BINDER; Yehuda ; et al.	
	10	20120099566	A1	2012-26-04	Laine; Tuomas ; et al.	
	11	20120254370	A1	2012-10-04	Utz BACHER	
	12	20080125123	A1	2008-05-29	Jheroen P. Dorenbosch	
	13	20140301334	A1	2014-10-09	Miguel Labranche	
	14	20070239655	A1	2007-10-11	Masakuni Agetsuma	
	15	20070226810	A1	2007-09-27	Timo Hotti	
	16	20100094970	A1	2010-04-15	Gal Zuckerman	
	17	20130007253	A1	2013-01-03	Guohuai Li	

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/M.N/	18	20090037529	A1	2009-02-05	Gilad Armon-Kest	
	19	20090182843	A1	2009-07-16	Michael G. Hluchyj	
	20	20060036755	A1	2006-02-16	Ibrahim S. Abdullah	
	21	20140376403	A1	2014-12-25	Wenqi Shao	
	22	20050228964	A1	2005-13-10	Sechrest, Stuart ; et al.	
	23	20080086730	A1	2008-10-04	Vertes; Marc	
	24	20060259728	A1	2006-16-11	Chandrasekaran; Sashikanth ; et al.	
	25	20040254907	A1	2004-16-12	Crow, Preston F. ; et al.	
	26	20050015552	A1	2005-20-01	So, Kimming ; et al.	
	27	20050022236	A1	2005-01-27	Akihiko Ito; et al.	

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65 of 455

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US4

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	2597869	EP	A1	2013-18-12	Sharp Kk		
	2	2010090562	WO	A1	2010-12-08	Telefonaktiebolaget L M Ericsson (Publ)		
	3	2011068784	WO	A1	2011-09-06	Azuki Systems, Inc		

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/M.N/	1	Screen captures from YouTube video clip entitle "nVpn.net | Double your Safety and use Socks5 + nVpn" 38 pages, last accessed 11/20/2018 <https://www.youtube.com/watch?v=L0Hct2kSnn4>	
	2	Screen captures from YouTube video clip entitle "Andromeda" 47 pages, publicly known and available as of at least 2011 <https://www.youtube.com/watch?v=yRRYpFLbKNU>	
	3	SpyEye, https://www.symantec.com/security-center/writeup/2010-020216-0135-9; http://securesql.info/riskyclouds/spyeye-user-manual; known as of at least 2010 (13 pages)	
	4	Screen captures from YouTube video clip entitle "Change Your Country IP Address & Location with Easy Hide IP Software" 9 pages, publicly known and available as of at least 2011, <https://www.youtube.com/watch?v=ulwkf1sOfdA and https://www.youtube.com/watch?v=iFEMT-o9DTc>	
	5	CoralCDN ("CoralCDN"), https://pdos.csail.mit.edu/6.824/papers/freedman-coral.pdf (14 PAGES)	

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	Attorney Docket Number	HOLA-005-US4

/M.N/	6	European Search Report for EP 14182547.1, dated July 30, 2015
	7	R. Fielding et al, RFC 2616: Hypertext Transfer Protocol -- HTTP/1.1, June 1999, retrieved from the Internet http://rfc-editor.org [retrieved Apr. 15, 2002]
	8	"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*
	9	"Slice Embedding Solutions for Distributed Service Architectures" - Esposito et al., Boston University, Computer Science Dept., 10/2011 http://www.cs.bu.edu/techreports/pdf/2011-025-slice-embedding.pdf
	10	International Search Report of PCT/US2010/034072 dated July 01, 2010
	11	YouTube video clip entitled "nVpn.net | Double your Safety and use Socks5 + nVpn" <https://www.youtube.com/watch?v=L0Hct2kSnn4>
	12	YouTube video clip entitled "Andromeda" <https://www.youtube.com/watch?v=yRRYpFLbKNU>
	13	YouTube video clip entitled "Change Your Country IP Address & Location with Easy Hide IP Software" <https://www.youtube.com/watch?v=ulwkf1sOfdA and https://www.youtube.com/watch?v=iFEMT-o9DTc>

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	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US4

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).

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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)	2019-01-18
Name/Print	Yehuda Binder	Registration Number	73,612

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Attorney Docket Number	HOLA-005-US4

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/M.N/	1	6868453	B1	2005-03-15	Mitsuhiro Watanabe	
/M.N/	2	8595786	B2	2013-11-26	In Hwan Choi	

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/M.N/	1	20030097408	A1	2003-05-22	Masahiro Kageyama	
/M.N/	2	20070100839	A1	2007-05-03	Deok-ho Kim	
/M.N/	3	20080256175	A1	2008-10-16	Sang-kwon Lee	
/M.N/	4	20060212542	A1	2006-09-21	Han Fang	

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/M.N/	5	20110035503	A1	2011-02-10	SAM ZAID	
/M.N/	6	20050097441	A1	2005-05-05	Jonathan D. Herbach	

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Examiner Signature	/MINH CHAU NGUYEN/	Date Considered	01/22/2019

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	Attorney Docket Number	HOLA-005-US4

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See attached certification statement.

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Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2018-10-18
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:

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.

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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)).

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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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	7652	((web near servers) with (transfer$4 provid$4 transmit$4 send$4 forward$4) with (content$1 file$1 document$1 page$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/06 23:31
S2	578	S1 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	2019/01/06 23:48
S3	39	S2 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	2019/01/06 23:49
S4	457	S2 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	2019/01/06 23:49
S5	395	S4 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	2019/01/06 23:49
S6	394	S5 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	2019/01/06 23:49
S7	394	S6 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	2019/01/06 23:49
S8	361	S7 and (request$4 same (url$1 (web near server$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/06 23:50
S9	161	S8 and @ad< "20091008"	US-PGPUB; USPAT;	OR	OFF	2019/01/06 23:50

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S10	37	S9 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	2019/01/06 23:50
S11	0	S10 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	2019/01/06 23:50
S12	3	S10 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	2019/01/06 23:50
S13	146021	(H04L67/42 H04L41/046 H04L67/108 H04L67/22 H04L67/02).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/06 23:50
S14	1189	S13 and S1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/06 23:51
S15	20	S14 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	2019/01/06 23:51
S16	17	S15 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	2019/01/06 23:51
S17	0	S16 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	2019/01/06 23:51
S18	11	S16 and (request$4 same (url$1 same (web near server$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/06 23:52
S19	3	S18 and (server$1 with (select$4 list$4 retriev$4 inquir$4 quer$4) with	US-PGPUB; USPAT;	OR	OFF	2019/01/06 23:52

		(client$1 peer$1) with (geographic$4 location$1))	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S20	1	S19 and @ad< "20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/01/06 23:52

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S21	1	(((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	2019/01/06 23:52
S22	6	(((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	2019/01/06 23:52
S23	1	S22 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	2019/01/06 23:54
S24	0	S23 and @ad< "20091008"	US-PGPUB; USPAT	OR	OFF	2019/01/06 23:54

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15957945
Filing Date	2018-04-20
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US4

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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
	1	7788378		2010-08-31	Ravi T. Rao	
	2	9253164		2016-02-02	Christopher S. Gouge	
	3	7890547	B2	2011-02-15	Timo Hotti	
	4	8832179	B2	2014-09-09	Owen , et al.	
	5	7818430	B2	2010-10-19	Gal Zuckerman	
	6	6154782	A	2000-11-28	NAOHISA KAWAGUCHI	
	7	5577243	A	1996-17-11	Sherwood , et al.	
	8	8135912	B2	2012-13-03	Shribman , et al.	

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	Attorney Docket Number	HOLA-005-US4

	9	8719505	B2	2014-06-05	Shribman , et al.	
	10	9201808	B2	2015-01-12	Shribman , et al.	
	11	9990295	B2	2018-06-05	Shribman , et al.	

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	1	20080109446	A1	2008-05-08	Matrix Xin Wang	
	2	20110066924	A1	2011-03-17	Gregory Dorso	
	3	20110128911	A1	2011-06-02	Kamel M. Shaheen	
	4	20130157699	A1	2013-06-20	Mohit Talwar	
	5	20130326607	A1	2013-12-05	Liang Feng	
	6	20030204602	A1	2003-30-10	Hudson, Michael D. ; et al.	

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	7	20120124173	A1	2012-17-05	De; Pradipta ; et al.	
	8	20020069241	A1	2002-06-06	Narlikar, Girija ; et al.	
	9	20130201316	A1	2013-08-08	BINDER; Yehuda ; et al.	
	10	20120099566	A1	2012-26-04	Laine; Tuomas ; et al.	
	11	20120254370	A1	2012-10-04	Utz BACHER	
	12	20080125123	A1	2008-05-29	Jheroen P. Dorenbosch	
	13	20140301334	A1	2014-10-09	Miguel Labranche	
	14	20070239655	A1	2007-10-11	Masakuni Agetsuma	
	15	20070226810	A1	2007-09-27	Timo Hotti	
	16	20100094970	A1	2010-04-15	Gal Zuckerman	
	17	20130007253	A1	2013-01-03	Guohuai Li	

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	18	20090037529	A1	2009-02-05	Gilad Armon-Kest	
	19	20090182843	A1	2009-07-16	Michael G. Hluchyj	
	20	20060036755	A1	2006-02-16	Ibrahim S. Abdullah	
	21	20140376403	A1	2014-12-25	Wenqi Shao	
	22	20050228964	A1	2005-13-10	Sechrest, Stuart ; et al.	
	23	20080086730	A1	2008-10-04	Vertes; Marc	
	24	20060259728	A1	2006-16-11	Chandrasekaran; Sashikanth ; et al.	
	25	20040254907	A1	2004-16-12	Crow, Preston F. ; et al.	
	26	20050015552	A1	2005-20-01	So, Kimming ; et al.	
	27	20050022236	A1	2005-01-27	Akihiko Ito; 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]
	1	2597869	EP	A1	2013-18-12	Sharp Kk		
	2	2010090562	WO	A1	2010-12-08	Telefonaktiebolaget L M Ericsson (Publ)		
	3	2011068784	WO	A1	2011-09-06	Azuki Systems, Inc		

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	1	Screen captures from YouTube video clip entitle "nVpn.net | Double your Safety and use Socks5 + nVpn" 38 pages, last accessed 11/20/2018 <https://www.youtube.com/watch?v=L0Hct2kSnn4>	
	2	Screen captures from YouTube video clip entitle "Andromeda" 47 pages, publicly known and available as of at least 2011 <https://www.youtube.com/watch?v=yRRYpFLbKNU>	
	3	SpyEye, https://www.symantec.com/security-center/writeup/2010-020216-0135-9; http://securesql.info/riskyclouds/spyeye-user-manual; known as of at least 2010 (13 pages)	
	4	Screen captures from YouTube video clip entitle "Change Your Country IP Address & Location with Easy Hide IP Software" 9 pages, publicly known and available as of at least 2011, <https://www.youtube.com/watch?v=ulwkf1sOfdA and https://www.youtube.com/watch?v=iFEMT-o9DTc>	
	5	CoralCDN ("CoralCDN"), https://pdos.csail.mit.edu/6.824/papers/freedman-coral.pdf (14 PAGES)	

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	6	European Search Report for EP 14182547.1, dated July 30, 2015
	7	R. Fielding et al, RFC 2616: Hypertext Transfer Protocol -- HTTP/1.1, June 1999, retrieved from the Internet http://rfc-editor.org [retrieved Apr. 15, 2002]
	8	"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*
	9	"Slice Embedding Solutions for Distributed Service Architectures" - Esposito et al., Boston University, Computer Science Dept., 10/2011 http://www.cs.bu.edu/techreports/pdf/2011-025-slice-embedding.pdf
	10	International Search Report of PCT/US2010/034072 dated July 01, 2010
	11	YouTube video clip entitled "nVpn.net | Double your Safety and use Socks5 + nVpn" <https://www.youtube.com/watch?v=L0Hct2kSnn4>
	12	YouTube video clip entitled "Andromeda" <https://www.youtube.com/watch?v=yRRYpFLbKNU>
	13	YouTube video clip entitled "Change Your Country IP Address & Location with Easy Hide IP Software" <https://www.youtube.com/watch?v=ulwkf1sOfdA and https://www.youtube.com/watch?v=iFEMT-o9DTc>

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	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US4

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)	2019-01-18
Name/Print	Yehuda Binder	Registration Number	73,612

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Oxylabs LT, UAB v. Bright Data Ltd.
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83 of 455

Privacy Act Statement

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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 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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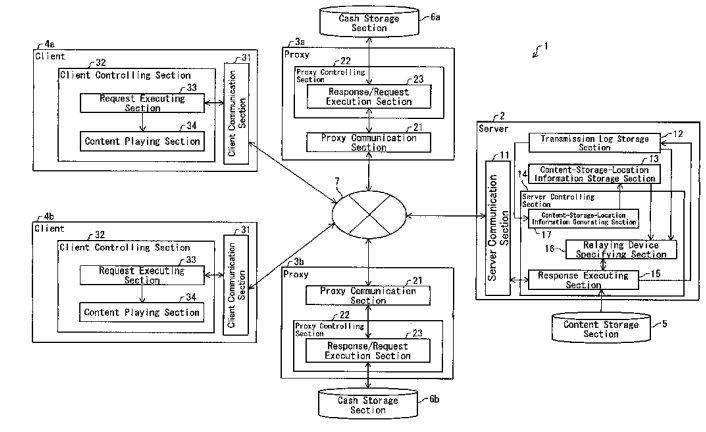
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(54) CONTENT DISTRIBUTION DEVICE, CONTENT PLAYBACK DEVICE, CONTENT DISTRIBUTION SYSTEM, METHOD FOR CONTROLLING A CONTENT DISTRIBUTION DEVICE, CONTROL PROGRAM, AND RECORDING MEDIUM

(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



EP 2 597 869 A1

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
85 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
86 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
87 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
88 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
89 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
90 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
91 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
92 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
93 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
94 of 455

[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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
95 of 455

[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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
96 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
97 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
98 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
99 of 455

(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)

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
100 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
101 of 455

[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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
102 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
103 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
104 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
105 of 455

"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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
106 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
107 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
108 of 455

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;

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
109 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
110 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
111 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
112 of 455

[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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
113 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
114 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
115 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
116 of 455

"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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
117 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
118 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
119 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
120 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
121 of 455

(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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
122 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
123 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
124 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
125 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
126 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
127 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
128 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
129 of 455

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)

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
130 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
131 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
132 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
133 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
134 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
135 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
136 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
137 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
138 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
139 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
140 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
141 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
142 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
143 of 455

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;

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
144 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
145 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
146 of 455

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;

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
147 of 455

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-

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
148 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
149 of 455

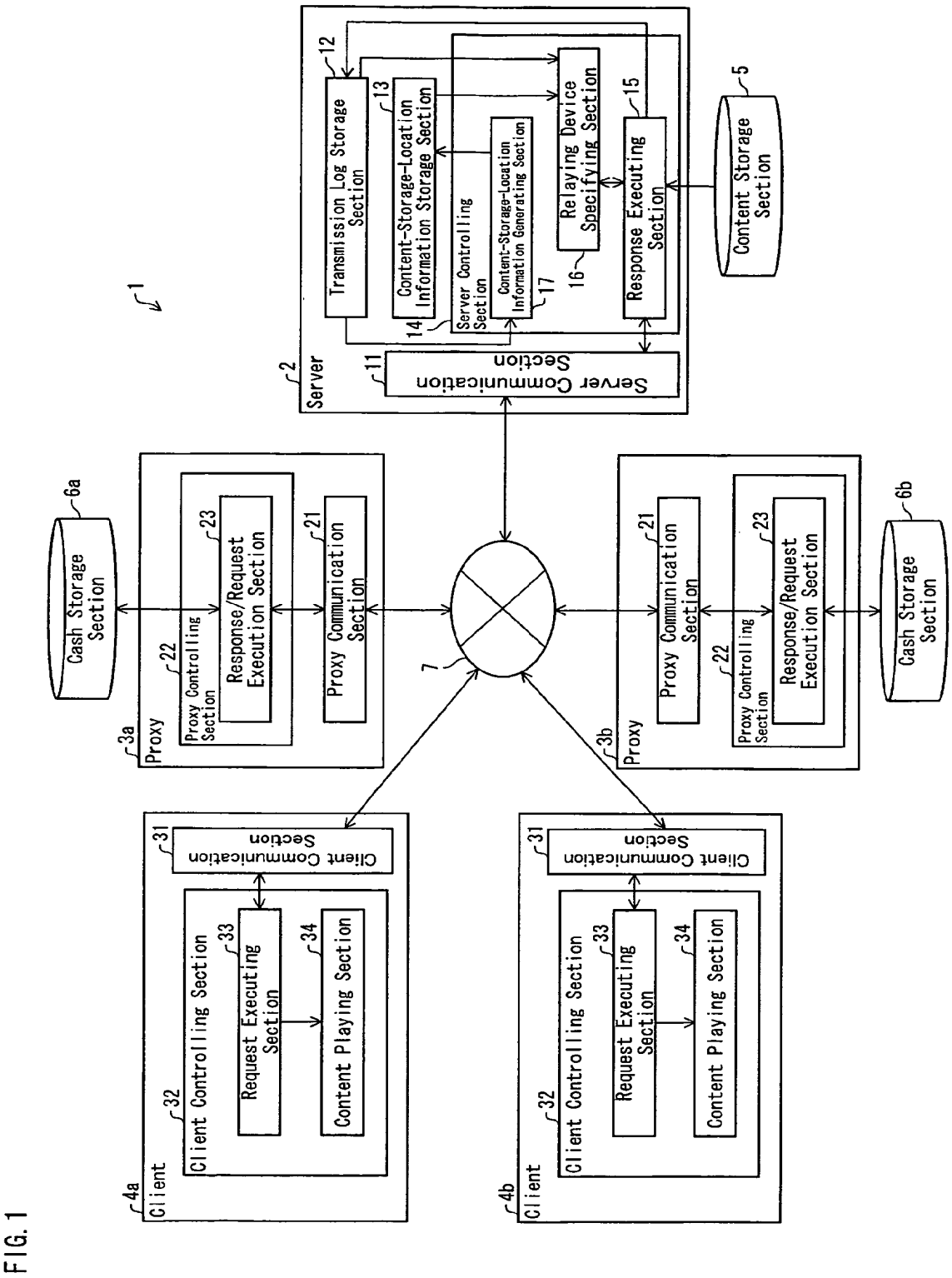


FIG. 1

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
150 of 455

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
...	...	...	...

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
151 of 455

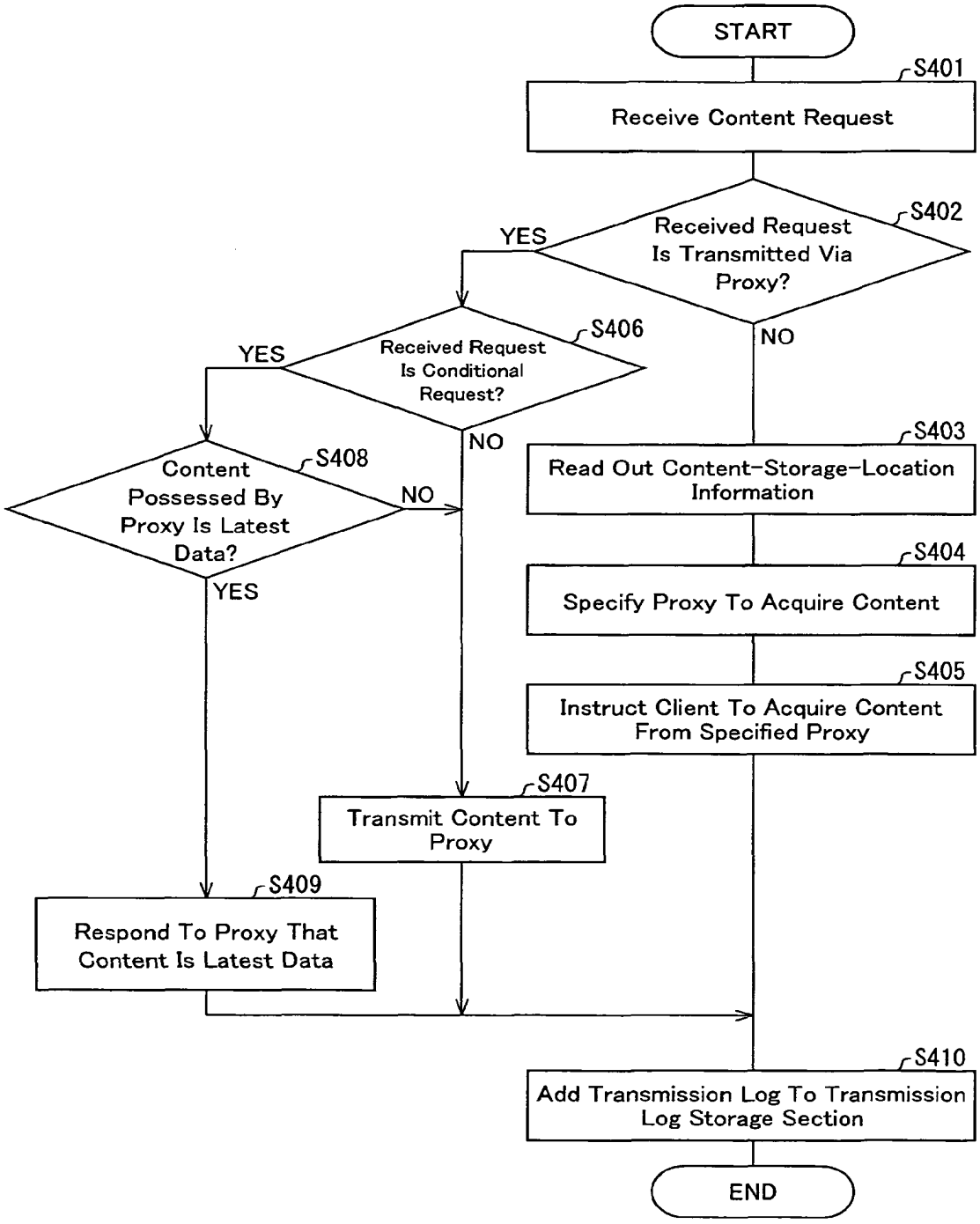
FIG. 3

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
⋮	⋮	⋮

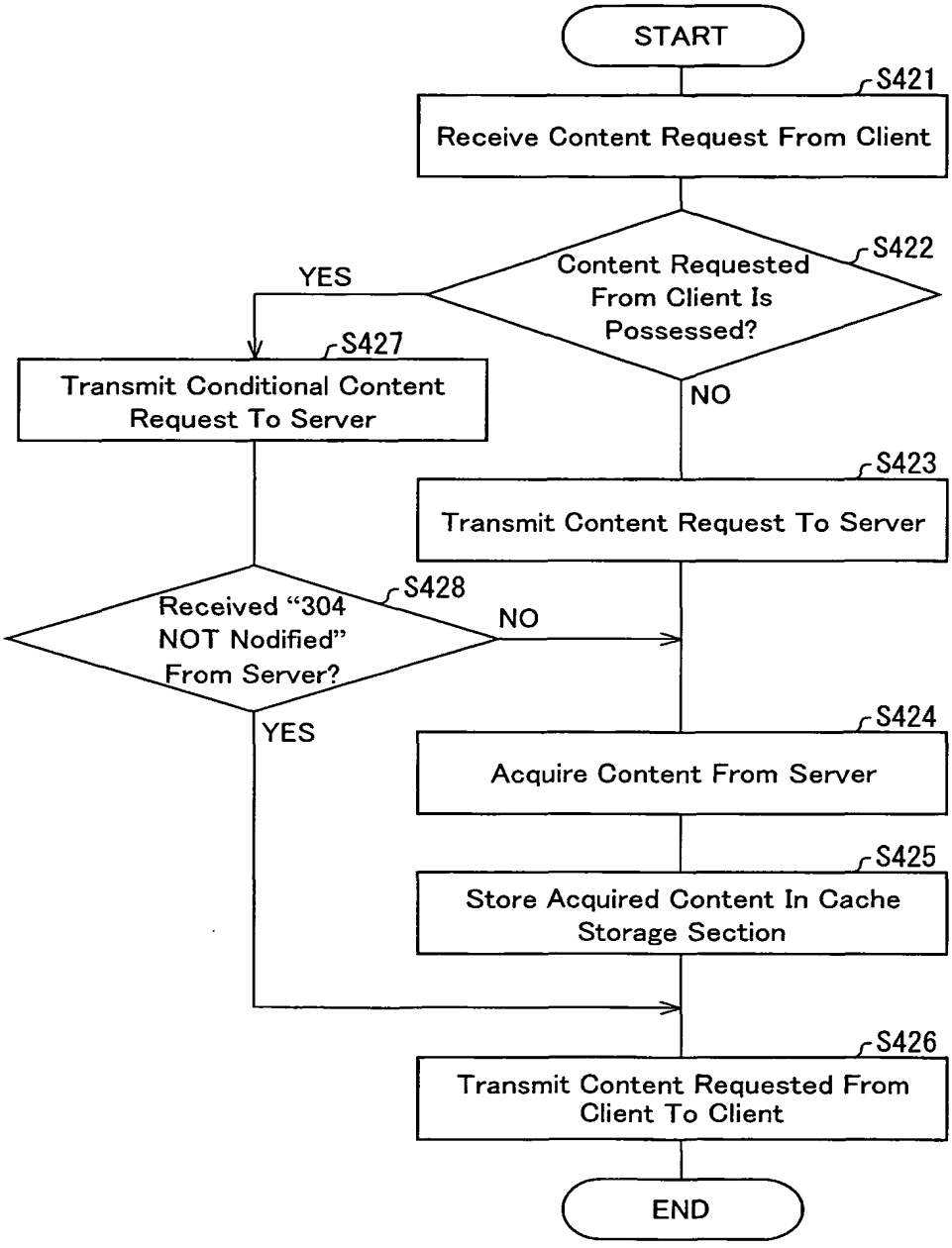
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
152 of 455

FIG. 4



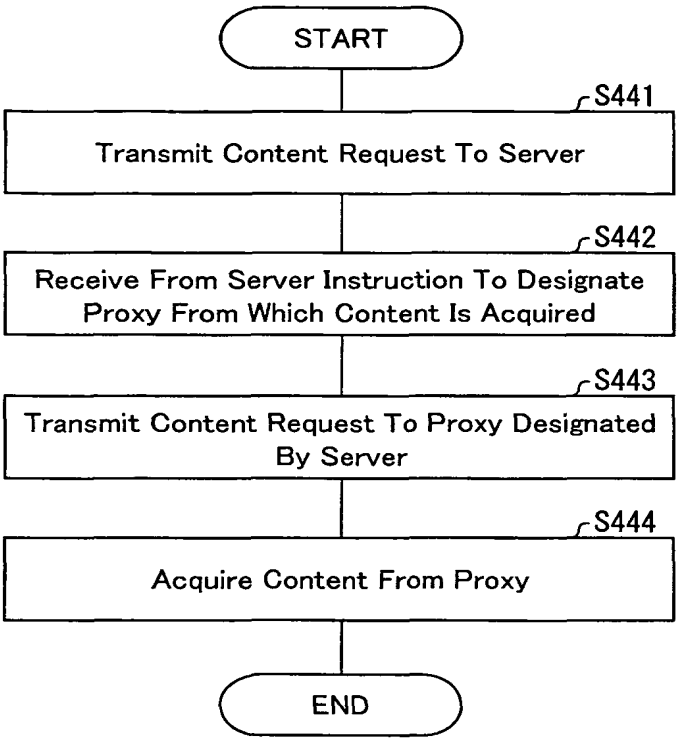
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
153 of 455

FIG. 5



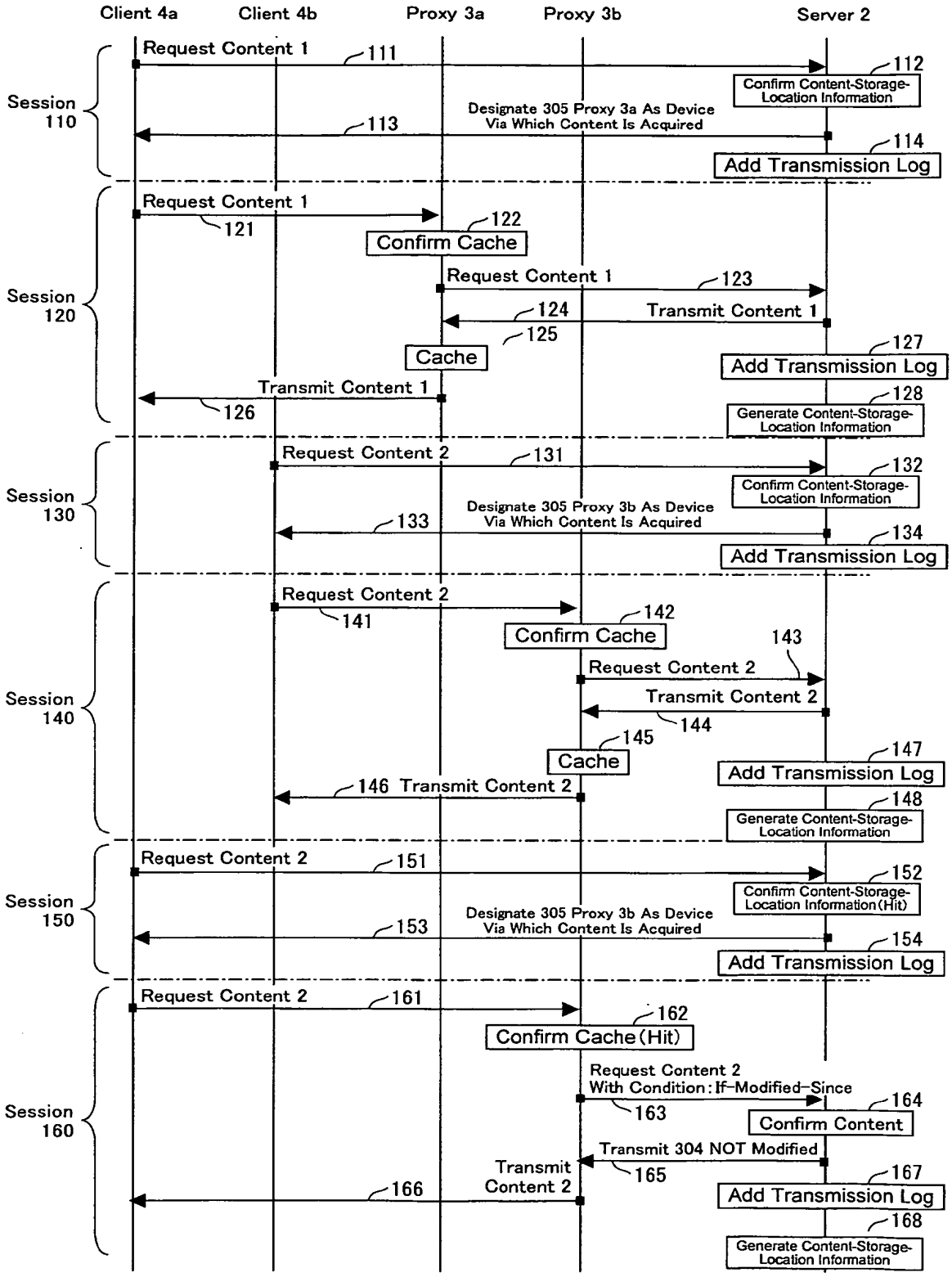
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
154 of 455

FIG. 6



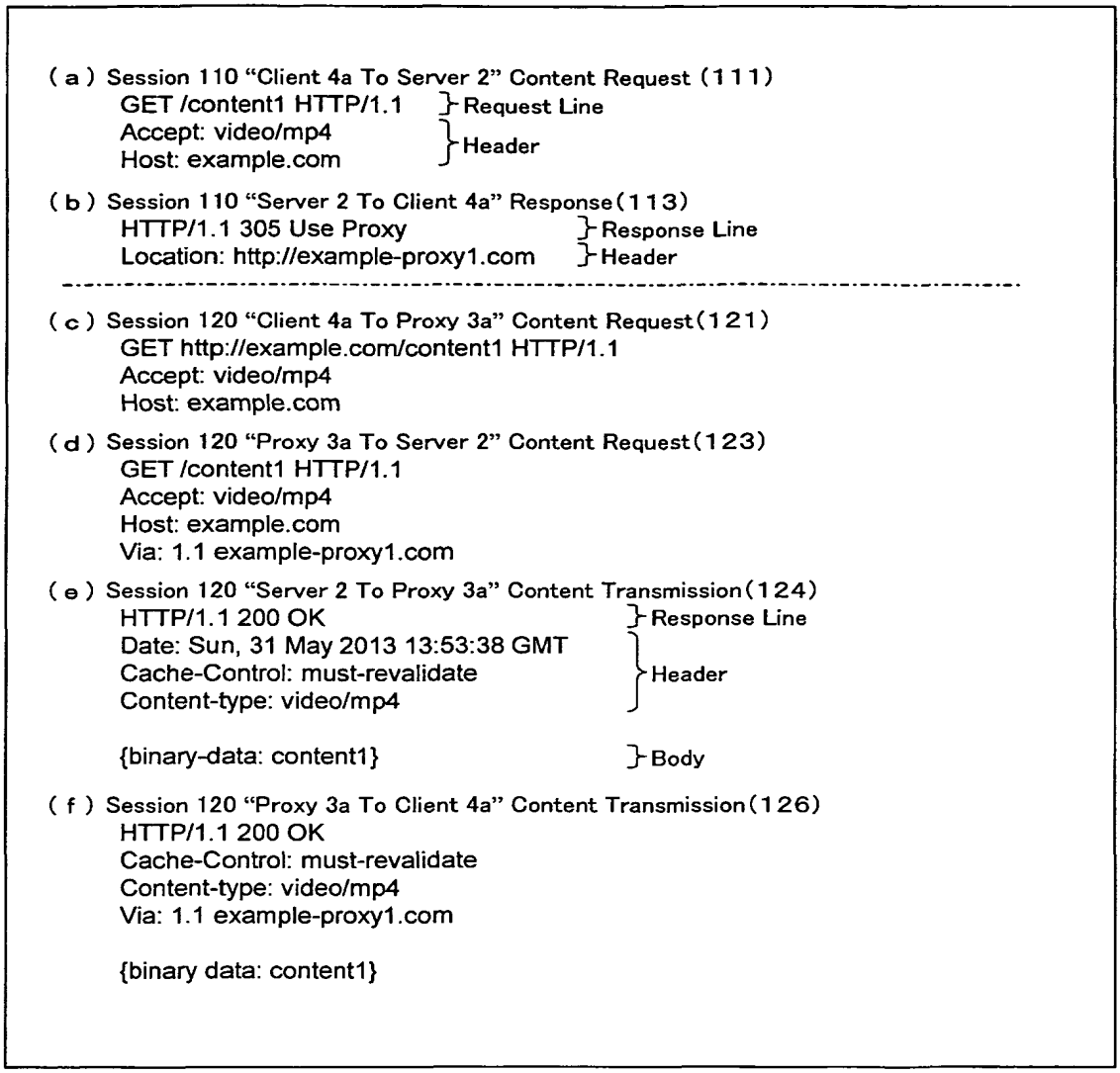
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
155 of 455

FIG. 7



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
156 of 455

FIG. 8



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
157 of 455

FIG. 9

(a) Session 130 "Client 4b To Server 2" Content Request(131)
GET /content2 HTTP/1.1
Accept: video/mp4
Host: example.com

(b) Session 130 "Server 2 To Client 4b" Response(133)
HTTP/1.1 305 Use Proxy
Location: http://example-proxy2.com

(c) Session 140 "Client 4b To Proxy 3b" Content Request(141)
GET http://example.com/content2 HTTP/1.1
Accept: video/mp4
Host: example.com

(d) Session 140 "Proxy 3b To Server 2" Content Request(143)
GET /content2 HTTP/1.1
Accept: video/mp4
Host: example.com
Via: 1.1 example-proxy2.com

(e) Session 140 "Server 2 To Proxy 3b" Content Transmission(144)
HTTP/1.1 200 OK
Date: Sun, 31 May 2013 15:03:08 GMT
Cache-Control: must-revalidate
Content-type: video/mp4

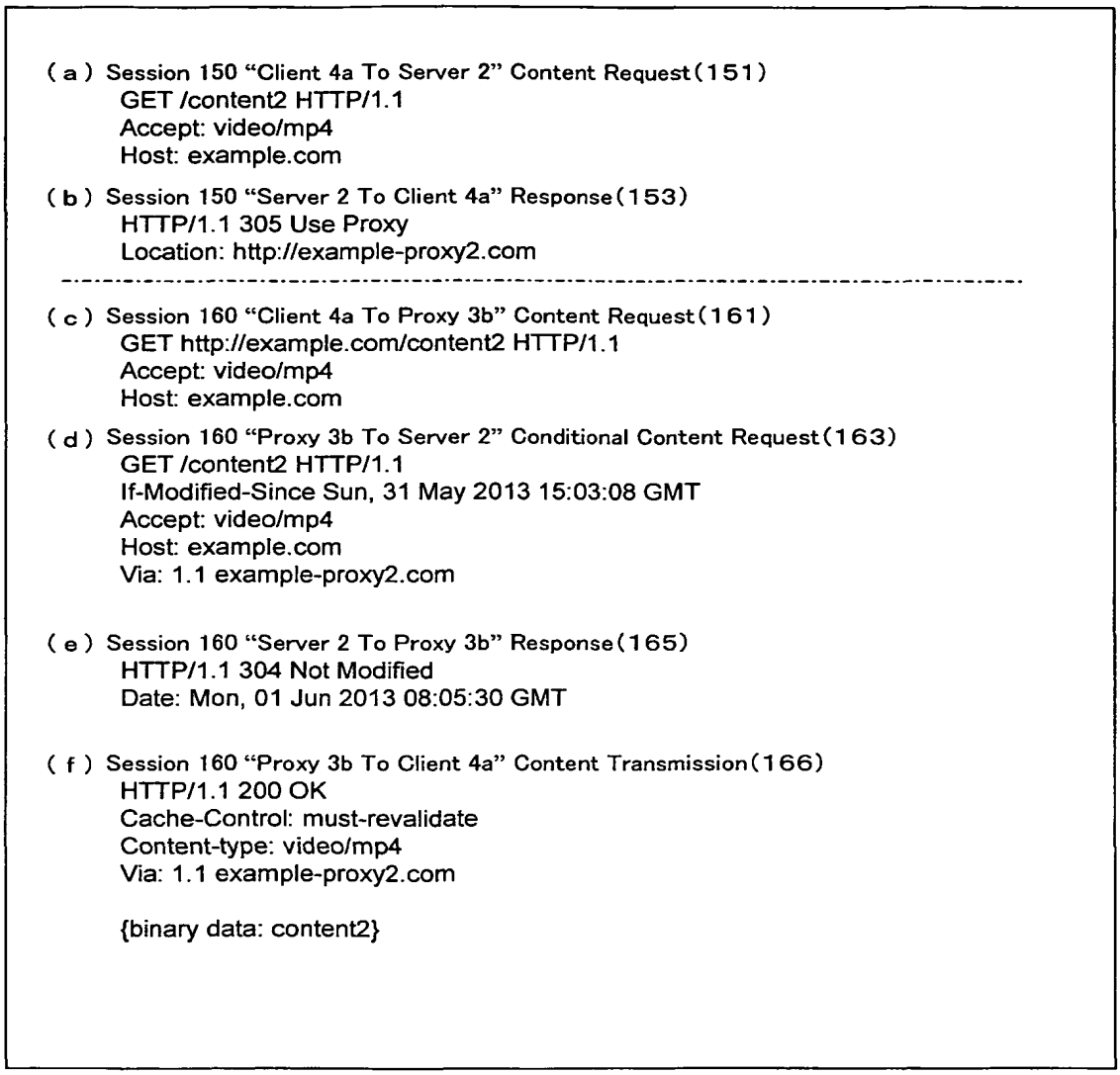
{binary-data: content2}

(f) Session 140 "Proxy 3b To Client 4b" Content Transmission(146)
HTTP/1.1 200 OK
Cache-Control: must-revalidate
Content-type: video/mp4
Via: 1.1 example-proxy2.com

{binary data: content2}

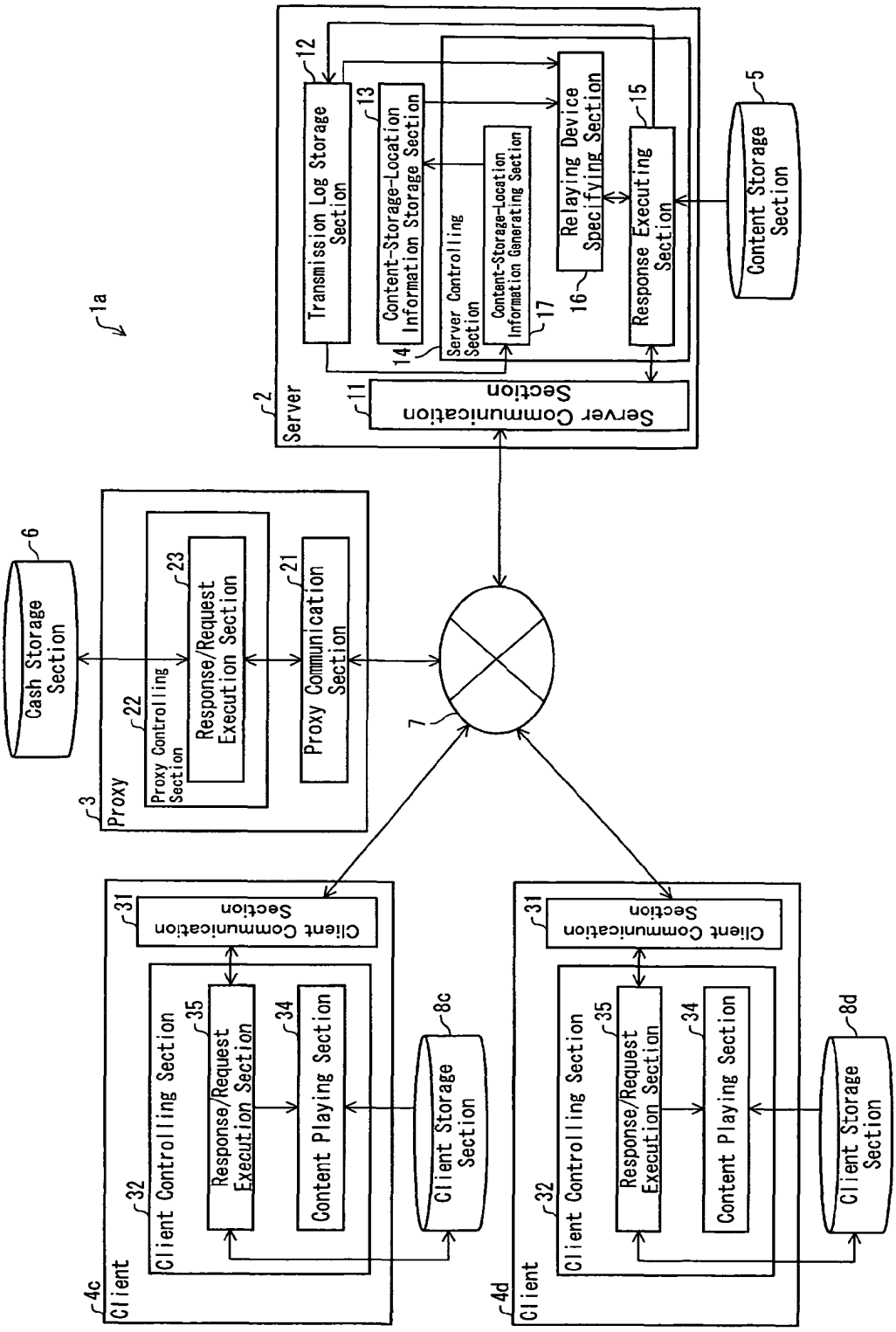
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
158 of 455

FIG. 10



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
159 of 455

FIG. 11



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
160 of 455

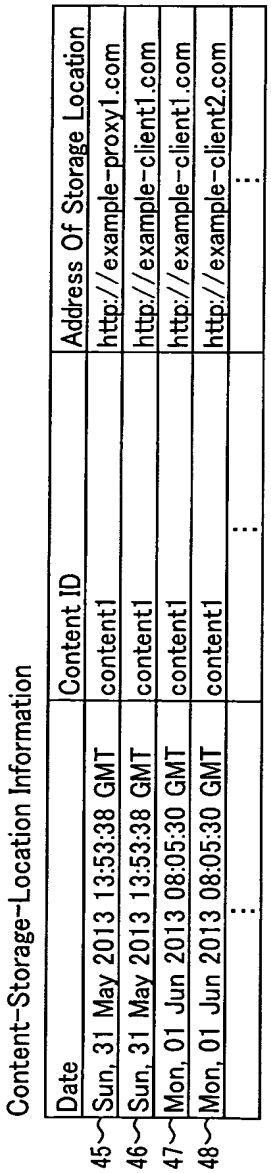
FIG. 12

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
	⋮	⋮	⋮	⋮

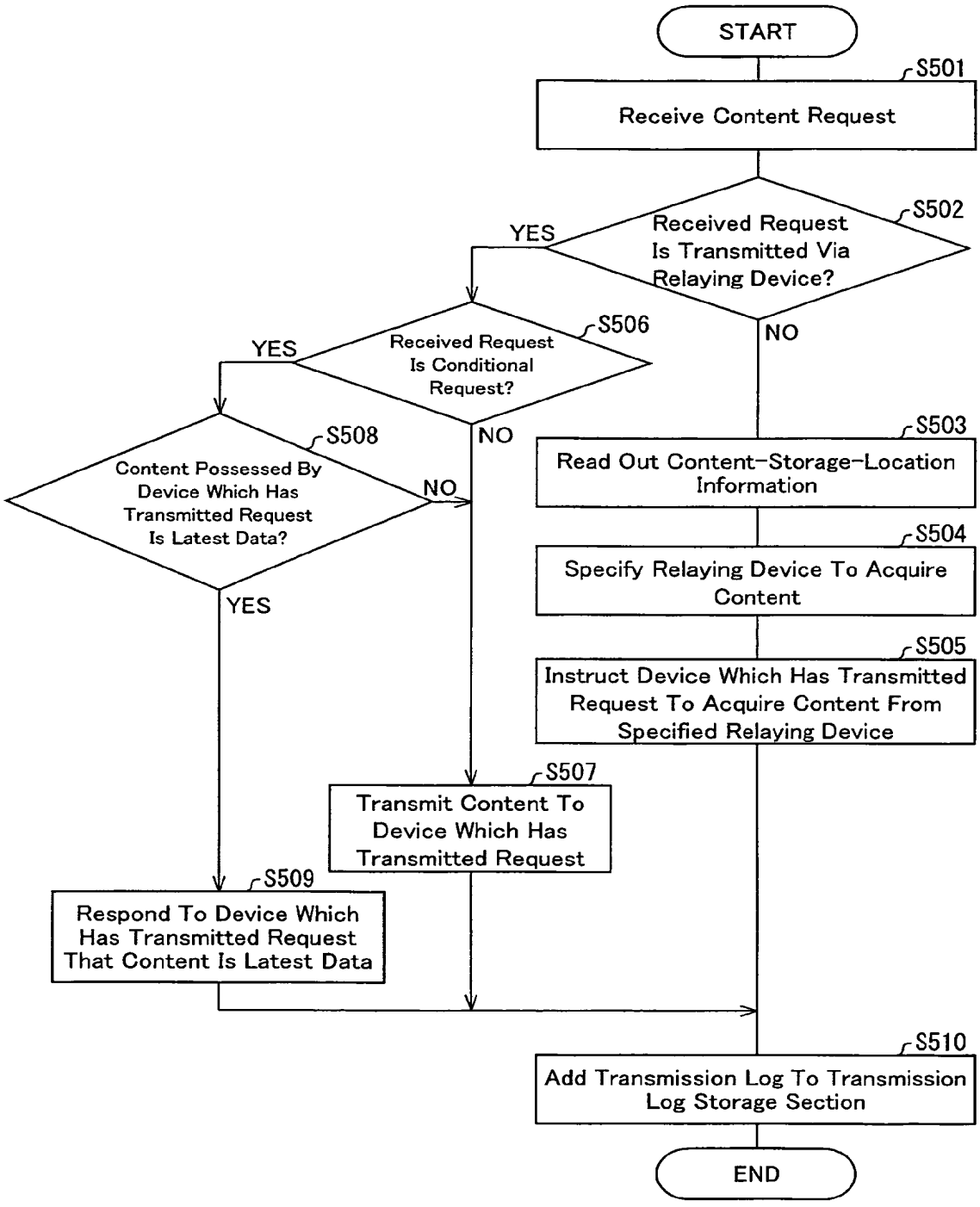
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
161 of 455

FIG. 13



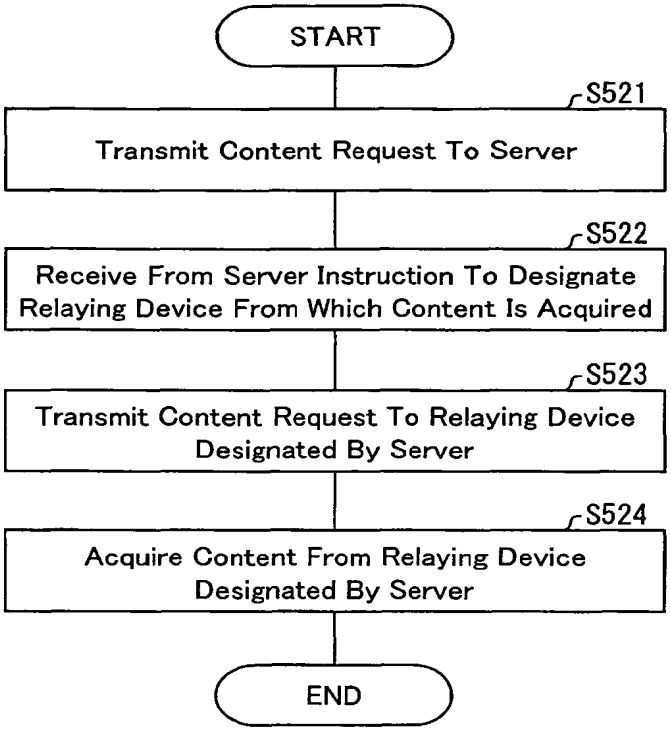
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
162 of 455

FIG. 14



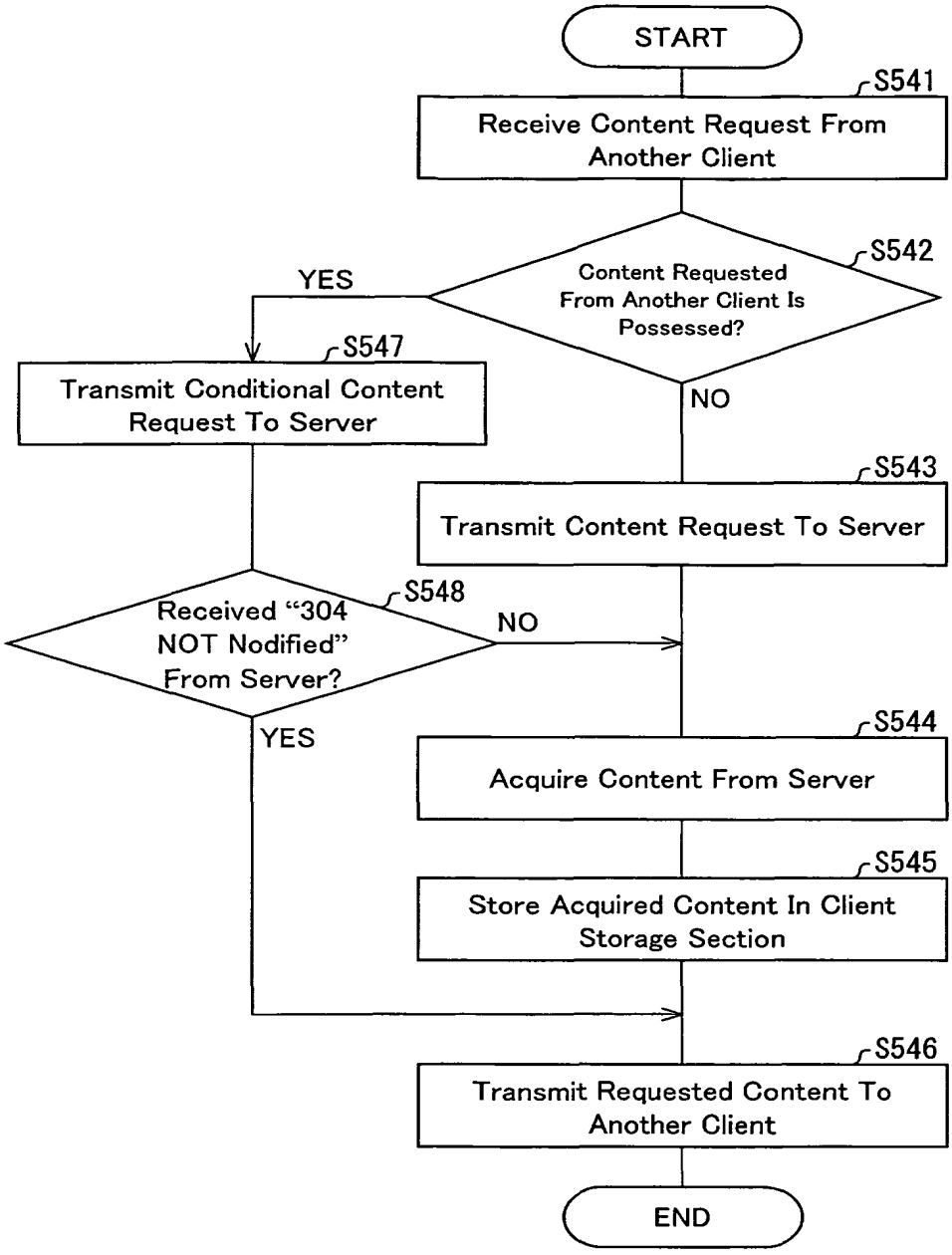
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
163 of 455

FIG. 15



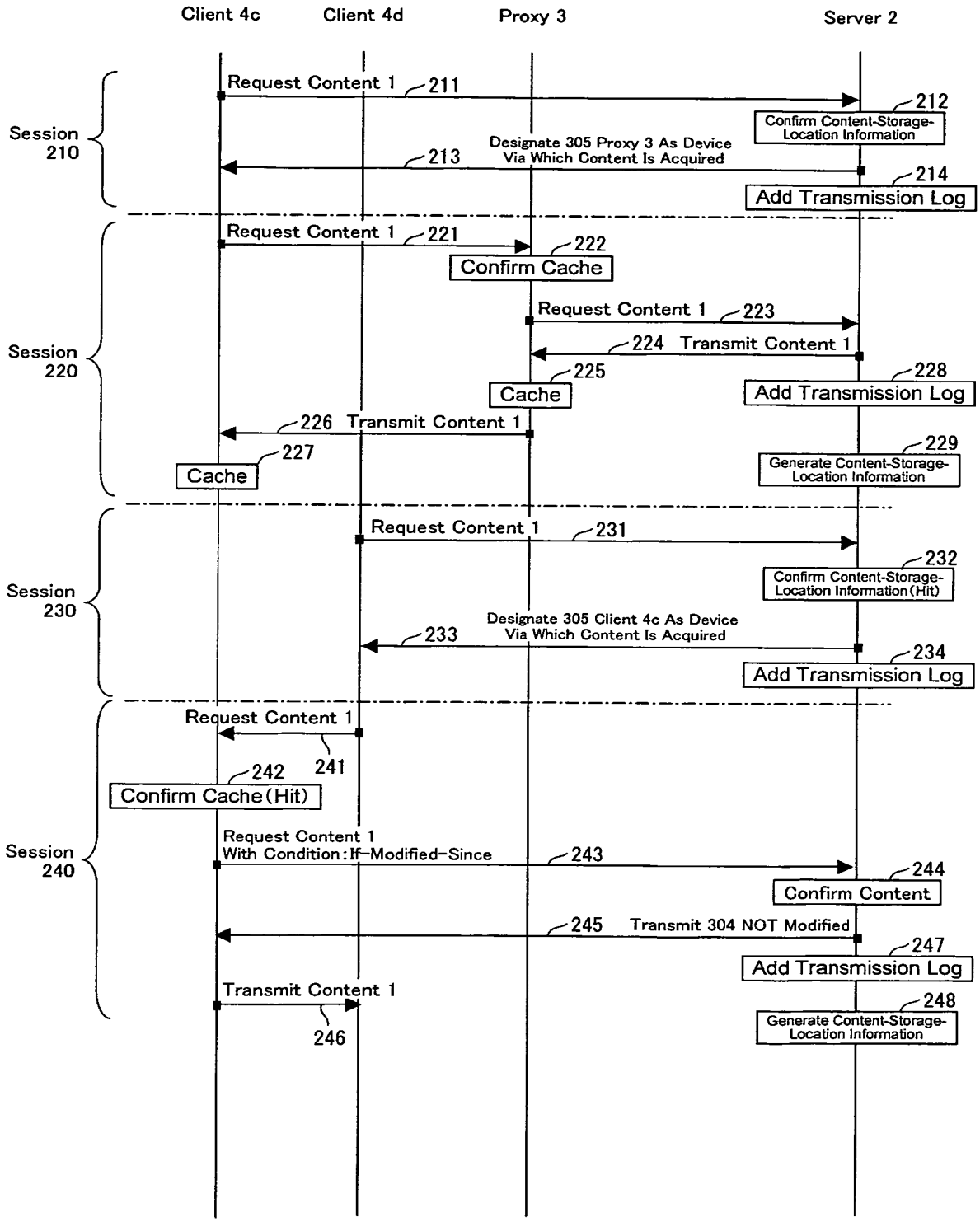
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
164 of 455

FIG. 16



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
165 of 455

FIG. 17



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
166 of 455

FIG. 18

(a) Session 210 "Client 4c To Server 2" Content Request(211)
GET /content1 HTTP/1.1
Accept: video/mp4
Host: example.com

(b) Session 210 "Server 2 To Client 4c" Response(213)
HTTP/1.1 305 Use Proxy
Location: http://example-proxy1.com

(c) Session 220 "Client 4c To Proxy 3" Content Request(221)
GET http://example.com/content1 HTTP/1.1
Accept: video/mp4
Host: example.com

(d) Session 220 "Proxy 3 To Server 2" Content Request(223)
GET /content1 HTTP/1.1
Accept: video/mp4
Host: example.com
Via: 1.1 example-proxy1.com

(e) Session 220 "Server 2 To Proxy 3" Content Transmission(224)
HTTP/1.1 200 OK
Date: Sun, 31 May 2013 13:53:38 GMT
Cache-Control: must-revalidate
Content-type: video/mp4

{binary-data: content1}

(f) Session 220 "Proxy 3 To Client 4c" Content Transmission(226)
HTTP/1.1 200 OK
Cache-Control: must-revalidate
Content-type: video/mp4
Via: 1.1 example-proxy1.com

{binary data: content1}

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
167 of 455

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

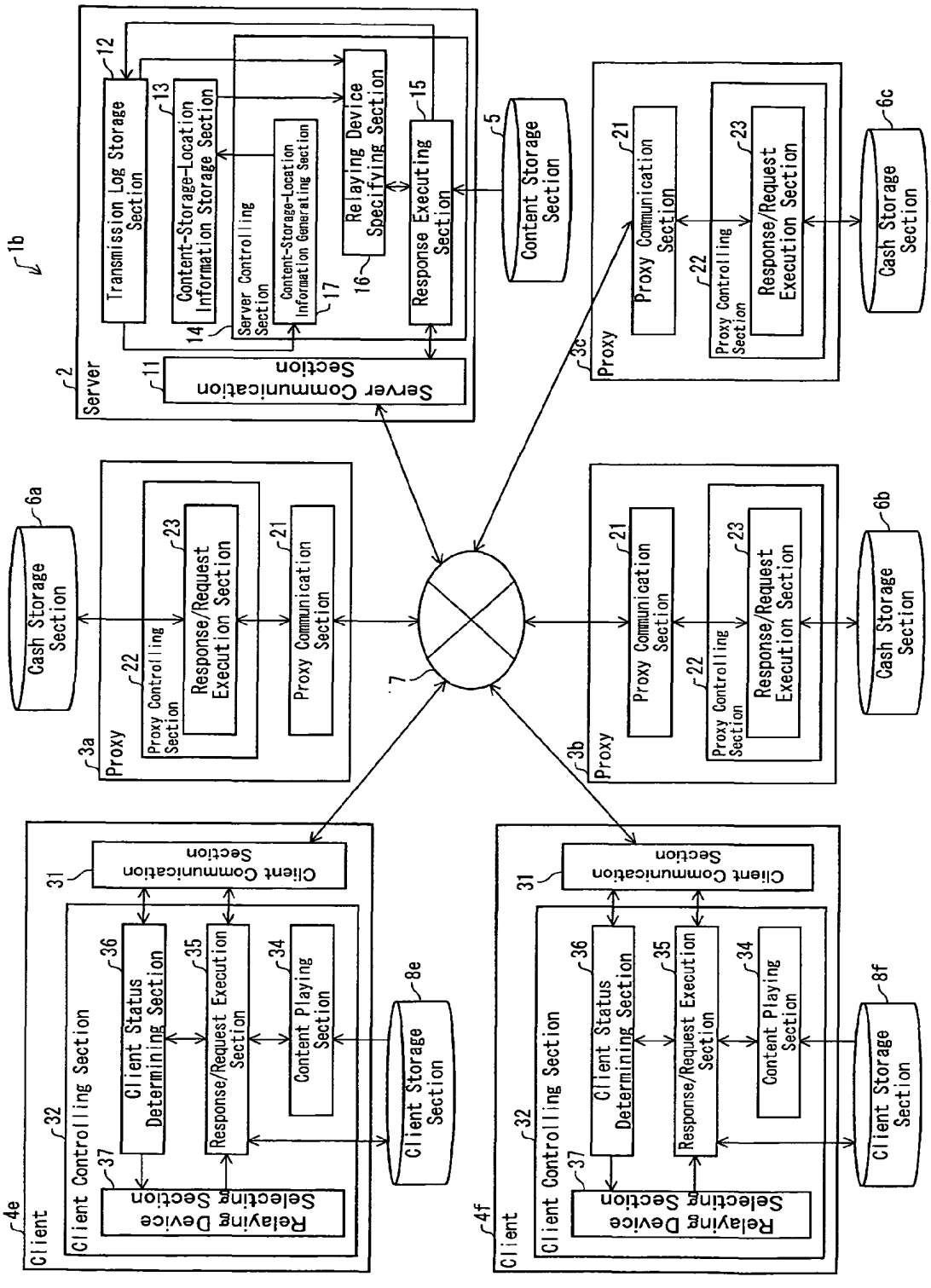
(e) Session 240 "Server 2 To Client 4c" Response(245)
HTTP/1.1 304 Not Modified
Date: Mon, 01 Jun 2013 08:05:30 GMT

(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}

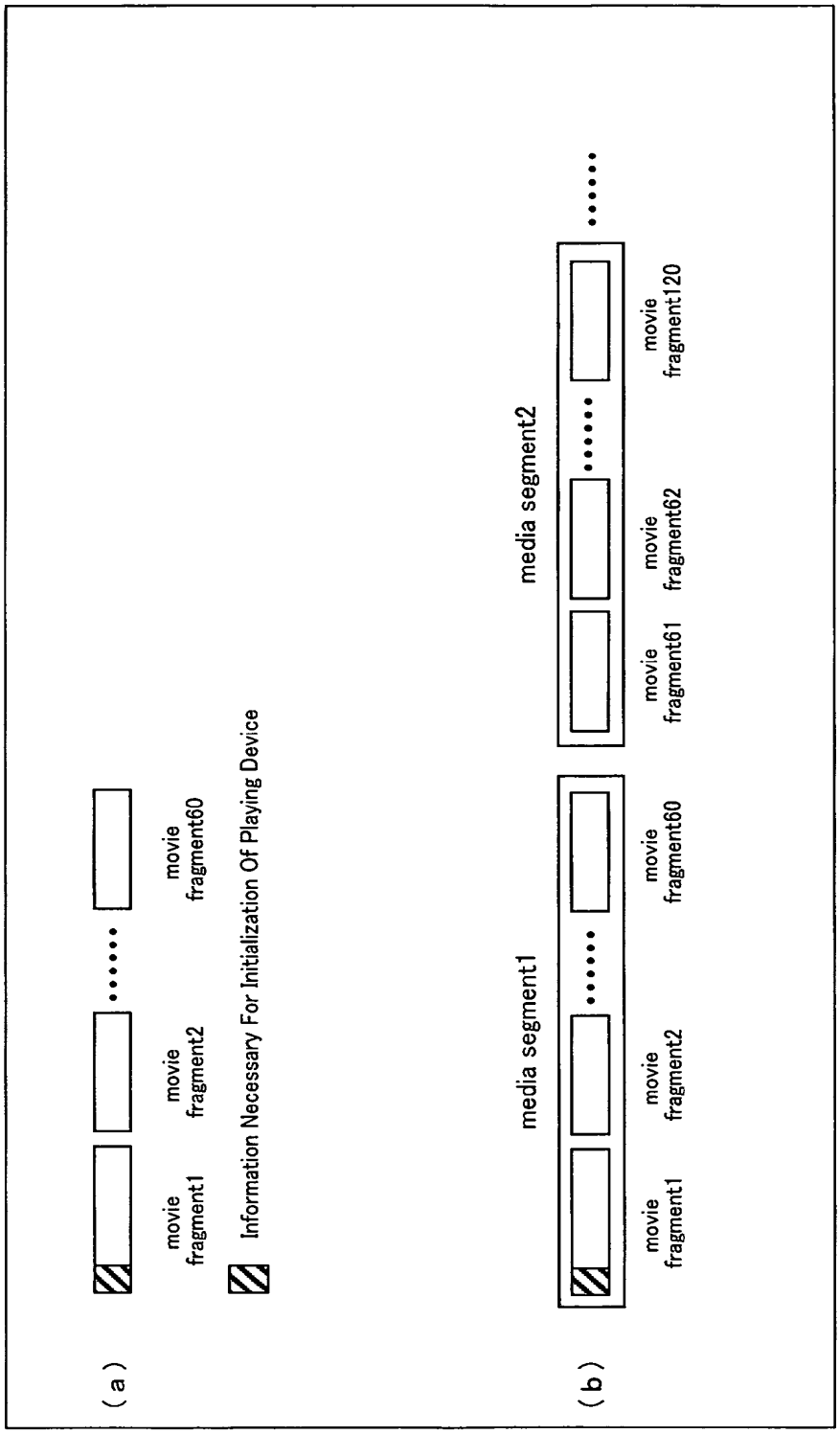
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
168 of 455

FIG. 20



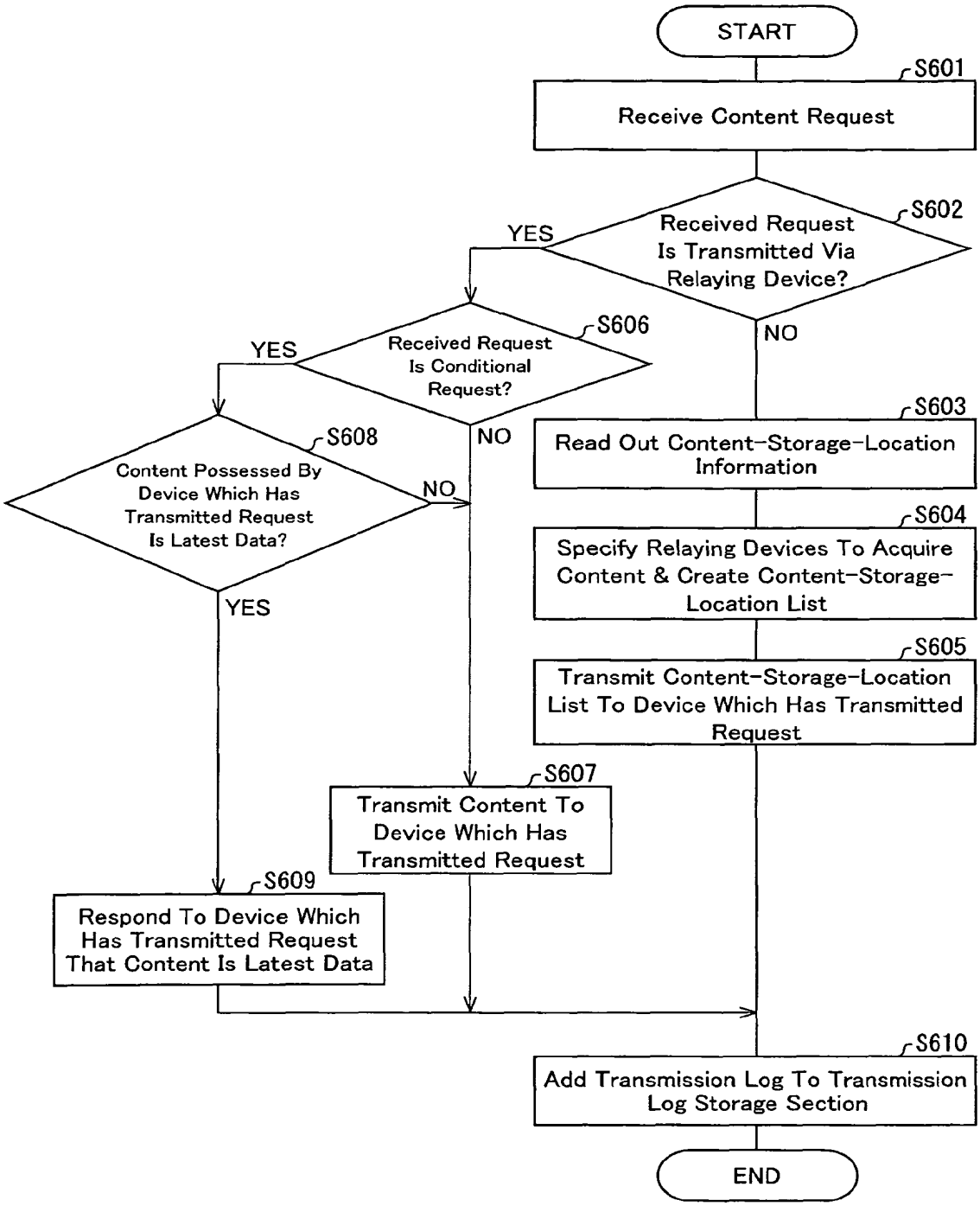
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
169 of 455

FIG. 21



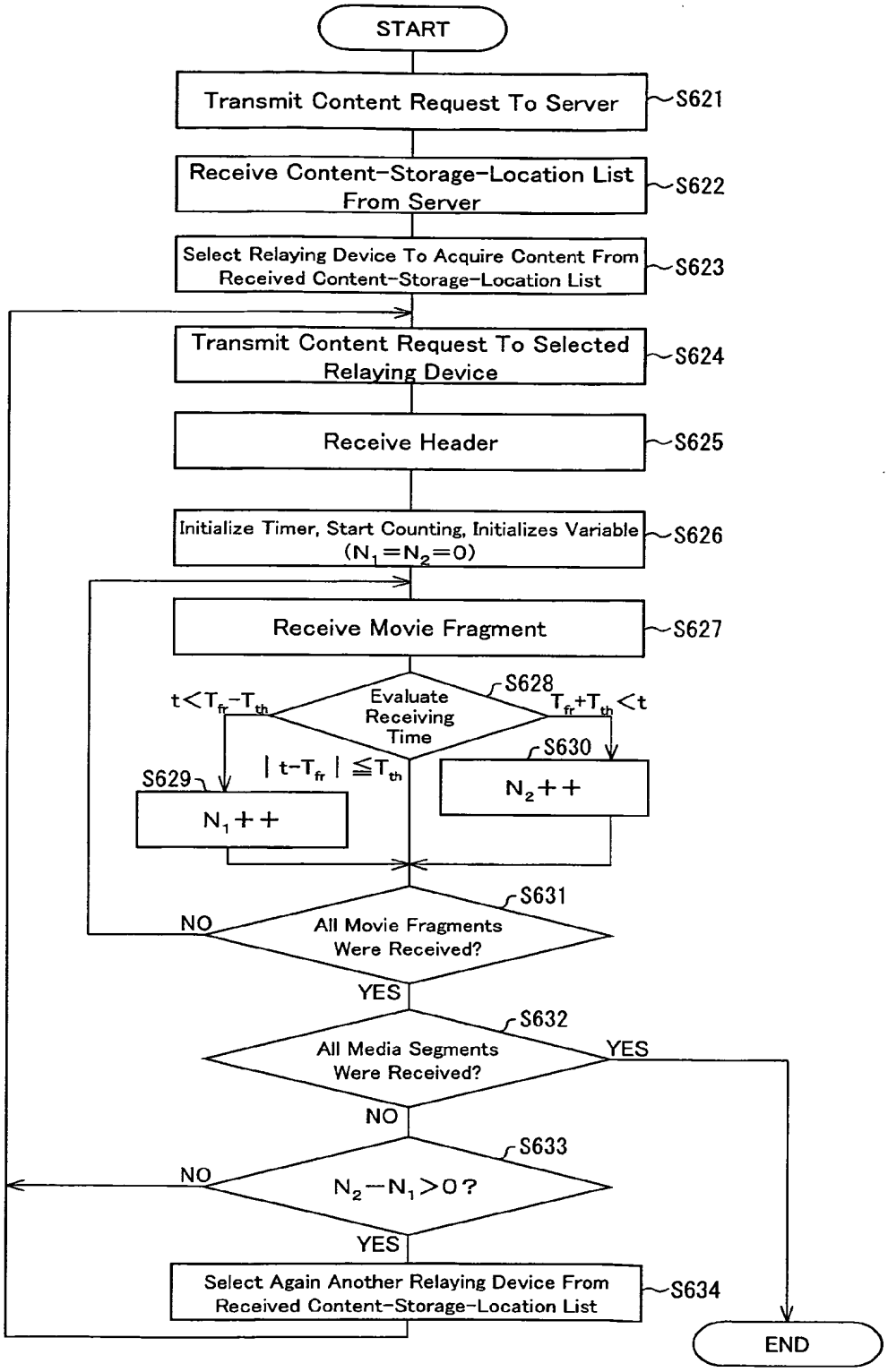
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
170 of 455

FIG. 22



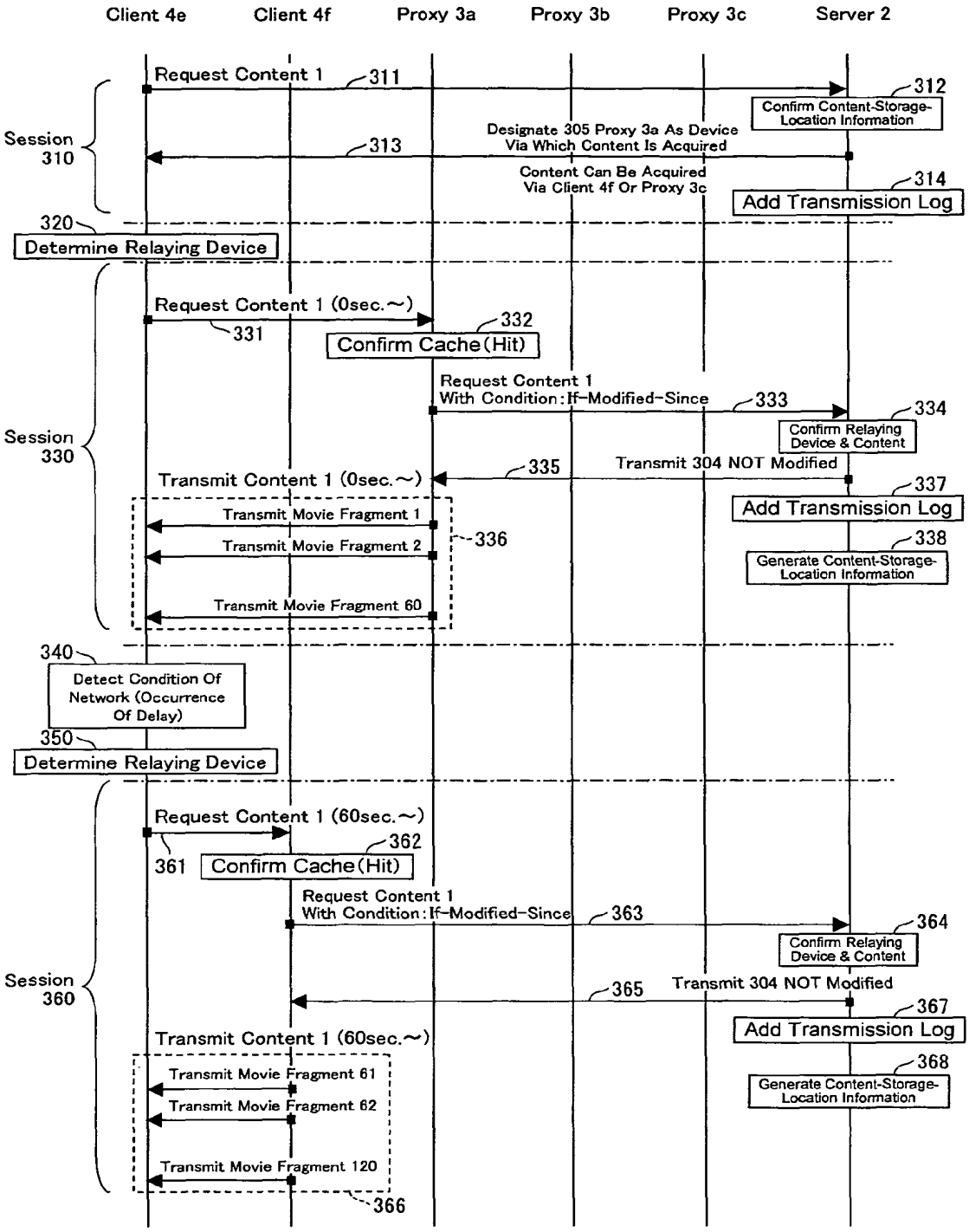
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
171 of 455

FIG. 23



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
172 of 455

FIG. 24



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
173 of 455

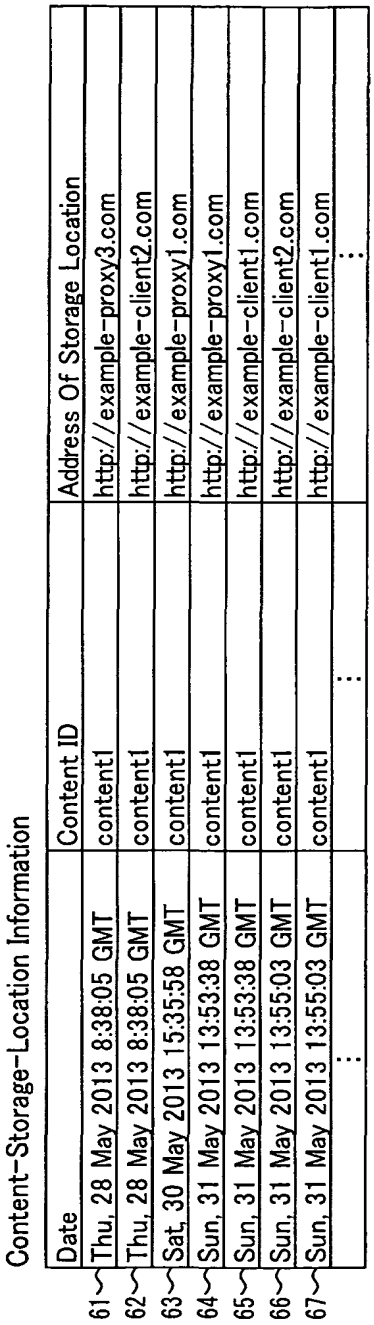
FIG. 25

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
	⋮	⋮	⋮	⋮

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
174 of 455

FIG. 26



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
175 of 455

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--
```


Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
176 of 455

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

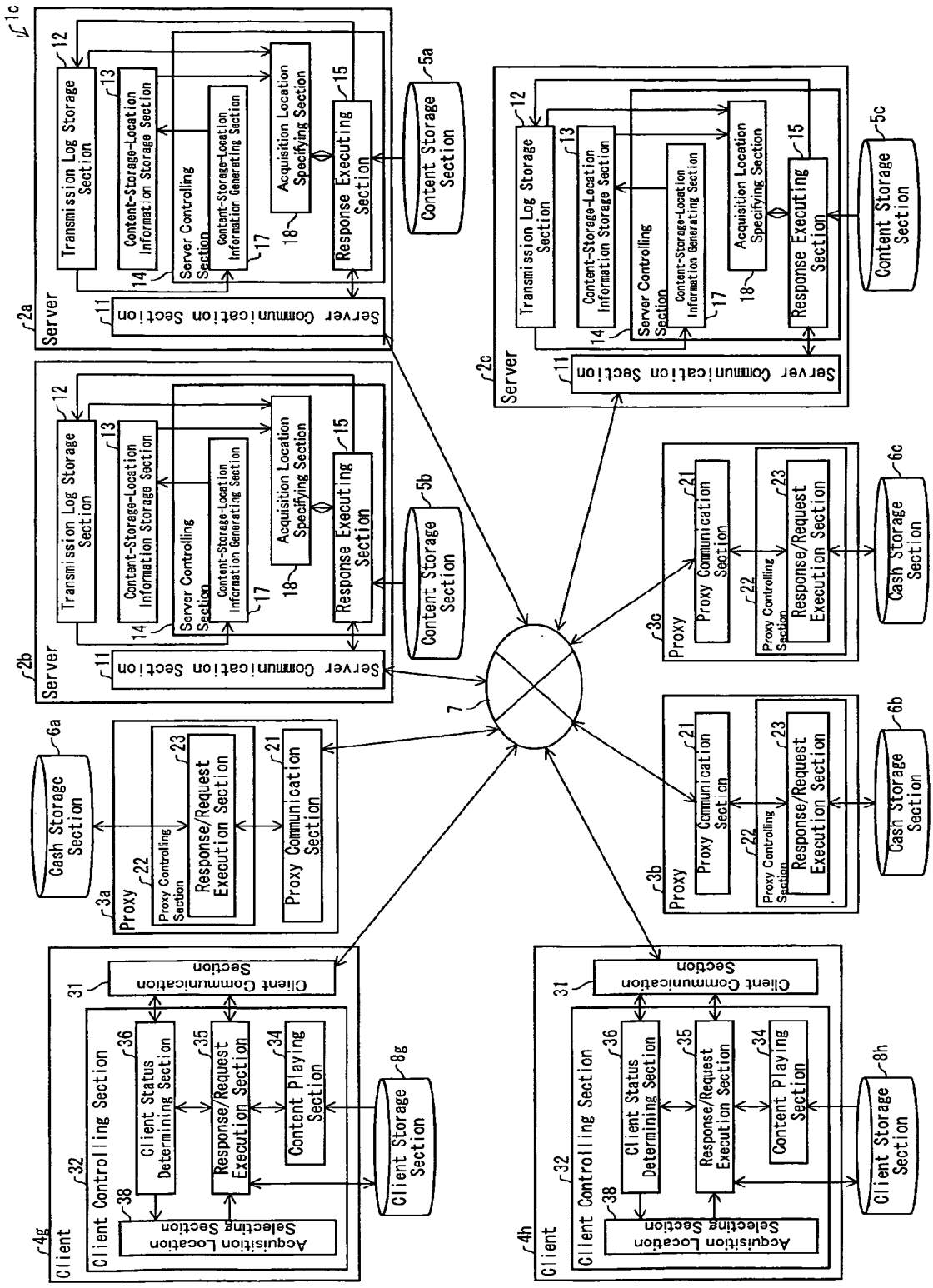
(d) Session 360 "Client 4f To Client 4e" Content Transmission(366)
HTTP/1.1 200 OK
Content-type: mutipart/media-segment; boundary=THIS_STRING_SEPARATES
Content-Location: http://example.com/content1/1
Cache-Control: must-revalidate
Via: 1.1 example-client2.com
X-Media-Segment-Index: 2/60

--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--

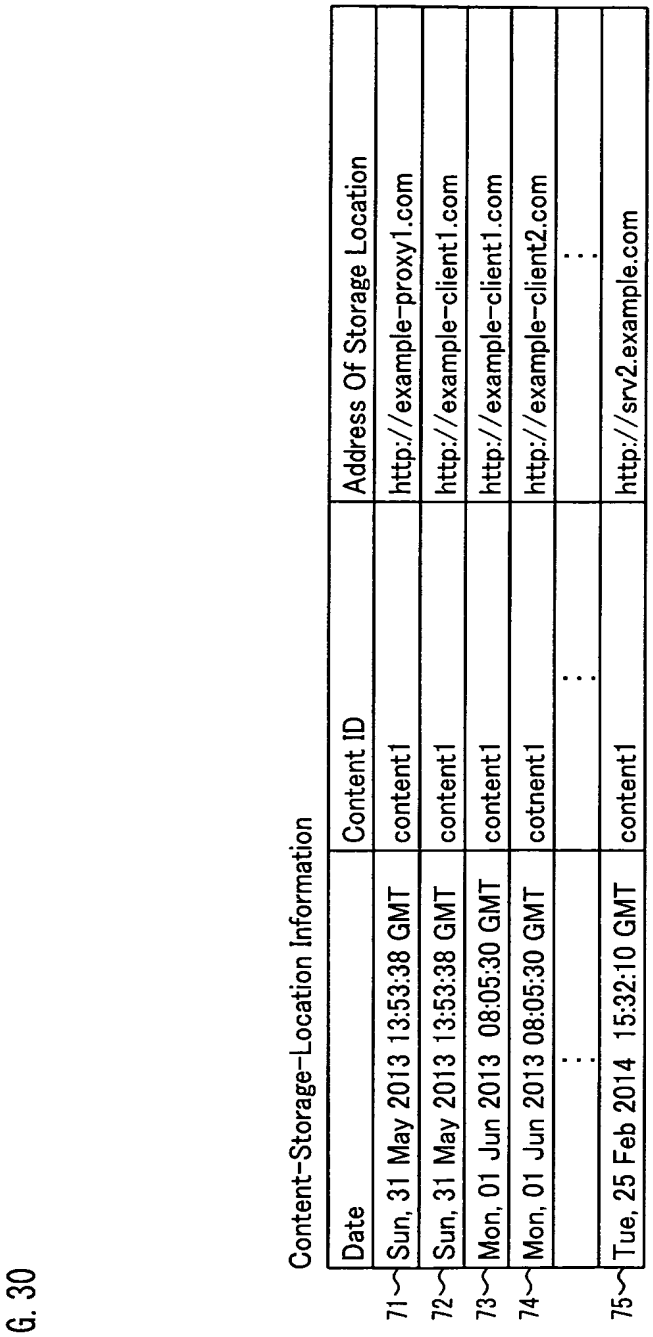
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
177 of 455

FIG. 29



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
178 of 455

FIG. 30



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
179 of 455

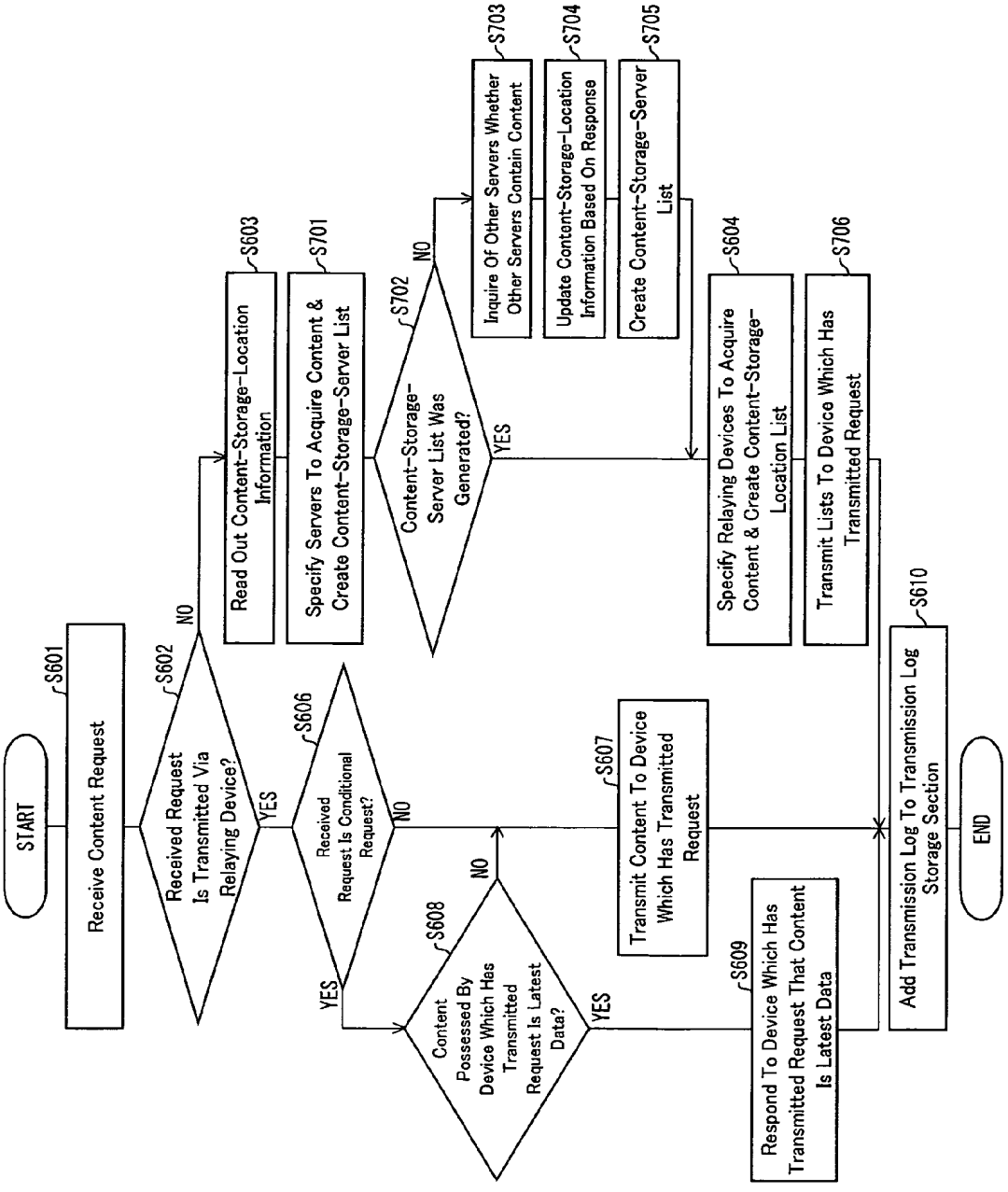
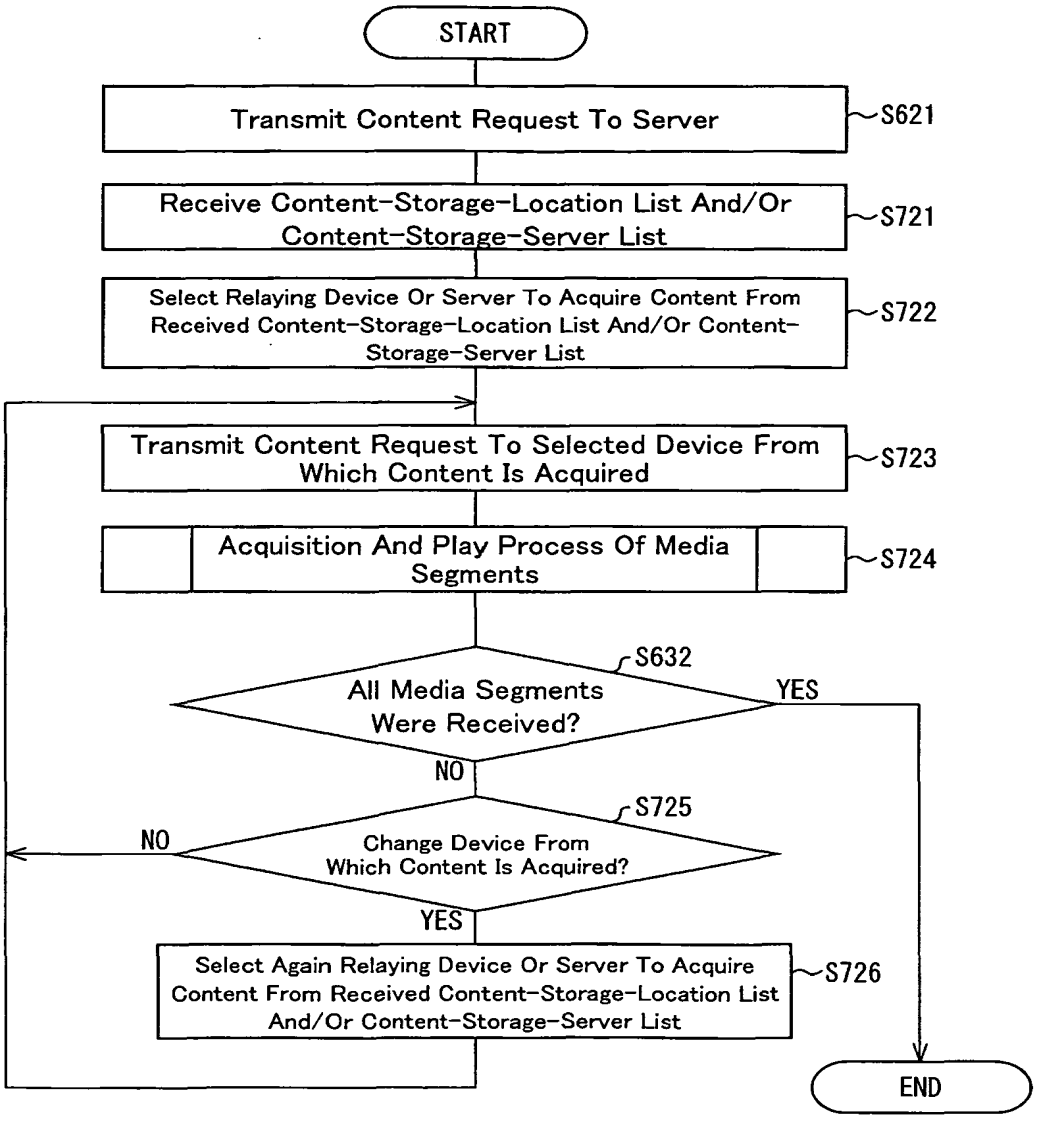


FIG. 31

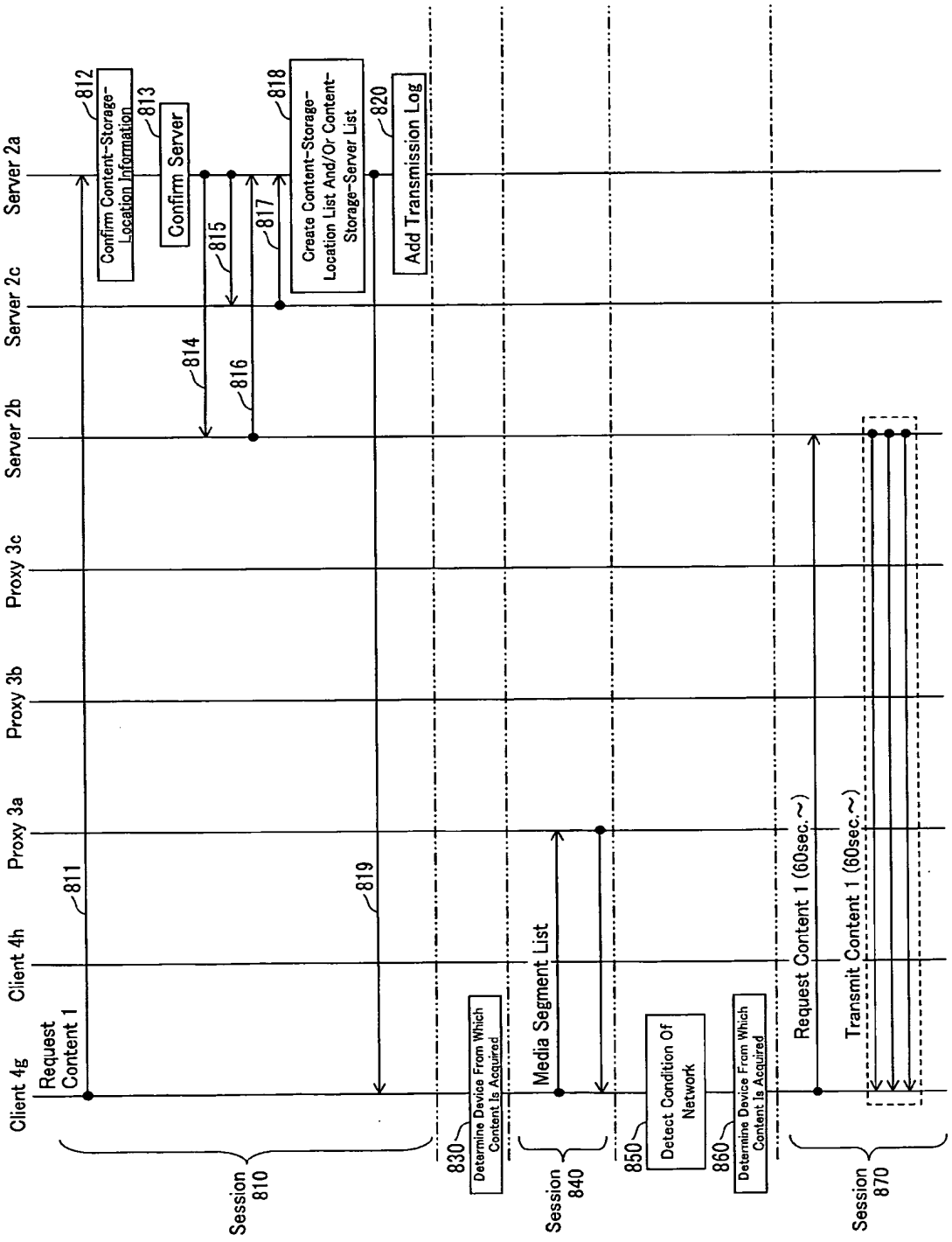
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
180 of 455

FIG. 32



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
181 of 455

FIG. 33



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
182 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
183 of 455

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>
```


Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
184 of 455

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>
```

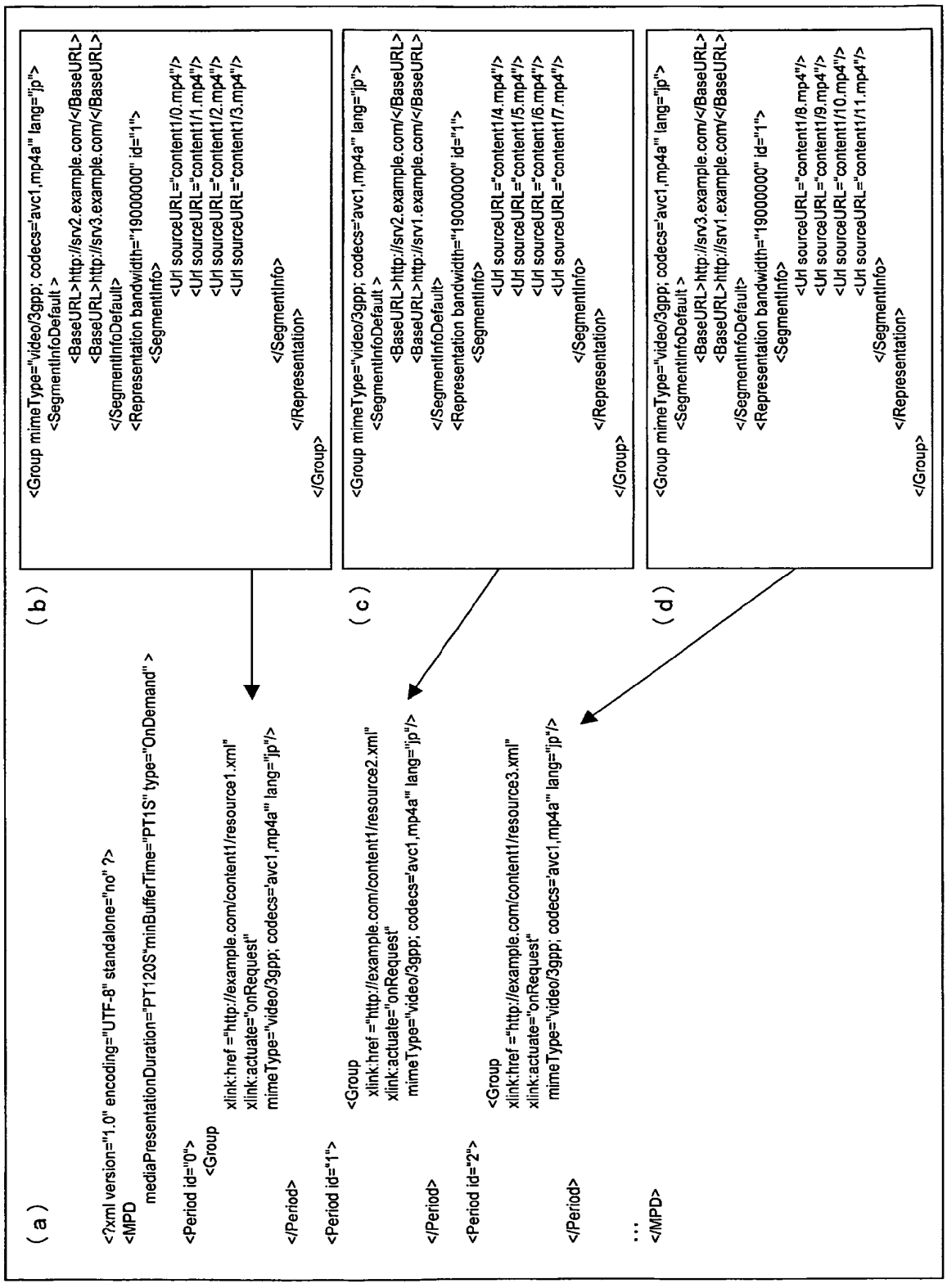

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
185 of 455

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>
```

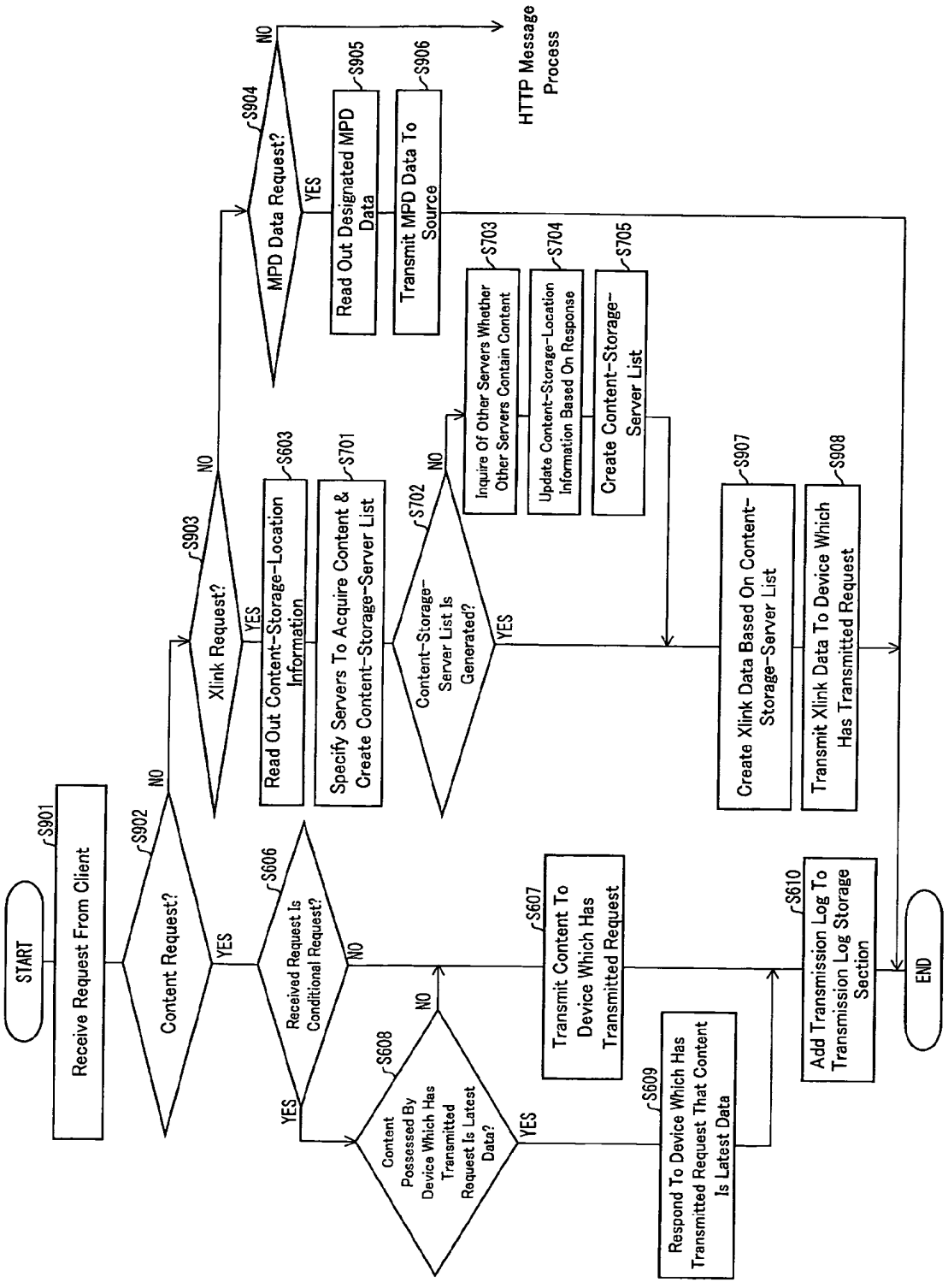

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
186 of 455

FIG. 38



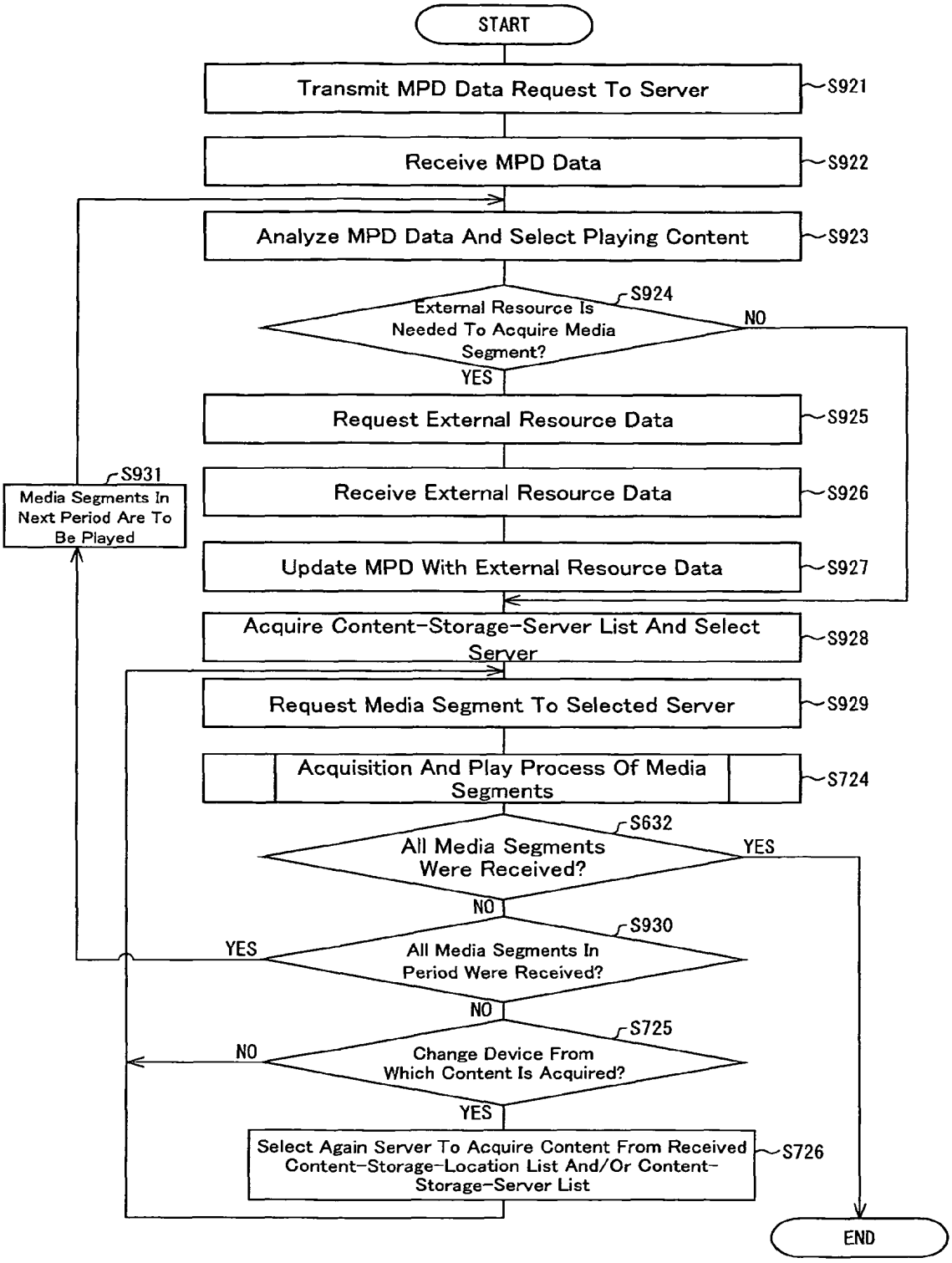
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
187 of 455

FIG. 39



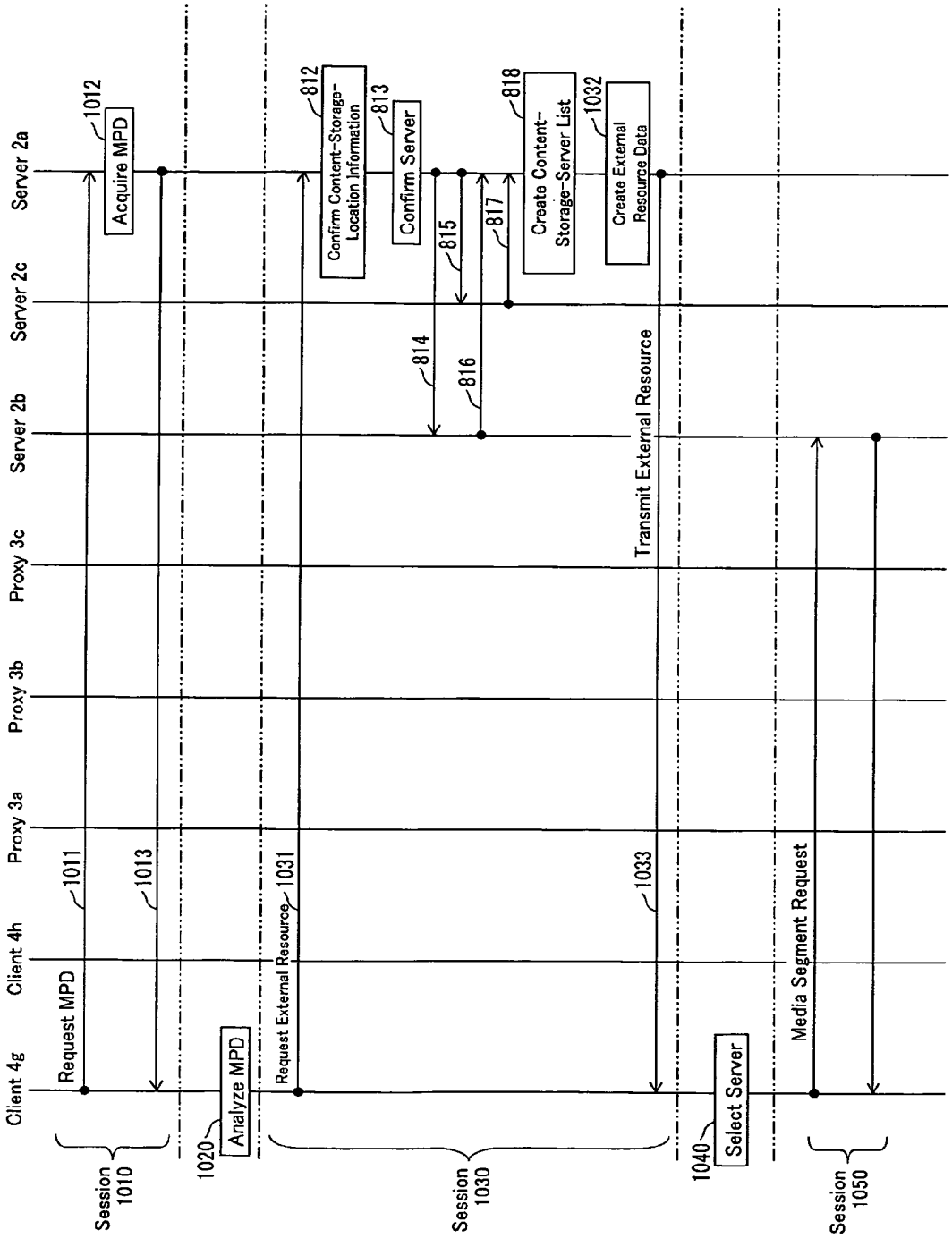
Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
188 of 455

FIG. 40



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
189 of 455

FIG. 41



Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
190 of 455

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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"E" earlier application or patent but published on or after the international filing date
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"P" document published prior to the international filing date but later than the priority date claimed
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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)

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
191 of 455

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005110244 A **[0004]**

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
192 of 455

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WO 2010/090562 A1

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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).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (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, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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.

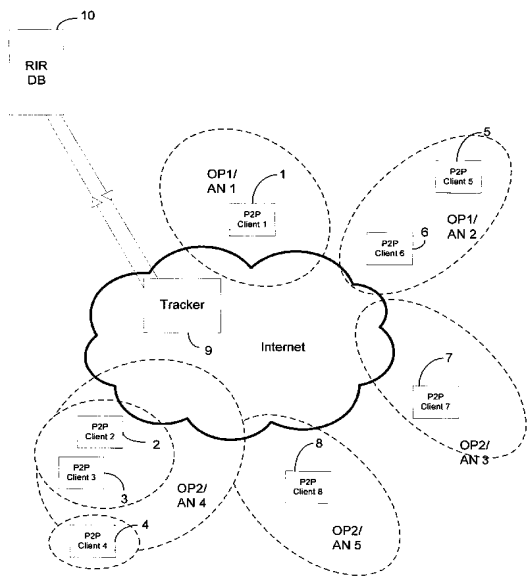


Fig. 1

WO 2010/090562 A1

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
194 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
199 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
200 of 455

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.

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

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).

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
211 of 455

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:

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
213 of 455

- 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).

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
214 of 455

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);

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
215 of 455

- means for grouping the peers with respect to the network parameters.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
216 of 455

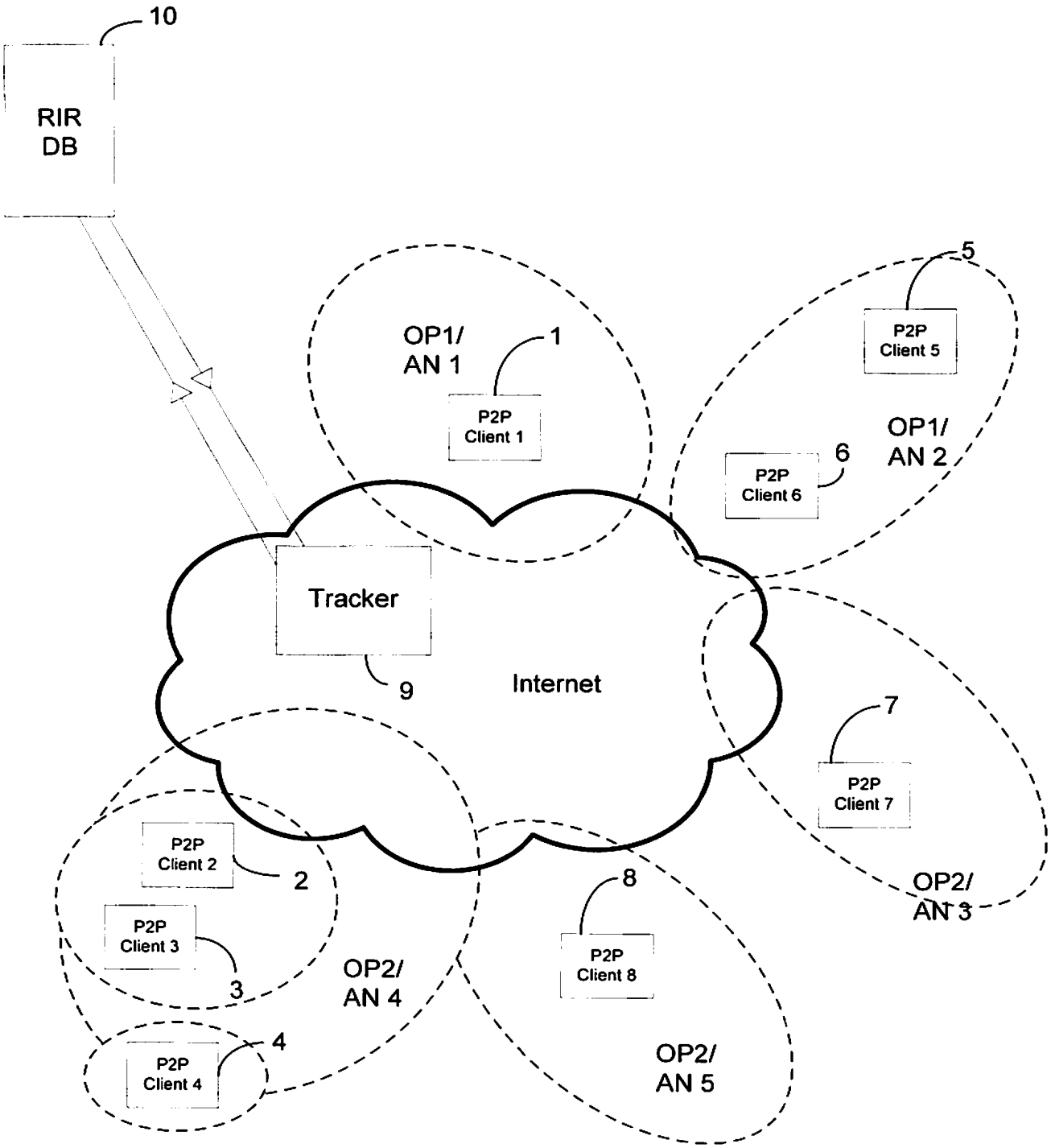

10
RIR DB
OP1/ AN 1
1
P2P Client 1
5
P2P Client 5
OP1/ AN 2
6
P2P Client 6
Tracker
9
Internet
7
P2P Client 7
OP2/ AN 3
P2P Client 2
2
P2P Client 3
3
OP2/ AN 4
4
P2P Client 4
8
P2P Client 8
OP2/ AN 5

Fig. 1

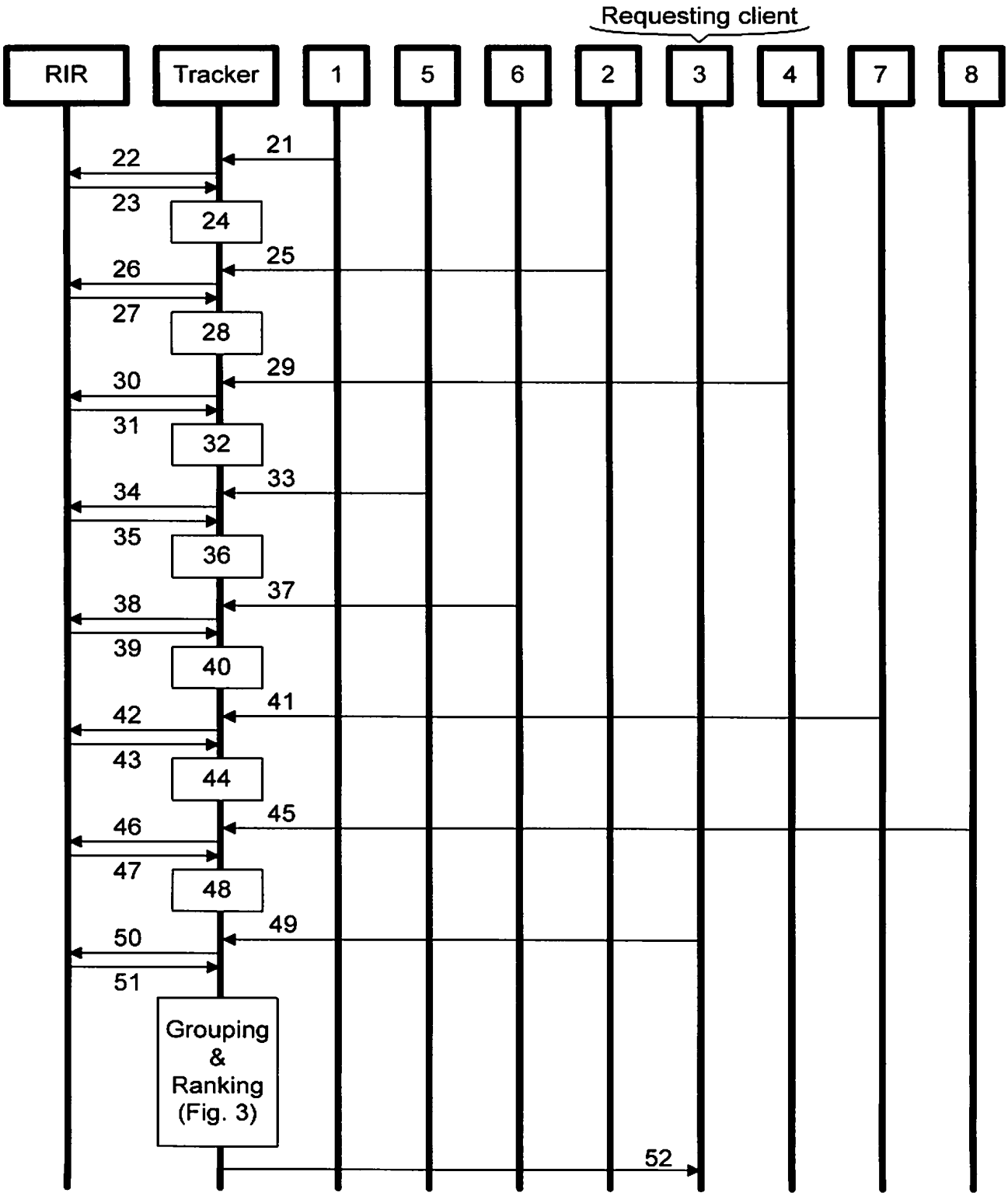

Requesting client
RIR
Tracker
1
5
6
2
3
4
7
8
21
22
23
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28
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46
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48
49
50
51
Grouping & Ranking (Fig. 3)
52

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

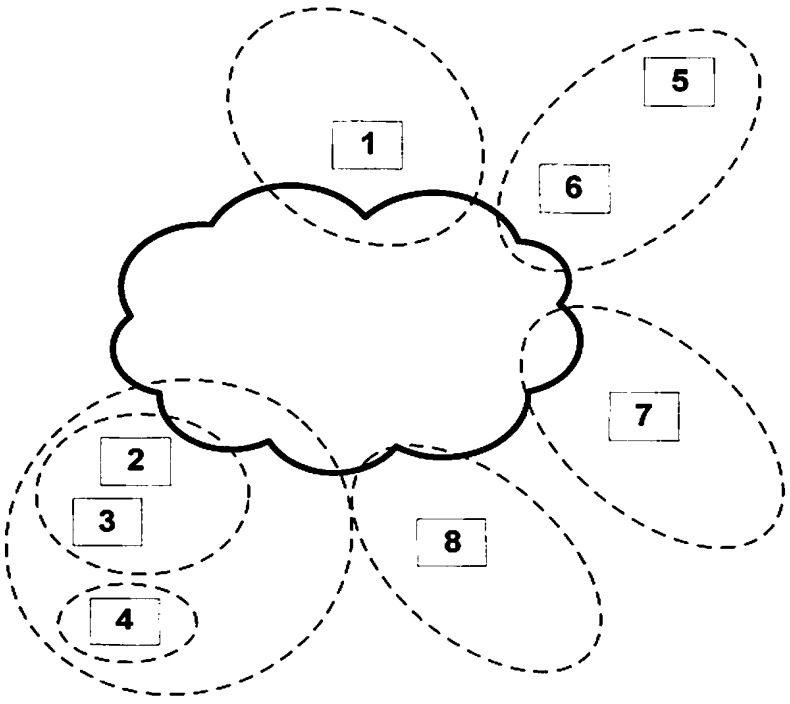


Fig. 3

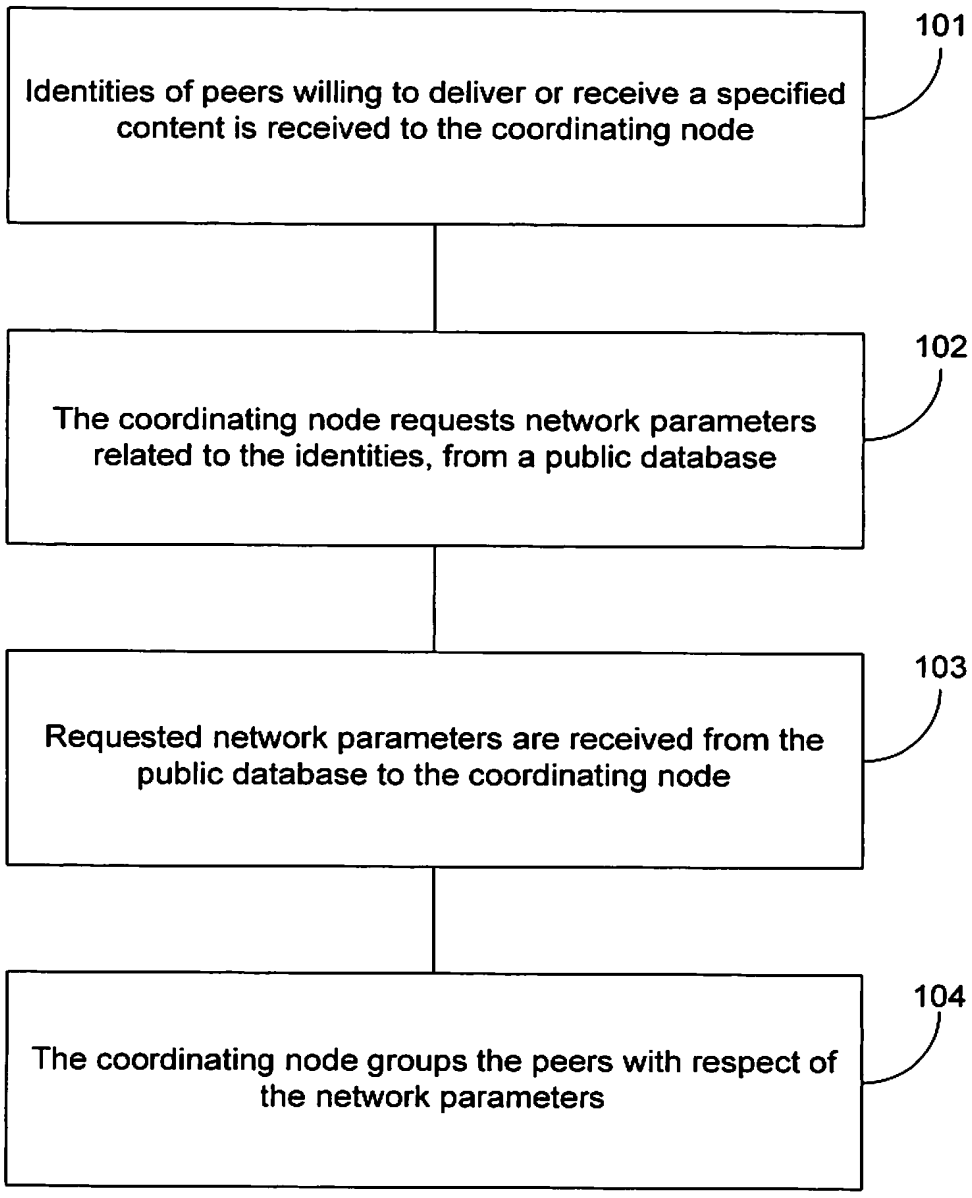

Identities of peers willing to deliver or receive a specified content is received to the coordinating node
101
The coordinating node requests network parameters related to the identities, from a public database
102
Requested network parameters are received from the public database to the coordinating node
103
The coordinating node groups the peers with respect of the network parameters
104

Fig. 4

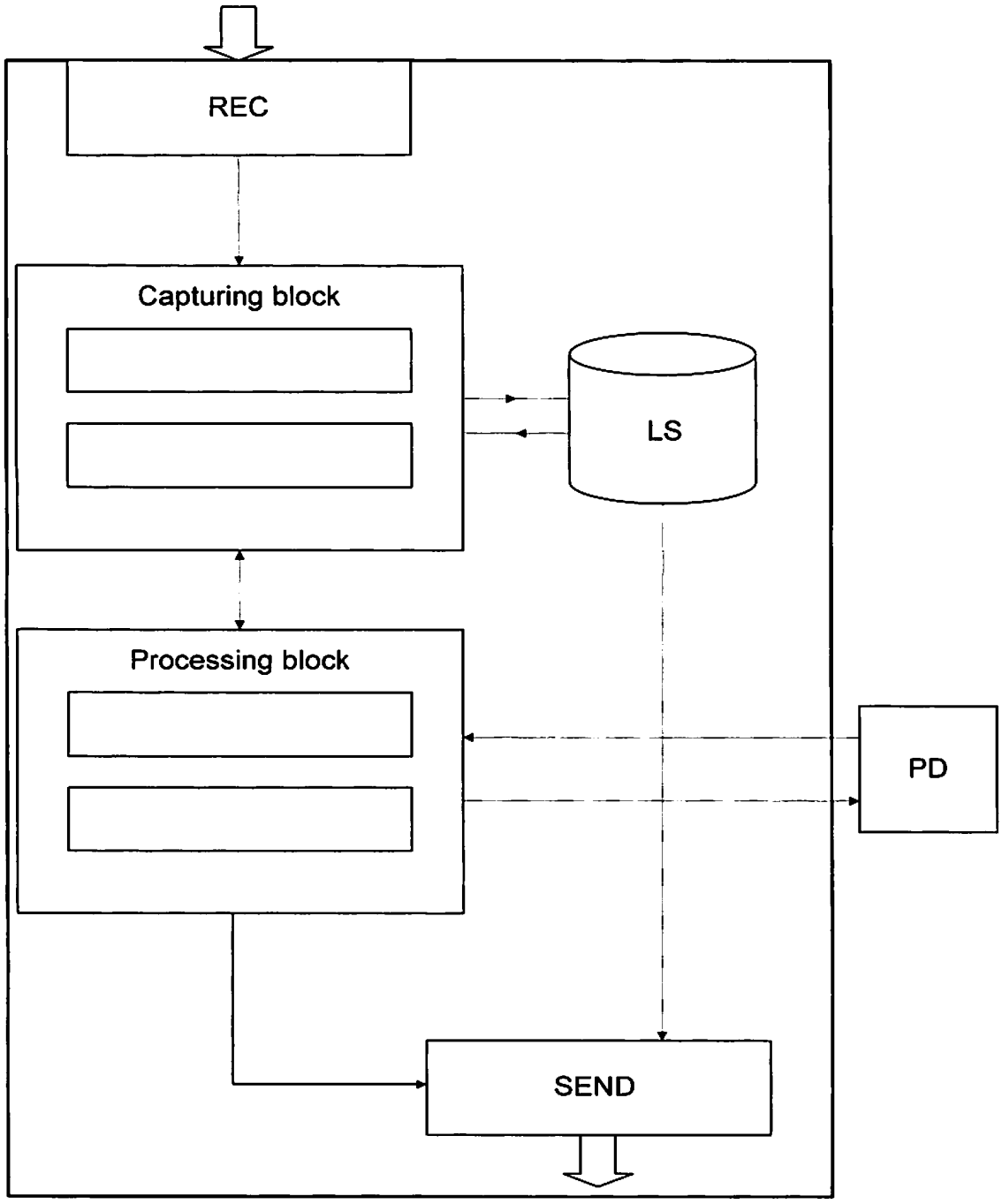


Fig. 5

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
221 of 455

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

Form PCT/ISA/210 (second sheet) (July 2009)

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

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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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
224 of 455

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				WO	2007097877	A	30/08/2007
US	20070064702	A1	22/03/2007	NONE			
US	20080040420	A1	14/02/2008	NONE			

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
225 of 455

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Published:
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(54) **Title**: METHOD AND SYSTEM FOR SECURE AND RELIABLE VIDEO STREAMING WITH RATE ADAPTATION

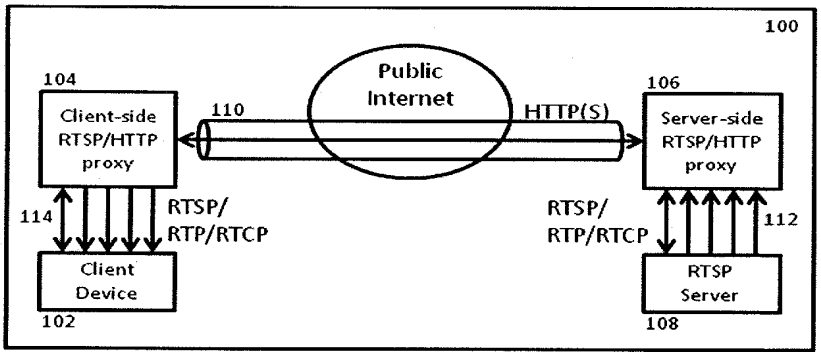


Fig. 1

(57) **Abstract**: A system for media delivery includes a server-side proxy for aggregating and encrypting stream data for efficient HTTP-based distribution over an unsecured network. A client-side proxy decrypts and distributes the encapsulated stream data to client devices. A multicast-based infrastructure may be used for increased scalability. The encoded rate of the media delivered over the persistent HTTP proxy connections may be dynamically adapted. The client-side proxy may be integrated within a mobile device for maximum network security and reliability.

WO 2011/068784 A1

METHOD AND SYSTEM FOR SECURE AND RELIABLE VIDEO STREAMING WITH RATE ADAPTATION

BACKGROUND

The invention relates in general to streaming media and more specifically to implementing secure and reliable streaming media with dynamic bit rate adaptation.

Available bandwidth in the internet can vary widely. For mobile networks, the limited bandwidth and limited coverage, as well as wireless interference can cause large fluctuations in available bandwidth which exacerbate the naturally bursty nature of the internet. When congestion occurs, bandwidth can degrade quickly. For streaming media, which require long lived connections, being able to adapt to the changing bandwidth can be advantageous. This is especially so for streaming which requires large amounts of consistent bandwidth.

In general, interruptions in network availability where the usable bandwidth falls below a certain level for any extended period of time can result in very noticeable display artifacts or playback stoppages. Adapting to network conditions is especially important in these cases. The issue with video is that video is typically compressed using predictive differential encoding, where interdependencies between frames complicate bit rate changes. Video file formats also typically contain header information which describe frame encodings and indices; dynamically changing bit rates may cause conflicts with the existing header information. This is further complicated in live streams where the complete video is not available to generate headers from.

Frame-based solutions like RTSP/RTP solve the header problem by only sending one frame at a time. In this case, there is no need for header information to describe the surrounding frames. However RTSP/RTP solutions can result in poorer quality due to UDP frame loss and require network support for UDP firewall fixups, which may be viewed as network security risks. More recently segment-based solutions like HTTP Live Streaming allow for the use of the ubiquitous HTTP protocol which does not have the frame loss or firewall issues of RTSP/RTP, but does require that the client media player support the specified m3u8 playlist polling. For many legacy mobile devices that support RTSP, and not m3u8 playlists, a different solution is required.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
227 of 455

Within the mobile carrier network, physical security and network access control provide content providers with reasonable protection from unauthorized content extrusion, at a network level. Similarly the closed platforms with proprietary interfaces used in many mobile end-point devices prevent creation of rogue applications to spoof the native end-point application for unauthorized content extrusion. However, content is no longer solely distributed through the carrier network alone, and not all mobile end-point devices are closed platforms anymore. Over the top (OTT) delivery has become a much more popular distribution mechanism, bypassing mobile carrier integration, and recent advancements in smart phone and smart pad platforms (e.g., Apple iPhone, Blackberry, and Android) have made application development and phone hacking much more prevalent. The need to secure content delivery paths is critical to the monetization of content and the protection of content provider intellectual property.

In addition to security, high quality video delivery is paramount to successful monetization of content. Traditional video streaming protocols, e.g., RTSP/RTP, are based on unreliable transport protocols, i.e., UDP. The use of UDP allows for graceful degradation of quality by dropping or ignoring late and lost packets, respectively. While this helps prevent playback interruptions, it causes image distortion when rendering video content. Within a well-provisioned private network where packet loss and lateness is known to be minimal, UDP works well. UDP also allows for the use of IP multicast for scalability. In the public Internet, however, there are few network throughput or packet delivery guarantees. The lack of reliability causes RTSP/RTP-based video streaming deployments to be undesirable given their poor quality.

Methods such as layered video encodings, multiple description video encodings (MDC), and forward error correction (FEC) have been proposed to help combat the lack of reliable transport in RTSP/RTP. These schemes distribute data over multiple paths and/or send redundant data in order to increase the probability that at least partially renderable data is received by the client. Though these schemes have been shown to improve quality, they add complexity and overhead but are still not guaranteed to produce high quality video. A different approach is required for integrating secure delivery of high quality video into the RTSP/RTP delivery infrastructure.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
228 of 455

SUMMARY

A method is provided for integrating and enhancing the reliability and security of streaming video delivery protocols. The method can work transparently with standard HTTP servers and use a file format compatible with legacy HTTP infrastructure. Media may be delivered over a persistent connection from a single server or a plurality of servers. The method can also include the ability for legacy client media players to dynamically change the encoded rate of the media delivered over a persistent connection. The method may require no client modification and can leverage standard media players embedded in mobile devices for seamless media delivery over wireless networks with high bandwidth fluctuations. The method may be used with optimized multicast distribution infrastructure.

Generally, the method for distributing live streaming data to clients includes a first (server-side) proxy connecting to a streaming server, aggregating streaming data into file segments and writing the file segments to one or more storage devices. The file segments are transferred from the storage devices to a second (client-side) proxy, which decodes and parses the file segments to generate native live stream data and serves the native live stream data to clients for live media playback.

A system is also specified for implementing a client and server proxy infrastructure in accordance with the provisions of the method. The system includes a server-side proxy for aggregating and encrypting stream data for efficient HTTP-based distribution over an unsecured network. The system further includes a client-side proxy for decrypting and distributing the encapsulated stream data to the client devices. The distribution mechanism includes support for multicast-based infrastructure for increased scalability. The method further support for dynamically adapting the encoded rate of the media delivered over the persistent HTTP proxy connections. An additional system is specified for integrating the client-side proxy within a mobile device for maximum network security and an reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features and advantages will be apparent from the following description of particular embodiments of the invention, as illustrated in the accompanying drawings.

Figure 1 is a block diagram of a system which is capable of conducting procedures, in accordance with various embodiments of the invention;

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
229 of 455

Figure 2 is another block diagram of a system which is capable of conducting procedures, in accordance with various embodiments of the invention;

Figure 3 is another block diagram of a system which is capable of conducting procedures, in accordance with various embodiments of the invention;

Figure 4 is a diagram of a segment file format used, in accordance with an embodiment of the present invention;

Figure 5 is a flow chart showing a method for performing stream segmentation, in accordance with various embodiments of the invention;

Figure 6 is a flow chart showing a method for performing stream segment retrieval and decoding, in accordance with an embodiment of the present invention;

Figure 7 is a flow chart showing another method for performing stream segment retrieval and decoding, in accordance with an embodiment of the present invention;

Figure 8 is a block diagram of a proxy capable of performing server-side transcoding, encapsulation, and streaming services , in accordance with an embodiment of the present invention;

Figure 9 is a block diagram of a proxy capable of performing RTSP client-side decapsulation, parsing, and streaming services , in accordance with an embodiment of the present invention;

Figure 10 is a block diagram of another proxy capable of performing HLS client-side decapsulation, parsing, and streaming services , in accordance with an embodiment of the present invention;

Figure 11 is another block diagram of a system which is capable of conducting procedures in accordance with various embodiments of the invention; and

Figure 12 is a flow chart showing a method for performing segment retrieval failover, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

Overview

In one embodiment, the present invention provides a method for delivering streaming data over a network. In one embodiment, the invention is described as being integrated into an existing Real-Time Streaming Protocol/ Real-Time Protocol (RTSP/RTP) video delivery infrastructure, however, the invention is generally suitable for tunneling any

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
230 of 455

real-time streaming protocol; RTSP/RTP just happens to be a predominant protocol and is therefore of focus. In another embodiment, the invention is suitable for integration into an HTTP Live Streaming (HLS) video delivery infrastructure. In another embodiment, the invention is suitable for integration into Real-Time Messaging Protocol (RTMP) video delivery infrastructure. In another embodiment, the invention is suitable for integration into an Internet Information Services (IIS) Smooth Streaming video delivery infrastructure.

In one embodiment, the invention includes a server-side proxy and one or more client-side proxies. The server-side proxy connects to one or more streaming servers and records the data in batches. In one embodiment, the streaming server is an RTSP server and the data is RTP/RTCP data. The RTP and RTCP data is written into segment files along with control information used to decode the segments by the client-side proxies. In another embodiment, the streaming server is an HLS server and the data is MPEG transport stream (MPEG-TS) data, where MPEG stands for "Motion Picture Experts Group" as known in the art. In another embodiment, the streaming server is an RTMP server and the data is RTMP data. In another embodiment, the streaming server is an IIS Smooth Streaming server and the data is MPEG-4 (MP4) fragment data. In one embodiment, the segment is then encrypted by the server-side proxy. In one embodiment, encryption uses the AES128 block cipher. In another embodiment, the encryption uses the RC4 stream cipher. In another embodiment, the encryption uses the HC128 stream cipher. In another embodiment, the encryption uses the AES128 counter mode (CTR) stream cipher. There are many encryption methods, as should be familiar to those skilled in the art; any valid encryption method may be used. The segment is then available for transmission to the client-side proxies.

In one embodiment, client-side proxies initiate persistent HTTP connections to the server-side proxies, and the segments are streamed out as they become available. The segments are sent using the HTTP chunked transfer encoding so that the segment sizes and number of segments do not need to be known a priori. In another embodiment, the client-side proxies may use non-persistent HTTP requests to poll the server-side proxy for new segments at fixed intervals. In another embodiment, the client-side proxies initiate persistent HTTP connections to a CDN to retrieve the segments. In another embodiment, the client-side proxies initiate non-persistent HTTP connections to a CDN to retrieve the segments at fixed intervals. In another embodiment, the client-side proxies may use FTP requests to poll for new segments at fixed intervals. In one embodiment, HTTP connections

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
231 of 455

may be secured (i.e., HTTPS) using SSL/TLS to provide data privacy when retrieving segments. In another embodiment, the FTP connections may be secure (i.e., SFTP/SCP) to provide data privacy when retrieving segments. In one embodiment, the segment files adhere to a file naming convention which specifies the bitrate and format in the name, to simplify segment polling and retrieval.

In one embodiment, the server-side proxy connects to a single streaming server retrieving a single video stream. In one embodiment, the streaming server is an RTSP server. Each RTSP connection should be accompanied by at least one audio RTP channel, one audio RTCP channel, one video RTP channel, and one video RTCP channel, as should be known to those skilled in the art. Herein, this group of RTSP/RTP/RTCP connections is considered a single atomic stream. In one embodiment, the stream contains a high definition video stream. This source video is transcoded into a plurality of different encodings. In one embodiment only the video bitrates differ between encodings. In another embodiment, the video bitrates, frame rates, and/or resolution may differ. The different encodings are written into separate file segments.

In another embodiment, the server-side proxy connects to a single streaming server retrieving a plurality of streams. Each stream is for the same source video content, with each stream encoded differently. In another embodiment, the server-side proxy connects to a single RTSP server to retrieve a plurality of streams. In one embodiment, each stream in the plurality of streams contains the same content encoded differently. In one embodiment only the video bitrates differ. In another embodiment, the video bitrates, frame rates, and/or resolution may differ. The client-side proxy may request that one or more bitrates be sent to it over a persistent HTTP connection. The client-side proxy may choose a different bitrate or set of bitrates by initiating a new persistent HTTP connection to the server-side proxy. The client-side proxy may select any segments it wishes when using a polling-based approach.

In another embodiment, the server-side proxy connects to a plurality of streaming servers retrieving multiple streams which are to be spliced together. In one embodiment, an advertisement may be retrieved from one server, while the main content is retrieved from another server, and the advertisement is spliced in at designated intervals. In another embodiment, one viewing angle for an event may be available on one server, while another viewing angle may be available on the other server, and the different viewing angles are to

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
232 of 455

be switched between. In one embodiment the splicing and switching is done based on a fixed schedule that is known a priori. In another embodiment the splicing and switching is done on demand based on user input.

In one embodiment, the segments are all of a fixed duration. In another embodiment, the segments may all be of a fixed size. In one embodiment, video segments are packed to integer time boundaries. In another embodiment compressed and/or encrypted segments are padded out to round numbered byte boundaries. This can help simplify byte-based offset calculations. It also can provide a level of size obfuscation, for security purposes. In another embodiment the segments may be of variable duration or size. In one embodiment, video segments are packed based on key frame or group of frame counts.

In one embodiment, the segments are served from standard HTTP servers. In another embodiment, the segments may be served from an optimized caching infrastructure. The segments are designed to be usable with existing infrastructure. They do not require special servers for delivery and they do not require decoding for delivery. They also do not require custom rendering engines for displaying the content.

In one embodiment, the client-side proxy acts as an RTSP server for individual client devices. The client-side proxy decodes the segments retrieved from the server-side proxy and replays the RTP/RTCP content contained within the segment. The RTP/RTCP headers may be spoofed to produce valid sequence numbers and port numbers, etc., for each client device. The methods for header field rewrite for spoofing prior to transmission should be known to those skilled in the art. In one embodiment, the client-side proxy is embedded inside a client application, directly interacting with only the local device's native media player. In another embodiment, the client-side proxy acts as an HLS server for individual client devices. The client-side proxy tracks segment availability and creates m3u8 playlists for the client. In another embodiment, the client-side proxy acts as a standalone device, serving multiple client endpoints. In one embodiment, the client-side proxy accepts individual connections from each endpoint. In another embodiment, the client-side proxy distributes the RTP/RTCP data via IP multicast. The client devices join an IP multicast tree and receive the data from the network, rather than making direct connections to the client-side proxy.

In one embodiment, the invention uses bandwidth measurements to determine when a change in bitrate is required. If the estimated bandwidth falls below a given threshold for

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
233 of 455

the current encoding, for a specified amount of time, then a lower bit rate encoding should be selected. Likewise if the estimated bandwidth rises above a different threshold for the current encoding, for a different specified amount of time, then a higher bit rate encoding may be selected. The rate change takes place at the download of the next segment.

In one embodiment, the bandwidth is estimated based on the download time for each segment (S / T), where S is the size of the segment and T is the time elapsed in retrieving the segment. In one embodiment, the downloader keeps a trailing history of B bandwidth estimates, calculating the average over the last B samples. When a new sample is taken, the Bth oldest sample is dropped and the new sample is included in the average:

```
integer B_index    // tail position in the circular history buffer
integer B_total    // sum of all the entries in the history buffer
integer B_count    // total number of entries in the history buffer
integer B_new      // newly sampled bandwidth measurement
integer B_old      // oldest bandwidth sample to be replaced
integer B_average  // current average bandwidth
array B_history    // circular history buffer

B_old = B_history[B_index]          // find the sample to be replaced
B_history[B_index] = B_new          // replace the sample with the new
sample
B_total = B_total - B_old           // remove the old sample from the sum
B_total = B_total + B_new           // add the new sample into the sum
B_average = B_total / B_count       // update the average
B_index = (B_index + 1) % B_count   // update the buffer index
```

The history size should be selected so as not to tax the client device. A longer history will be less sensitive to transient fluctuations, but will be less able to predict rapid decreases in bandwidth. In another embodiment the downloader keeps only a single sample and uses a dampening filter for statistical correlation.

```
integer B_new      // newly sampled bandwidth measurement
integer B_average  // current average bandwidth
float B_weight     // weight of new samples, between 0 and 1

B_average = (B_average * (1 - B_weight)) + (B_average * B_weight) // update
the average
```

This method requires less memory and fewer calculations. It also allows for exponential drop off in historical weighting. In one embodiment, download progress for a given segment is monitored periodically so that the segment size S of the retrieved data does

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
234 of 455

not impact the rate at which bandwidth measurements are taken. There are numerous methods for estimating bandwidth, as should be known to those skilled in the art; the above are representative of the types of schemes possible but do not encompass an exhaustive list of schemes. Other bandwidth measurement techniques as applicable to the observed traffic patterns are acceptable within the context of the present invention.

Live RTP data is typically sent just-in-time (JIT) by the RTSP server, so the data received by the server-side proxy is naturally paced. The server-side proxy does not need to inject additional delay into the distribution of segments, nor does the client-side proxy need to inject additional pacing into the polling retrieval of segments. The data is received by the server-side proxy and packed into segments. Once the segment is complete, the segment is immediately distributed to the client-side proxies. The client-side proxies then immediately distribute the data contained in the segment to the client devices. If the segment sizes are large, then the client-side proxy paces the delivery of RTP data to the client devices. In one embodiment, the client-side proxy inspects the RTP timestamps produced by the RTSP server, and uses them as a guideline for pacing the RTP/RTCP data to the client devices. In one embodiment, the segments are made available for video on demand (VoD) playback once they have been created. If the segments already exist on the storage device, then they could be downloaded as fast as the network allows. In one embodiment, the server-side proxy paces the delivery of segments to the client-side proxy. In another embodiment, the client-side proxy requests segments from the server-side proxy in a paced manner. In another embodiment, the client-side proxy requests segments from the CDN in a paced manner. The pacing rate is determined by the duration of the segments. The segments are delivered by the server-side proxy or retrieved by the client-side proxy JIT to maximize network efficiency.

In one embodiment, the invention uses bandwidth measurements to determine when a change in bitrate is required. If the estimated bandwidth falls below a given threshold for the current encoding, for a specified amount of time, then a lower bit rate encoding should be selected. Likewise if the estimated bandwidth rises above a different threshold for the current encoding, for a different specified amount of time, then a higher bit rate encoding may be selected. In one embodiment, the rate change is initiated by the server-side proxy. The server-side proxy uses TCP buffer occupancy rate to estimate the network bandwidth. When the estimated available bandwidth crosses a rate change threshold, the next segment

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
235 of 455

delivered is chosen from a different bitrate. In another embodiment, the rate change is initiated by the client-side proxy. The client-side proxy uses segment retrieval time to estimate the network bandwidth. When the estimated available bandwidth crossed a rate change threshold, the next segment requested is chosen from a different bitrate.

In the description that follows, a single reference number may refer to analogous items in different embodiments described in the figures. It will be appreciated that this use of a single reference number is for ease of reference only and does not signify that the item referred to is necessarily identical in all pertinent details in the different embodiments. Additionally, as noted below, items may be matched in ways other than the specific ways shown in the Figures.

Description of Illustrative Embodiments

In FIG. 1 is a block diagram 100 for one embodiment of the present invention. It shows a streaming server 108 (shown as an RTSP server 108), a server-side proxy 106, a client-side proxy 104, and a client device 102. The streaming server 108, the server-side proxy 106, the client-side proxy 104, and the client device 102 are all typically computerized devices which include one or more processors, memory, storage (e.g., magnetic or flash memory storage), and input/output circuitry all coupled together by one or more data buses, along with program instructions which are executed by the processor out of the memory to perform certain functions which are described herein. Part or all of the functions may be depicted by corresponding blocks in the drawings, and these should be understood to cover a computerized device programmed to perform the identified function.

In the interest of specificity, the following description is directed primarily to an embodiment employing RTSP. As described below, other types of streaming protocols, servers, and connections may be employed. The references to RTSP in the drawings and description are not to be taken as limiting the scope of any claims not specifically directed to RTSP.

The server-side proxy 106 initiates a real-time streaming connection 112 (shown as RTSP connection 112) to the RTSP server 108. The RTSP connection 112 shown contains a bi-directional RTSP control channel, and four unidirectional RTP/RTCP data channels (i.e., one audio RTP channel, one audio RTCP channel, one video RTP channel, and one video RTCP channel), all of which constitutes a single stream. The server-side proxy 106

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
236 of 455

captures the data from all four RTP/RTCP channels and orders them based on timestamps within the packets. The packets are then written to a segment file. A header is added to each of the individual packets to make the different channels distinguishable when parsed by the client-side proxy 104. Once the segment file has reached its capacity, the file is closed and a new file is started. In one embodiment, the file capacity is based on the wall-clock duration of the stream, e.g., 10 seconds of data. In another embodiment, the file capacity is based on video key frame boundaries, e.g. 10 seconds of data plus any data until the next key frame is detected. In another embodiment, then file capacity is based on file size in bytes, e.g., 128KB plus any data until the next packet.

In one embodiment, the server-side proxy 106 takes the recorded stream and transcodes it into a plurality of encodings. In one embodiment only the video bitrates differ between encodings. In another embodiment, the video bitrates, frame rates, and/or resolution may differ.

The client device 102 initiates a real-time streaming connection 114 (shown as RTSP connection 114) to the client-side proxy 104. The RTSP connection 114 shown contains a bi-directional RTSP control channel, and four unidirectional RTP/RTCP data channels (i.e., one audio RTP channel, one audio RTCP channel, one video RTP channel, and one video RTCP channel), all of which constitutes a single stream. The client-side proxy 104 initiates a connection 110 to the server-side proxy 106. In one embodiment, the connection 110 is a persistent HTTP connection. In another embodiment, the connection 110 is a persistent HTTPS connection. In another embodiment, the connection 110 is a onetime use HTTP connection. In another embodiment, the connection 110 is a onetime use HTTPS connection. In another embodiment, the connection 110 is a persistent FTP, SFTP, or SCP connection. In another embodiment, the connection 110 is a onetime use FTP, SFTP, or SCP connection.

In one embodiment, the client-side proxy 104 requests the first segment for the stream from the server-side proxy 106. In another embodiment the client-side proxy 104 requests the current segment for the stream from the server-side proxy 106. If the stream is a live stream, the current segment will provide the closest to live viewing experience. If the client device 102 prefers to see the stream from the beginning, however, it may request the first segment, whether the stream is live or not. In one embodiment, the server-side proxy 106 selects the latest completed segment and immediately sends it to the client-side proxy

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
237 of 455

104. In another embodiment, the server-side proxy 106 selects the earliest completed segment and immediately sends it to the client-side proxy 104. For some live events, the entire history of the stream may not be saved, therefore, the first segment may be mapped to the earliest available segment. For video on demand (VoD), the first segment should exist, and will be the earliest available segment.

For persistent HTTP/HTTPS connections, segments are sent as a single HTTP chunk, as defined by the HTTP chunk transfer encoding. Subsequent segments will be sent as they become available as separate HTTP chunks, as should be familiar to those skilled in the art. For onetime use HTTP/HTTPS and FTP/SFTP/SCP, the client-side proxy 104 polls for the availability of the next segment using the appropriate mechanism for the specific protocol, as should be familiar to those skilled in the art. Though only one client-side proxy 104 is shown, multiple client-side proxies 104 may connect to a single server-side proxy 106. A client-side proxy 104 may also connect to multiple server-side proxies 106.

The client-side proxy 104 decodes the segments and parses out the component RTP/RTCP stream data and forwards the data to the client device 102. The RTP/RTCP data is paced as per the RTP specification. The client-side proxy 104 uses the timestamp information in the RTP/RTCP packet headers as relative measures of time. The timing relationship between packets should be identical, as seen by the client device 102, to the timing relationship when the stream was recorded by the server-side proxy 106. The timestamps and sequence numbers are updated, however, to coincide with the specific client device 102 connection. Manipulation of the RTP/RTCP header information to normalize timestamps and sequence numbers should be familiar to those skilled in the art.

The client device 102 delivers the data to the a media player on client device 102 which renders the stream. The HTTP proxy infrastructure is transparent to the native media player which receives RTSP/RTP data as requested.

In FIG. 2 is a block diagram 200 for another embodiment of the present invention. As with FIG. 1, it shows an RTSP server 108, the server-side proxy 106, the client-side proxy 104, and a client device 102. FIG. 2, however, shows a plurality of RTSP servers 108 and a plurality of client devices 102. The connections 112 between the server-side proxy 106 and the RTSP servers 108 are the same, there are just multiple of them. Each connection 112 attaches to a different RTSP server 108, to retrieve different content which is to be spliced together. In one embodiment, one RTSP server 108 may contain a live event

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
238 of 455

which pauses for commercial interruptions, while one or more other RTSP servers 108 may contain advertisements which are to be inserted during the commercial breaks. In another embodiment, multiple RTSP servers 108 may contain different camera angles for a given live event, where a final video stream switches between the different camera angles. In one embodiment, the splicing of streams (advertisements) and/or the switching of streams (camera angles) is determined before the event and performed on a set schedule. In another embodiment, the splicing of streams (advertisements) and/or the switching of streams (camera angles) is determined live by user intervention. Though only one client-side proxy 104 is shown, multiple client-side proxies 104 may connect to a single server-side proxy 106. A client-side proxy 104 may also connect to multiple server-side proxies 106.

In one embodiment, the server-side proxy 106 takes each of the recorded streams and transcodes them into a plurality of encodings. In one embodiment only the video bitrates differ between encodings. In another embodiment, the video bitrates, frame rates, and/or resolution may differ.

The connection 110 between the client-side proxy 104 and the server-side proxy 106 is the same as in the discussion of FIG. 1. The segment parsing and RTP/RTCP packet normalization and pacing performed by the client-side proxy 104 is also the same as in the discussion of FIG. 1. The connection 214 between the client devices 102 and the client-side proxy 104 is via a multicast connection such as an IP multicast distribution tree. The client-side proxy 104 and client devices 102 connect to the multicast distribution tree through a multicast registration protocol, e.g., IGMP. A multicast router infrastructure is typically required. The client-side proxy 104 then sends the RTP/RTCP data to a multicast address, and does not communicate with client devices 102 directly. The client devices 102 receive the live data from the multicast tree and deliver the data to the native media player which renders the stream. The HTTP proxy infrastructure is transparent to the native media player which receives RTSP/RTP data as requested.

FIG. 3 is a block diagram 300 for another embodiment of the present invention. As with FIGs. 1 and 2, it shows an RTSP server 108, the server-side proxy 106, the client-side proxy 104, and a client device 102. FIG. 3, however, shows a single server-side proxy 106 with multiple RTSP connections 112 to it. The server-side proxy 106 connects to a CDN 320 for remote storage of the generated segments. FIG. 3 also shows a more detailed view of the client device 102, with an integrated client-side proxy 104. Each RTSP connection

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
239 of 455

112 connects to the same RTSP server 108. In one embodiment, the each RTSP connection 112 retrieves the same content, each encoded at a different bitrate, frame rate, and/or resolution. The server-side proxy 106 makes multiple simultaneous RTSP connections 112 to the RTSP server 108 and records all of the different encodings so that it can service a request for any of the different encodings at any time. In another embodiment, each RTSP connection 112 retrieves different content and the server-side proxy 106 takes the recorded streams and transcodes them into a plurality of encodings. In one embodiment only the video bitrates differ between encodings. In another embodiment, the video bitrates, frame rates, and/or resolution may differ. Though only one client-side proxy 104 is shown, multiple client-side proxies 104 may connect to the CDN 320. A client-side proxy 104 may also connect to multiple CDNs 320.

The client-side proxy 104 is integrated into the client device 102, by being embedded into a client device application 318. The client device application 318 integrates the client-side proxy 104 software to provide direct access to the native media player 316. This integration provides the highest level of security as the HTTP proxy security is extended all the way to the client device 102. Whether it is the transport security of HTTPS or the content security of the segment encryption, extending the security later to the client device 102 prevents the possibility of client-side man-in-the-middle attacks. In one embodiment, the connection 110 between the client-side proxy 104 and the CDN 320 is a persistent HTTP connection. In another embodiment, the connection 110 is a persistent HTTPS connection. In another embodiment, the connection 110 is a onetime use HTTP connection. In another embodiment, the connection 110 is a onetime use HTTPS connection. In another embodiment, the connection 110 is a persistent FTP, SFTP, or SCP connection. In another embodiment, the connection 110 is a onetime use FTP, SFTP, or SCP connection.

In one embodiment, the client-side proxy 104 requests the first segment for the stream from the CDN 320. In another embodiment the client-side proxy 104 requests the current segment for the stream from the CDN 320. If the stream is a live stream, the current segment will provide the closest to live viewing experience. If the client device 102 prefers to see the stream from the beginning, however, it may request the first segment, whether the stream is live or not. For some live events, the entire history of the stream may not be saved, therefore, if the first segment does not exist, the current segment should be retrieved.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
240 of 455

For video on demand (VoD), the first segment should exist.

The client-side proxy 104 polls for the availability of the next segment using the appropriate mechanism for the specific protocol, as should be familiar to those skilled in the art. The segment parsing and RTP/RTCP packet normalization and pacing performed by the client-side proxy 104 is the same as in the discussion of FIG. 1. The connection 114 between the client devices 102 and the client-side proxy 104 is the same as in the discussion of FIG. 1. The native media player 318 receives the data directly from the client-side proxy 104 and renders the stream. The HTTP proxy infrastructure is transparent to the native media player which receives RTSP/RTP data as requested.

To support rate adaptation, the client-side proxy 104 measures the bandwidth and latency of the segment retrieval from the server-side proxy 106 or CDN 320. In one embodiment, the client-side proxy 104 calculates the available bandwidth based on download time and size of each segment retrieved. In one embodiment, bitrate switching is initiated when the average bandwidth falls below the current encoding's bitrate or a higher bitrate encoding's bitrate:

```
int bandwidth_avg      // average available network bandwidth
int video_bit_rate     // current video encoding bit rate
if bandwidth_avg < video_bit_rate
  for each encoding sorted by bit rate in descending order
    if encoding.bit_rate < bandwidth_avg && encoding.bit_rate !=
video_bit_rate
      change encoding
      break
    end
  end
end
```

In one embodiment, when an encoding change is desired, the client-side proxy 104 will terminate its existing persistent HTTP connection and initiate a new persistent HTTP connection requesting the data for the new encoding. In another embodiment, polled approaches just switch the segment type requested from the server-side proxy 106 or CDN 320 by the client-side proxy 104.

FIG. 4 is a diagram 400 of a segment format which may be used in accordance with an embodiment of the present invention. The segment 402 contains a plurality of segment frames 404. Each segment frame 404 consists of a frame header 406 and a frame payload

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
241 of 455

408. The frame header 406 contains frame type information 410 and frame payload length information 412. In one embodiment, the frame type indicates the payload channel information (audio RTP, audio RTCP, video RTP, and/or video RTCP) as well as any additional information about the payload framing. The frame payload length 412 indicates the length of the segment frame payload section 408. The frame payload length 412 may be used to parse the segment sequentially, without the need for global index headers and metadata to be packed at the beginning of the segment. In one embodiment, the frame header 406 is aligned to 4 or 8 byte boundaries to optimize copying of the frame payload 408. In one embodiment, the frame payload 408 contains an RTP or RTCP packet 414. In one embodiment, RTP protocol pads the frame payload 408 out to a 4 or 8 byte boundary, to ensure that the frame header 406 is 4 or 8 byte aligned, respectively.

FIG. 5 is a flow chart 500 describing the process of retrieving content from an RTSP server 108 and generating segments in the server-side proxy 106. In step 502, the server-side proxy 106 initiates a connection to the RTSP server 108, setting up the necessary RTP/RTCP channels (i.e., audio RTP, audio RTCP, video RTP, and/or video RTCP). In step 504, it checks to see if a new segment file is needed. In the case of a new connection, a new segment file is needed. In the case of an existing connection, the segment file contents are checked against segment file capacity thresholds. In one embodiment, the file capacity is based on the wall-clock duration of the stream, e.g., 10 seconds of data. In another embodiment, the file capacity is based on video key frame boundaries, e.g. 10 seconds of data plus any data until the next key frame is detected. In another embodiment, then file capacity is based on file size in bytes, e.g., 128KB plus any data until the next packet. If the threshold is not met, processing continues to step 506. If the threshold has been met, or the connection is new, processing continues to step 508. The processing from step 508 for existing connections is described below. For new connections, step 508 simply opens a new segment which is used during the processing of steps 506 through 516/518 for the first segment of a new connection.

In step 506, the server-side proxy 106 reads from the RTP/RTCP connections. The reads are performed periodically. In one embodiment, a delay is inserted at the beginning of step 506, e.g., 1 second, to allow RTP/RTCP data to accumulate in the sockets. The data from all RTP/RTCP channels is read, and ordered. In one embodiment, packets are inserted into a priority queue, based on their timestamps. Enforcing time-based ordering simplifies

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
242 of 455

the parsing for the client-side proxy 104. The priority queue allows data to be written into segments based on different segment sizing criteria. In one embodiment, packet data from the priority queue is later read and written to the segment file. This allows the segment file to write less than the amount of data that was read from the sockets. In another embodiment, RTP/RTCP packets are written directly into the segment file.

Once a batch read is completed, the processing proceeds to step 516 to check and see if any transcoding is required. If transcoding is required, processing proceeds to step 518 where the transcoding occurs. In one embodiment, a plurality of queues are maintained, one for each transcoding. The RTP frame data is reassembled and transcoded using methods which should be known to those skilled in the art. In one embodiment only the video bitrates differ between encodings. In another embodiment, the video bitrates, frame rates, and/or resolution may differ. The transcoded frames are re-encapsulated using the existing RTP headers that were supplied with the original input. The encapsulated frames are written to the corresponding queues associated with each encoding.

Once transcoding is complete, or if no transcoding was required, processing proceeds back to step 504 to check and see if the segment thresholds have been met with the newly read data. The loop from 504 through 516/518 is repeated until the segment threshold is reached in step 508.

In step 508, the data for the segment is flushed out to a file and the file is closed. In one embodiment, the threshold checking performed in step 504 indicates how much data to pull from the priority queue and write to the file. Once the file has been written, the buffers are flushed and the file is closed. In another embodiment, the data has already been written to the segment file in step 506 and only a buffer flush is required prior to closing the file. Once the buffer has been flushed, two parallel paths are executed. In one execution path, processing proceeds back to step 506 for normal channel operations. In another execution path, starting in step 510, post processing is performed on the segment and the segment is delivered to the client. In step 510, a check is done to see if segment encryption is required. If no segment encryption is required processing proceeds to step 514. If segment encryption is required, processing proceeds to step 512 where the segment encryption is performed. The segment encryption generates a segment specific seed value for the encryption cipher. In one embodiment, the encryption seed is based off of a hash (e.g., MD5 or SHA1) of the shared secret and the segment number. Other seed generation

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
243 of 455

techniques may also be used, as long as they are reproducible and known to the client-side proxy 104. Once the segment has been encrypted, processing proceeds to step 514. In step 514, the segment is read for delivery to the client-side proxy 104. If the client-side proxy 104 has initiated a persistent HTTP connection to the server-side proxy 106, the segment is sent out over the persistent HTTP connection. The segment name, which contains meaningful information about the segment (e.g., segment number, encoding type, and encryption method) is sent first, and then the segment itself is sent after. Each is sent as an individual HTTP chunk.

FIG. 6 is a flow chart 600 describing the process of retrieving content from the server-side proxy 106 or CDN 320 and redistributing that content over RTSP connections 114 or multicast trees 214 to client devices 102 from the client-side proxy 104. In step 602, the client-side proxy 104 accepts an RTSP connection from the client device 102. In step 604, the client-side proxy 104 then initiates a persistent HTTP connection to the server-side proxy 106 or CDN 320. In one embodiment, a persistent HTTPS connection using SSL/TLS to secure the connection is initiated. The HTTP GET request indicates a segment name. The segment name contains meaningful information about the segment (e.g., segment number, encoding type, encryption method, and the source content identifier). The server-side proxy 106 associates the request with an existing backend process 500 (FIG. 5), or creates a new backend process 500 to service the request. Processing then proceeds to step 606 where the client-side proxy 104 waits for a segment to be sent by the server-side proxy 106. When the segment is received by the client-side proxy 104, the client-side proxy 104 calculates the time it took to receive the segment, and uses that to compute a bandwidth estimate. The bandwidth estimate is used at a later point to check and see if a rate switch should be initiated.

The segment pre-processing starts in step 608. In step 608, the segment is checked to see if it is encrypted. In one embodiment, encryption is denoted by the segment name. If the segment is encrypted, then processing proceeds to step 610 where the segment is decrypted. Once the segment is decrypted, or if the segment was not encrypted, processing proceeds to step 612. In step 612, the segment is parsed and the RTP/RTCP contents are retrieved. The RTP/RTCP headers are normalized so that port numbers, sequence numbers, and timestamps provided by the RTSP server 108 to the server-side proxy 106, are converted to match the connection parameters negotiated between the client-side proxy 104

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
244 of 455

and the client device 102. The RTP/RTCP packets are then queued for transmission to the client device 102. Relative time-based pacing is implemented so as not to overrun the client device 102. In one embodiment, each packet is paced exactly using the difference in timestamps from the original RTP/RTCP packets to determine the delay between packet transmissions. In another embodiment, packets are sent in bursts, using the difference in timestamps from the original RTP/RTCP packets to determine the delay between packet burst transmissions. Once all the packets from the current segment have been sent, processing proceeds to step 614.

In step 614, a check is performed to see if a rate switch is desired. The bandwidth estimate information gathered in step 606 is compared with the bitrate of the segment that was just retrieved. If the available bandwidth is less than, or very near the current video encoding's bitrate, then a switch to a lower bitrate may be warranted. If the available bandwidth is significantly higher than the current encoding's bitrate and a higher bitrate encoding's bitrate, then a switch to a higher bitrate may be acceptable. If no rate switch is desired, then processing proceeds back to step 606 to await the next segment. If a rate switch is desired, processing proceeds to step 616 where the new bitrate and new segment name are determined. The current persistent HTTP connection is then terminated, and processing proceeds back to step 604 to initiate a new persistent HTTP connection. In one embodiment, the check for a rate switch may be performed in parallel with segment decryption and parsing to mask the latency of setting up the new persistent HTTP connection.

FIG. 7 is a flow chart 700 describing another process for retrieving content from the server-side proxy 106 or CDN 320 and redistributing that content over RTSP connections 114 or multicast trees 214 to client devices 102 from the client-side proxy 104. In step 702, the client-side proxy 104 accepts an RTSP connection from the client device 102. In step 704, the client-side proxy 104 then issues an HTTP request to the server-side proxy 106 or CDN 320. In one embodiment, an HTTPS connection using SSL/TLS secures the connection. The HTTP GET request indicates a segment name. The segment name contains meaningful information about the segment (e.g., segment number, encoding type, encryption method, and the source content identifier). Processing then proceeds to step 706 where the client-side proxy 104 waits for a segment to be retrieved from the server-side proxy 106 or CDN 320. When the segment is received by the client-side proxy 104, the

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
245 of 455

client-side proxy 104 calculates the time it took to receive the segment, and uses that to compute a bandwidth estimate.

The segment pre-processing starts in step 708. In step 708, the segment is checked to see if it is encrypted. In one embodiment, encryption is denoted by the segment name. If the segment is encrypted, then processing proceeds to step 710 where the segment is decrypted. Once the segment is decrypted, or if the segment was not encrypted, processing proceeds to step 712. In step 712, the segment is parsed and the RTP/RTCP contents are retrieved. The RTP/RTCP headers are normalized so that port numbers, sequence numbers, and timestamps provided by the RTSP server 108 to the server-side proxy 106, are converted to match the connection parameters negotiated between the client-side proxy 104 and the client device 102. The RTP/RTCP packets are then queued for transmission to the client device 102. Relative time-based pacing is implemented so as not to overrun the client device 102. In one embodiment, each packet is paced exactly using the difference in timestamps from the original RTP/RTCP packets to determine the delay between packet transmissions. In another embodiment, packets are sent in bursts, using the different in timestamps from the original RTP/RTCP packets to determine the delay between packet burst transmissions. Once all the packets from the current segment have been sent, processing proceeds to step 714.

In step 714, a check is performed to see if a rate switch is desired. The bandwidth estimate information gathered in step 706 is compared with the bitrate of the segment that was just retrieved. If the available bandwidth is less than, or very near the current video encoding's bitrate, then a switch to a lower bitrate may be warranted. If the available bandwidth is significantly higher than the current encoding's bitrate and a higher bitrate encoding's bitrate, then a switch to a higher bitrate may be acceptable. If a rate switch is desired, processing proceeds to step 716 where the new bitrate and new segment name are determined. Once the new next segment is determined, or if no rate change was necessary, processing proceeds to step 718 where the pacing delay is calculated and enforced. The client-side proxy 104 does not need to retrieve the next segment until the current segment has played out; the pacing delay minimizes unnecessary network usage. In one embodiment, a pacing delay of (D – S/B – E), where D is the duration of the current segment, S is the size of the current segment (used as the estimated size of the next segment), B is the estimated available bandwidth, and E is an error value > 0. The

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
246 of 455

calculation takes the duration of the current segment, minus the retrieval time of the next segment, minus some constant to prevent underrun as the pacing delay. In another embodiment, no pacing delay is enforced, to provide maximum underrun protection. Processing waits in step 718 for the pacing delay to expire, then proceeds back to step 704 to issue the next segment retrieval HTTP GET request.

FIG. 8 is a diagram 800 of the components of the server-side proxy 106. A video stream 812 is recorded by the stream recorder 802. The stream recorder implements the specific protocol required to connect to the video stream 812. In one embodiment the protocol is RTMP. In another embodiment the protocol is RTSP/RTP. In another embodiment, the protocol is HTTP Live Streaming. In another embodiment, the protocol is Smooth Streaming. There are numerous live streaming protocols, as should be known to those skilled in the art, of which any would be suitable for the stream recorder 802. The stream recorder 802 passes recorded data to the stream transcoder 804, as it is received. The stream transcoder 804 is responsible for decoding the input stream and re-encoding the output video frames in the proper output bitrate, frame rate, and/or resolution. The stream transcoder 804 passes the re-encoded frames to the output framer 806. The output framer 806 is responsible for packing the encoded frames into the proper container format. In one embodiment, the stream transcoder 804 and output framer 806 support the H.264 , H263, MPEG2, MPEG4, and WVM, video codecs and the MP3, AAC, AMR, and WMA audio codecs, along with the FLV, MOV, 3GP, MPEG2-TS and Advanced Systems Format (ASF) container formats. In another embodiment, the stream transcoder 804 and output framer 806 may support other standard or proprietary codecs and container formats. In one embodiment, the output framer supports RTP encapsulation as well as the custom segment encapsulation described in FIG. 4. There are numerous video and audio codecs and container formats, as should be known to those skilled in the art, of which any would be suitable for the stream transcoder 804 and output framer 806. The output framer 806 writes the formatted data into segment files in the local media storage 816. The output framer 806 is responsible for enforcing segment boundaries and durations. When the segments are complete, the output framer 806 notifies the segment encryptor 808. If segment encryption is required, the segment encryptor 808 reads the segment from the media storage 816, encrypts the segment, and writes the encrypted segment back out to the media storage 816.

In one embodiment, the segment uploader 810 is notified that the segment is ready

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
247 of 455

for upload to the CDN 320 and the segment uploader 810 uploads the finished segments to the CDN 320 over connection 814. In one embodiment, the segment uploader 810 uses persistent HTTP connections to upload segments. In another embodiment, the segment uploader 810 uses persistent HTTPS connections to upload segments. In another embodiment, the segment uploader 810 uses onetime use HTTP connections to upload segments. In another embodiment, the segment uploader 810 uses onetime use HTTPS connections to upload segments. In another embodiment, the segment uploader 810 uses persistent FTP, SFTP, or SCP connections to upload segments. In another embodiment, the segment uploader 810 uses onetime use FTP, SFTP, or SCP connections to upload segments. In another embodiment, segment uploader 810 uses simple file copy to upload segments. There are numerous methods, with varying levels of security, which may be used to upload the files, as should be known to those skilled in the art, of which any would be suitable for the segment uploader 810.

In another embodiment, the completed segments are made available to an HTTP server 818. The HTTP server 818 accepts connections from the client-side proxy 104. Segments are read from the media storage 816 and delivered to the client-side proxy 104.

FIG. 9 is a diagram 900 of a client device, wherein the client device native media player 910 supports RTSP/RTP. In one embodiment, the client contains a downloader 902. The downloader 902 is responsible for interacting with the server-side proxy 106 or CDN 320 to retrieve segments. In one embodiment, the downloader 902 keeps track of multiple server-side proxies 106 or CDNs 320. Segments are retrieved from the primary server-side proxy 106 or CDN 320. If the response to a segment request fails to arrive in an acceptable amount of time, the downloader 902 issues a request to an alternate server-side proxy 106 or CDN 320. In one embodiment, the retrieval timeout is set as a percentage of the duration of the segment (e.g., 20%). The segments retrieved are written into the media buffer 920 and the downloader 902 notifies the segment decryptor 904. If the segment does not require decryption, the segment decryptor 904 notifies the segment parser 906 that the segment is ready. If the segment does require decryption, the segment decryptor 904 reads the segment from the media buffer 920, decrypts the segment, writes the decrypted segment back out to the media buffer 920, and notifies the segment parser 906 that the segment is ready. RTSP requires separate frame based delivery for audio and video tracks. The segments retrieved use the format 400 detailed in FIG. 4. The segments are parsed by the segment parser 906

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
248 of 455

to extract the individual audio and video RTP/RTCP frames. The RTP/RTCP frames are extracted and handed off to the RTSP server 908. In one embodiment, the segment parser 906 removes the segment from the media buffer 920 once it has been completely parsed. In another embodiment, the segment parser 906 does not purge segments until the media buffer 920 is full. The RTSP server 908 handles requests from the media player 910 on the RTSP control channel 914, and manages setting up the audio and video RTP channels 916 and 918, and the audio and video RTCP channels 917 and 919. The audio and video RTP/RTCP frames are sent in a paced manner, by the RTSP server 908 on their respective RTP/RTCP channels 916, 918, 917, and 919. In one embodiment, the relative inter-frame pacing information is gleaned from the RTP header timestamps. In one embodiment, the RTP headers are spoofed to produce valid sequence numbers and port numbers, etc., prior to delivery to the native media player 910.

FIG. 10 is a diagram 1000 of a client device, wherein the client device native media player 1010 supports HLS. In one embodiment, the client contains a downloader 1002. The downloader 1002 is responsible for interacting with the server-side proxy 106 or CDN 320 to retrieve segments. In one embodiment, the downloader 1002 keeps track of multiple server-side proxies 106 or CDNs 320. Segments are retrieved from the primary server-side proxy 106 or CDN 320. If the response to a segment request fails to arrive in an acceptable amount of time, the downloader 902 issues a request to an alternate server-side proxy 106 or CDN 320. In one embodiment, the retrieval timeout is set as a percentage of the duration of the segment (e.g., 20%). The segments retrieved are written into the media buffer 1020 and the downloader 1002 notifies the segment decryptor 1004. If the segment does not require decryption, the segment decryptor 1004 notifies the m3u8 playlist generator 1006 that the segment is ready. If the segment does require decryption, the segment decryptor 1004 reads the segment from the media buffer 1020, decrypts the segment, writes the decrypted segment back out to the media buffer 1020, and notifies the m3u8 playlist generator 1006 that the segment is ready. The playlist generator 1006 is passed the segment file location, in the media buffer, by the segment decryptor 1004. The playlist generator 1006 updates the existing playlist adding the new segment and removing the oldest segment and passes the updated playlist to the HTTP server 1008. The playlist generator 1006 is also responsible for purging old segments from the media buffer 1020. In one embodiment, segments are purged from the media buffer 1020 as segments are removed from the playlist. In another

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
249 of 455

embodiment, segments are only purged once the media buffer 1020 is full, to support the largest possible rewind buffer. The HTTP server 1008 responds to playlist polling requests from the media player 1010 with the current playlist provided by the playlist generator 1006. The HTTP server 1008 responds to segment requests from the media player 1010 by retrieving the segment from the media buffer 1020 and delivering it to the media player 1010. The media player 1010 connects to the HTTP server 1008 though a local host HTTP connection 1016.

FIG. 11 is a block diagram 1100 for another embodiment of the present invention. As with FIGs. 1, 2, and 3, it shows an RTSP server 108, the server-side proxy 106, the client-side proxy 104, and a client device 102. As with FIG. 3, it shows multiple RTSP connections 112 to the server-side proxy 106. The server-side proxy 106 connects to a plurality of CDNs 320 for redundancy in the remote storage of the generated segments, allowing for redundancy in the retrieval of segments. The client-side proxy 104 is integrated into the client device 102 application 318. The native HLS media player 316 connects to the client-side HLS proxy 104 via an HTTP connection 1122. The server-side proxy 106 makes multiple simultaneous RTSP connections 112 to the RTSP server 108 and retrieves the same content encoded at different bitrates, frame rates, and/or resolutions. In one embodiment only the video bitrates differ between encodings. In another embodiment, the video bitrates, frame rates, and/or resolution may differ. Though only one client-side proxy 104 is shown, multiple client-side proxies 104 may connect to the CDNs 320.

In one embodiment, the client-side proxy 104 connects to only a primary CDN 320 via connection 110. In one embodiment, the primary CDN is configured by the user or via the application 318. In one embodiment, if the request for content from the primary CDN 320 does not produce a response in a set amount of time, the client-side proxy 104 will initiate a second connection 110' to an alternate CDN 320' to retrieve the content. In one embodiment, the alternate CDNs are configured by the user or via the application 318. This provides resiliency to the system against CDN 320 network access failures for either the client-side proxy 104 or the server-side proxy 106.

In another embodiment, the client-side proxy 104 connects to both a primary CDN 320 and an alternate CDN 320', via connections 110 and 110' respectively. In one embodiment, the primary and alternate CDNs 320 are configured by the user or via the application 318. The client-side proxy 104 issues requests for a segment to all CDNs 320.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
250 of 455

The connection 110 for the first response to begin to arrive is chosen and all other connections 110 are aborted. This provides not only resiliency against CDN 320 network access failures, but also optimizes retrieval latency based on initial response time.

In one embodiment, the connections 110 and 110' between the client-side proxy 104 and the CDN 320 are persistent HTTP connections. In another embodiment, the connections 110 and 110' are persistent HTTPS connections. In another embodiment, the connections 110 and 110' are onetime use HTTP connections. In another embodiment, the connections 110 and 110' are onetime use HTTPS connections. In another embodiment, the connections 110 and 110' are persistent FTP, SFTP, or SCP connections. In another embodiment, the connections 110 and 110' are onetime use FTP, SFTP, or SCP connections.

FIG. 12 is a flow chart 1200 describing the process of implementing segment retrieval resiliency between client-side proxies 104 and server-side proxies 106 or CDNs 320. In step 1202, the client-side proxy 104 initiates a connection 110 to a primary server-side proxy 106 or CDN 320 and proceeds to step 1204. In step 1204, the client-side proxy 104 issues a segment retrieval request to the primary server-side proxy 106 or CDN 320. The client-side proxy 104 also sets a timer to detect when the segment response is taking too long. The timer should be set for less than the segment duration (e.g., 1/5 the segment duration) to allow enough time to request the segment from an alternate server-side proxy 106 or CDN 320. In one embodiment, the timer may be set for zero time in order to initiate multiple simultaneous requests for segments from multiple server-side proxies 106 or CDNs 320. When the segment response is received, or if the timer expires, processing proceeds to step 1206. In step 1206, the client-side proxy 104 checks to determine if the segment was received or if the timer expired. If the segment was received processing proceeds to step 1208, otherwise processing proceeds to step 1210. In step 1208, the received segment is processed. In one embodiment, segment retrieval is paced, so segment processing includes delaying until the next segment retrieval time. Once segment processing is complete, processing proceeds back to step 1204 where the next segment to be retrieved is requested. In step 1210, the current segment retrieval request has been determined to be taking too long. A new connection 110' may be initiated to an alternate server-side proxy 106 or CDN 320. In one embodiment, the current request is immediately aborted. In another embodiment, both the current connection 110 and the new connection 110' are kept open

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
251 of 455

until a response is received and the connection 110 with the fastest response is used, and the other connection 110 is closed. Once the alternate connection is opened, processing proceeds back to step 1204 where the segment request to the alternate server-side proxy 106 or CDN 320 is issued.

For purposes of completeness, the following provides a non-exclusive listing of numerous potential specific implementations and alternatives for various features, functions, or components of the disclosed methods, system and apparatus.

The streaming server may be realized as an RTSP server, or it may be realized as an HLS server, or it may be realized as an RTMP server, or it may be realized as a Microsoft Media Server (MMS) server, or it may be realized as an Internet Information Services (IIS) Smooth Streaming server.

Streaming data may be audio/video data. The audio/video may be encapsulated as RTP/RTCP data, or as MPEG-TS data, or as RTMP data, or as ASF data, or as MP4 fragment data.

Audio RTP, audio RTCP, video RTP, and video RTCP data within the file segments may be differentiated using custom frame headers. The custom frame headers may include audio/video track information for the frame, and/or frame length information, and/or end-of-stream delimiters.

Either fixed duration or variable duration segments may be used. Fixed duration segments may be of an integral number of seconds.

File segments may be encrypted, and if so then per-session cipher algorithms may be negotiated between proxies. Encryption algorithms that can be used include AES, RC4, and HC128. Different file segments may use different seed values for the cipher. Per-session seed modification algorithms may also be negotiated between proxies. A seed algorithm may use a segment number as the seed, or it may use a hash of the segment number and a shared secret.

Storage devices used for storing file segments may include local disks, and/or remote disks accessible through a storage access network.

The storage devices may be hosted by one or more content delivery networks (CDNs). A CDN may be accessed through one or more of HTTP POST, SCP/SFTP, and FTP. The client-side proxy may retrieve segments from the CDN.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
252 of 455

Data may be transferred between proxies using HTTP, and if so persistent connections between proxies may be used. Segments may be transferred securely using HTTPS SSL/TLS.

The client-side proxy may be a standalone network device. Alternatively, it may be embedded as part of an application in a client device (e.g., a mobile phone).

The client-side proxy may cache segments after they are retrieved. The segments may be cached only until the content which they contain has been delivered to the client media player, or they may be cached for a set period of time to support rewind requests from the client media player.

The server-side proxy may initiate a plurality of connections to a single streaming server for a single media, and may request a different bitrate for the same audio/video data on each connection. The client-side proxy may request a specific bitrate from the server-side proxy.

The server-side proxy may initiate a plurality of connections to a plurality of streaming servers for a single media. Alternatively, it may initiate a plurality of connections to a plurality of streaming servers for a plurality of different media. Media data from different connections may be spliced together into a single stream. For example, advertisements may be spliced in, or the data from different connections may be for different viewing angles for the same video event.

The client-side proxy may stream the segment data to the media player on the client device, for example using appropriate RTP/RTCP ports to an RTSP media player. Streaming may be done via IP multicast to client media players. The server-side proxy may act as an MBMS BCMCS content provider, and the client-side proxy may act as an MBMS BCMCS content server. Data may be made available to the client via HTTP for an HLS media player.

The server-side proxy may connect to the streaming server to retrieve a high bitrate media. The high bitrate media may be transcoded into a plurality of different encodings, e.g., a plurality of different bitrates, a plurality of different frame rates, a plurality of different resolutions. Independent file segments may be generated for each encoding. A plurality of container formats may be supported, such as MPEG-TS format or a custom RTP/RTCP format. All of the different encoding and format segment files may be made available to the client-side proxy through the storage device.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
253 of 455

The client-side proxy may request segments from a single server-side proxy. A segment may be retrieved from an alternate first proxy if the primary first proxy does not respond with an acceptable amount of time.

The client-side proxy may request segments from a plurality of server-side proxies, and may accept the first response that is received. Requests whose responses were not received first may be cancelled.

Though various implementations of both the client-side proxy and the server-side proxy are described, the heterogeneous permutations of multiple client-side proxy implementations and server-side proxy implementations are all valid. Any client-side proxy implementations, be they embedded in a mobile device application, or as a stand-alone appliance, using multicast or unicast delivery, may be paired with any of the server-side implementations, be they delivering segments via a local HTTP server or through one or more CDNs and connecting to one or multiple streaming servers. The abstraction of the tunneling functionality provided by the client-side and server-side proxies allow for transparent usage by the client device. The client device connects to the client-side proxy, regardless of its specific implementation. The server-side proxy connects to the streaming servers, regardless of its specific implementation. The client-side proxy and the server-side proxy communicate with each other to transparently tunnel media content from the streaming server to the client device. The tunneling may be through various physical transport mechanisms, including using a CDN as an intermediate storage device. It should be understood that the examples provided herein are to describe possible independent implementations for the client-side and server-side proxies, but should not be taken as limiting the possible pairing of any two client-side or server-side proxy implementations.

In the description herein for embodiments of the present invention, numerous specific details are provided, such as examples of components and/or methods, to provide a thorough understanding of embodiments of the present invention. One skilled in the relevant art will recognize, however, that an embodiment of the invention can be practiced without one or more of the specific details, or with other apparatus, systems, assemblies, methods, components, materials, parts, and/or the like. In other instances, well-known structures, materials, or operations are not specifically shown or described in detail to avoid obscuring aspects of embodiments of the present invention.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
254 of 455

CLAIMS

What is claimed is:

1. A method of operating a server-side proxy in a streaming data delivery system, comprising:

connecting to a streaming server to receive streaming data;

aggregating the streaming data into file segments and storing the file segments on one or more storage devices; and

transferring the file segments from the storage devices to a client-side proxy for delivery to a client device.

2. A method according to claim 1, wherein connecting to the streaming server comprises creating one or more real-time streaming connections.

3. A method according to claim 2, wherein the real-time streaming connections include a plurality of connections to the streaming server, the connections carrying the streaming data at respective distinct bit rates.

4. A method according to claim 2, wherein the streaming server is realized as a selected one of Real-Time Streaming Protocol (RTSP) server, an HTTP Live Streaming (HLS) server, a Real-Time Messaging Protocol (RTMP) server, a Microsoft Media Server (MMS) server, and an Internet Information Services (IIS) Smooth Streaming server.

5. A method according to claim 1, wherein the streaming data includes audio/video data encapsulated as a selected one of Real-Time Protocol/Real-Time Control Protocol (RTP/RTCP) data, MPEG Transport Stream (MPEG-TS) data, Real-Time Messaging Protocol (RTMP) data, Advanced Systems Format (ASF) data, and MPEG-4 (MP4) fragment data.

6. A method according to claim 1, wherein the streaming server is one of a plurality of streaming servers, and connecting to the streaming server is part of establishing respective connections to each of the plurality of streaming servers.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
255 of 455

7. A method according to claim 6, wherein the connections to different streaming servers carry respective distinct media.

8. A method according to claim 7, further including splicing media from distinct ones of the connections to create a single output stream to be delivered to the client device.

9. A method according to claim 1, wherein transferring the file segments includes encrypting the file segments from the storage devices to form encrypted file segments and transferring the encrypted file segments to the client-side proxy.

10. A method according to claim 1, wherein aggregating the file segments includes transcoding the file segments into transcoded file segments and aggregating the transcoded file segments for storing on the storage devices and transferring to the client-side proxy.

11. A method according to claim 1, wherein the file segments contain data of distinct types differentiated through use of custom frame headers each including media information, length information and an end-of-stream delimiter.

12. A method according to claim 1, wherein transferring includes use of a secure connection between the server-side proxy and the client-side proxy to securely transfer the file segments to the client-side proxy.

13. A server-side proxy for use in a streaming data delivery system, comprising:

memory;

a processor;

input/output circuitry for connecting the server-side proxy to a streaming server, one or more storage devices, and a client-side proxy; and

one or more data buses by which the memory, processor and input/output circuitry are coupled together,

the memory and processor being configured to store and execute program instructions to enable the server-side proxy to perform the method of any of claims 1 to 12.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
256 of 455

14. A method of operating a client-side proxy in a streaming data delivery system, comprising:

connecting to a server-side proxy to receive file segments of a data stream originated by a streaming server to which the server-side proxy is connected;

parsing the file segments to generate native live stream data; and

serving the native live stream data to one or more clients for live media playback.

15. A method according to claim 14, wherein serving the native live stream data to the clients comprises creating a respective real-time streaming connection to the respective client.

16. A method according to claim 15, wherein the real-time streaming connection is selected from a Real-Time Streaming Protocol (RTSP) connection and an HTTP Live Streaming (HLS) connection.

17. A method according to claim 14, wherein connecting to the server-side proxy includes establishing a persistent hypertext transport protocol (HTTP) connection with the server-side proxy.

18. A method according to claim 14, wherein the file segments are encrypted as received from the server-side proxy and parsing the file segments includes decrypting the file segments to form decrypted file segments, and serving the native live stream data includes streaming data from the decrypted file segments to the clients.

19. A method according to claim 14, further including monitoring for a need for a rate switch to change a rate at which the data of the file segments is received from the server-side proxy, and upon detecting the need for a rate switch then closing an existing connection to the server-side proxy and establishing a new connection to the server-side proxy for receiving the file segments at a new rate.

20. A method according to claim 14, wherein connecting to the server-side proxy includes

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
257 of 455

use of non-persistent hypertext transport protocol (HTTP) connections with the server-side proxy, each non-persistent HTTP connection used for receiving a respective one of the file segments.

21. A method according to claim 14, further including establishing a multicast distribution tree to which the clients can connect, and wherein serving the native live stream data includes transmitting the native live stream data to the multicast distribution tree for delivery to the clients.

22. A method according to claim 14, wherein each file segment is requested from a plurality of content delivery networks coupled to the server-side proxy, and a requested file segment is received from a first one of the content delivery networks to deliver the requested file segment.

23. A method according to claim 22, further including:

monitoring for delivery of the requested file segment via one of the content delivery networks, and receiving the requested file segment from the one content delivery network if delivered thereby; and

in the event that the requested file segment is not delivered by the one content delivery network, then requesting the file segment from another content delivery network.

24. A method according to claim 22, wherein:

multiple parallel requests for the requested file segment are submitted to different ones of the content delivery networks;

the requested file segment is received from the content delivery network having the fastest response; and

the requests to the other content delivery networks are.

25. A client-side proxy for use in a streaming data delivery system, comprising:

memory;

a processor;

input/output circuitry for connecting the client-side proxy to one or more client

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
258 of 455

media players and a server-side proxy; and

one or more data buses by which the memory, processor and input/output circuitry are coupled together,

the memory and processor being configured to store and execute program instructions to enable the client-side proxy to perform the method of any of claims 14 to 24.

26. A method for distributing live streaming data to clients, comprising:

connecting to a streaming server from a first proxy;

aggregating streaming data into file segments at the first proxy;

writing the file segments to a plurality of storage devices;

transferring the file segments from the storage devices to a second proxy;

decoding and parsing the file segments at the second proxy to generate native live stream data; and

serving the native live stream data to clients for live media playback.

27. A live streaming system for distributing live streaming data to clients, comprising:

a first proxy configured and operative to (1) connect to a streaming server, (2) aggregate streaming data into file segments, (3) write the file segments to a plurality of storage devices, and (4) transfer the file segments from the storage devices to a second proxy; and

a second proxy configured and operative to (1) receive the file segments from the first proxy, (2) decode and parse the file segments to generate native live stream data, and (3) serve the native live stream data to clients for live media playback.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
259 of 455

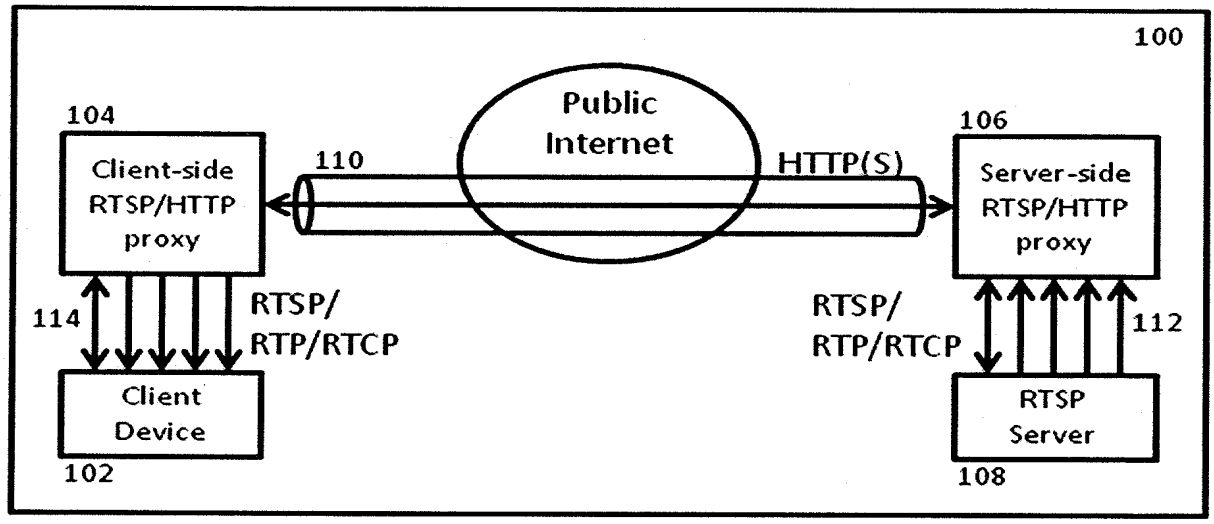

100
104
Client-side RTSP/HTTP proxy
110
Public Internet
HTTP(S)
106
Server-side RTSP/HTTP proxy
114
RTSP/ RTP/RTCP
RTSP/ RTP/RTCP
112
Client Device
102
RTSP Server
108

Fig. 1

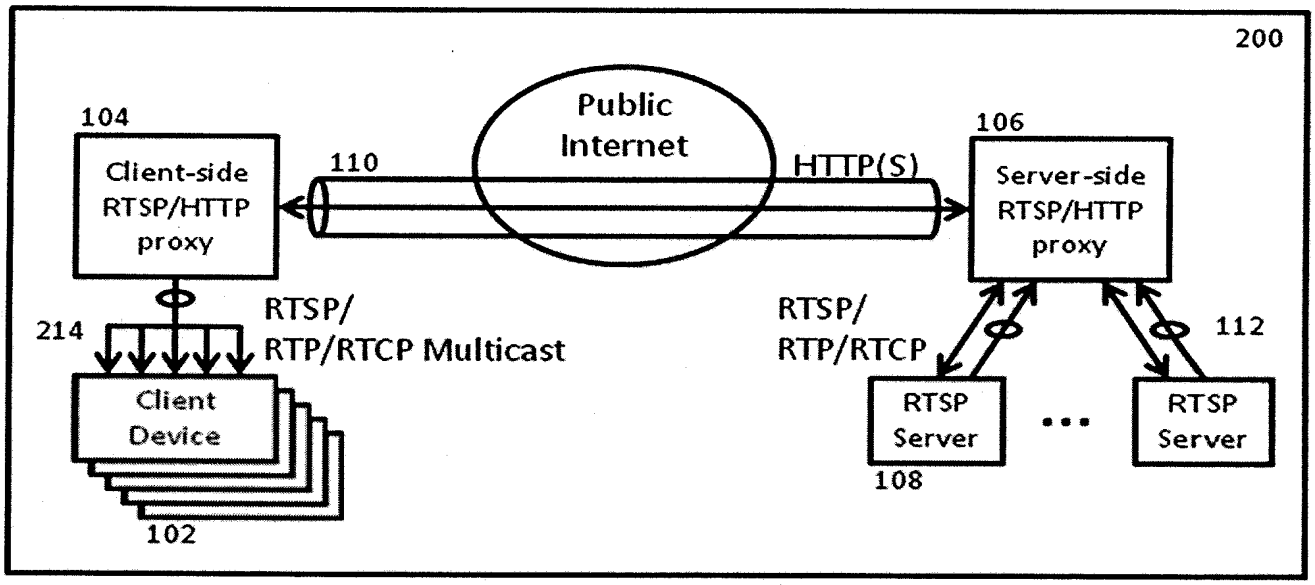

200
104
Client-side RTSP/HTTP proxy
110
Public Internet
HTTP(S)
106
Server-side RTSP/HTTP proxy
214
RTSP/ RTP/RTCP Multicast
RTSP/ RTP/RTCP
112
Client Device
102
RTSP Server
108
RTSP Server

Fig. 2

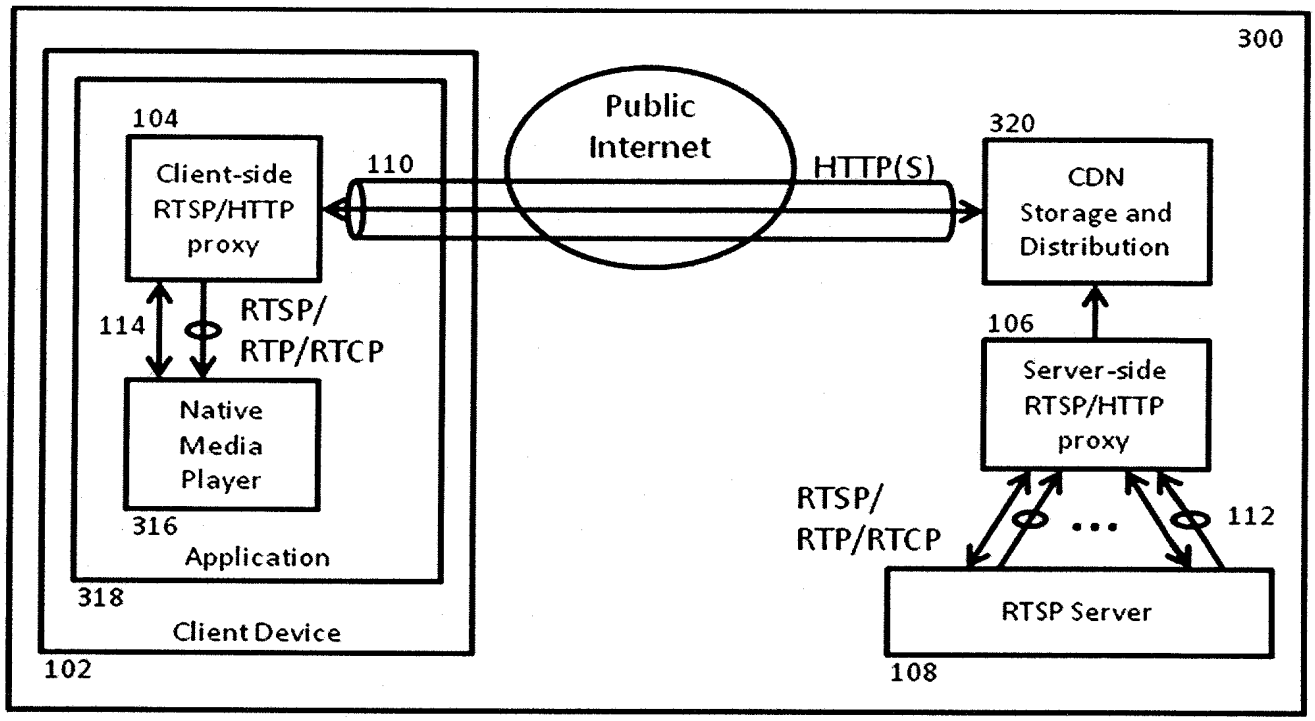

300
104
Client-side RTSP/HTTP proxy
110
Public Internet
HTTP(S)
320
CDN Storage and Distribution
114
RTSP/ RTP/RTCP
106
Server-side RTSP/HTTP proxy
Native Media Player
316
Application
318
Client Device
102
RTSP/ RTP/RTCP
112
RTSP Server
108

Fig. 3

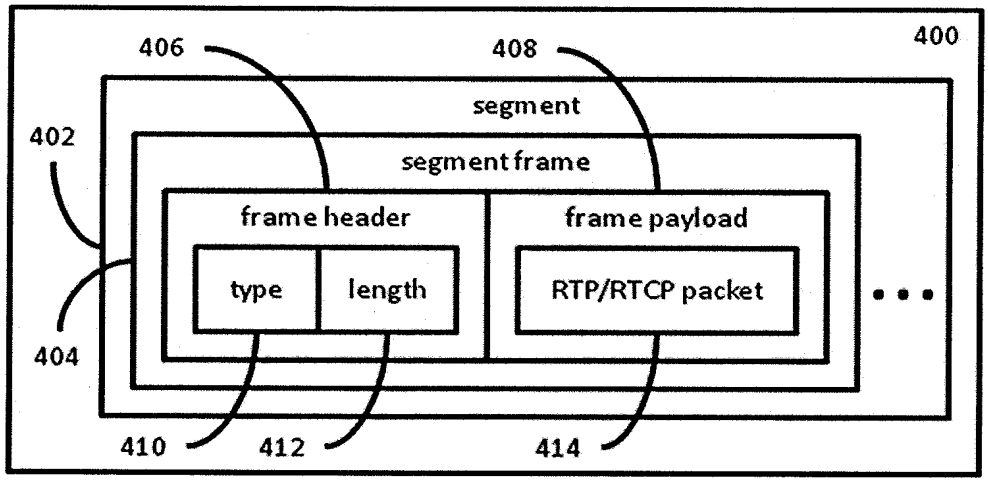

400
406
408
segment
402
segment frame
frame header
frame payload
type
length
RTP/RTCP packet
404
410
412
414

Fig. 4

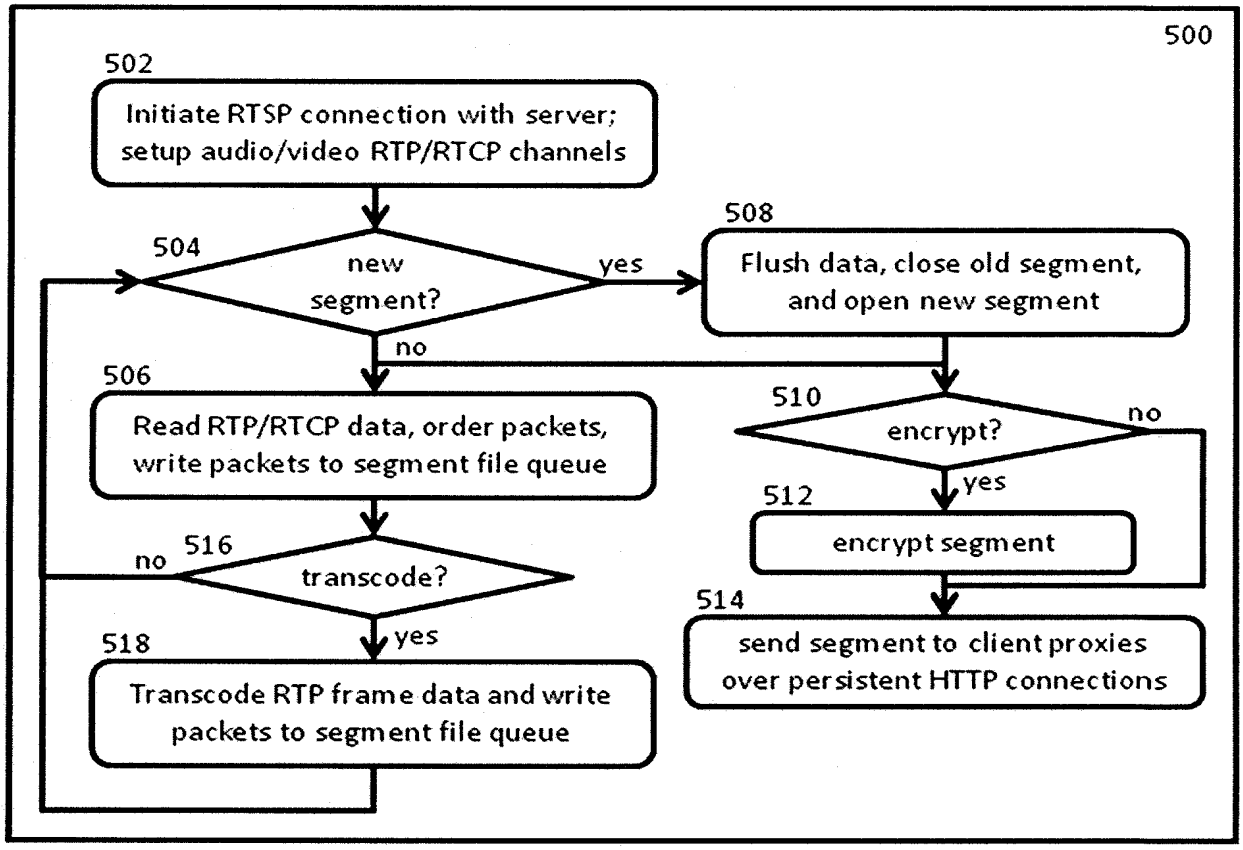

500
502
Initiate RTSP connection with server; setup audio/video RTP/RTCP channels
504
new segment?
yes
508
Flush data, close old segment, and open new segment
no
506
Read RTP/RTCP data, order packets, write packets to segment file queue
510
encrypt?
no
yes
512
encrypt segment
516
no
transcode?
yes
514
send segment to client proxies over persistent HTTP connections
518
Transcode RTP frame data and write packets to segment file queue

Fig. 5

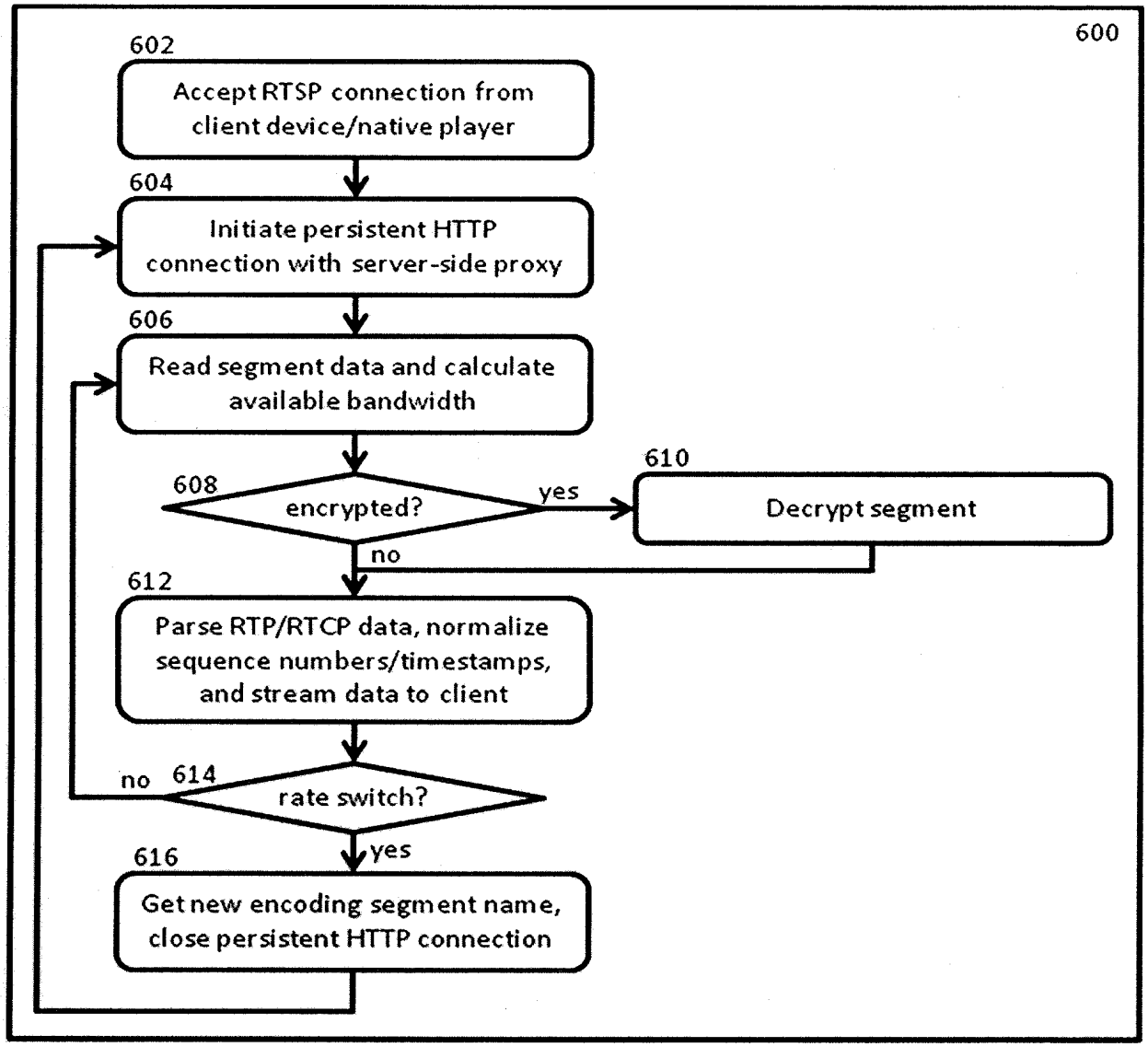

600
602
Accept RTSP connection from client device/native player
604
Initiate persistent HTTP connection with server-side proxy
606
Read segment data and calculate available bandwidth
608
encrypted?
yes
610
Decrypt segment
no
612
Parse RTP/RTCP data, normalize sequence numbers/timestamps, and stream data to client
614
rate switch?
no
yes
616
Get new encoding segment name, close persistent HTTP connection

Fig. 6

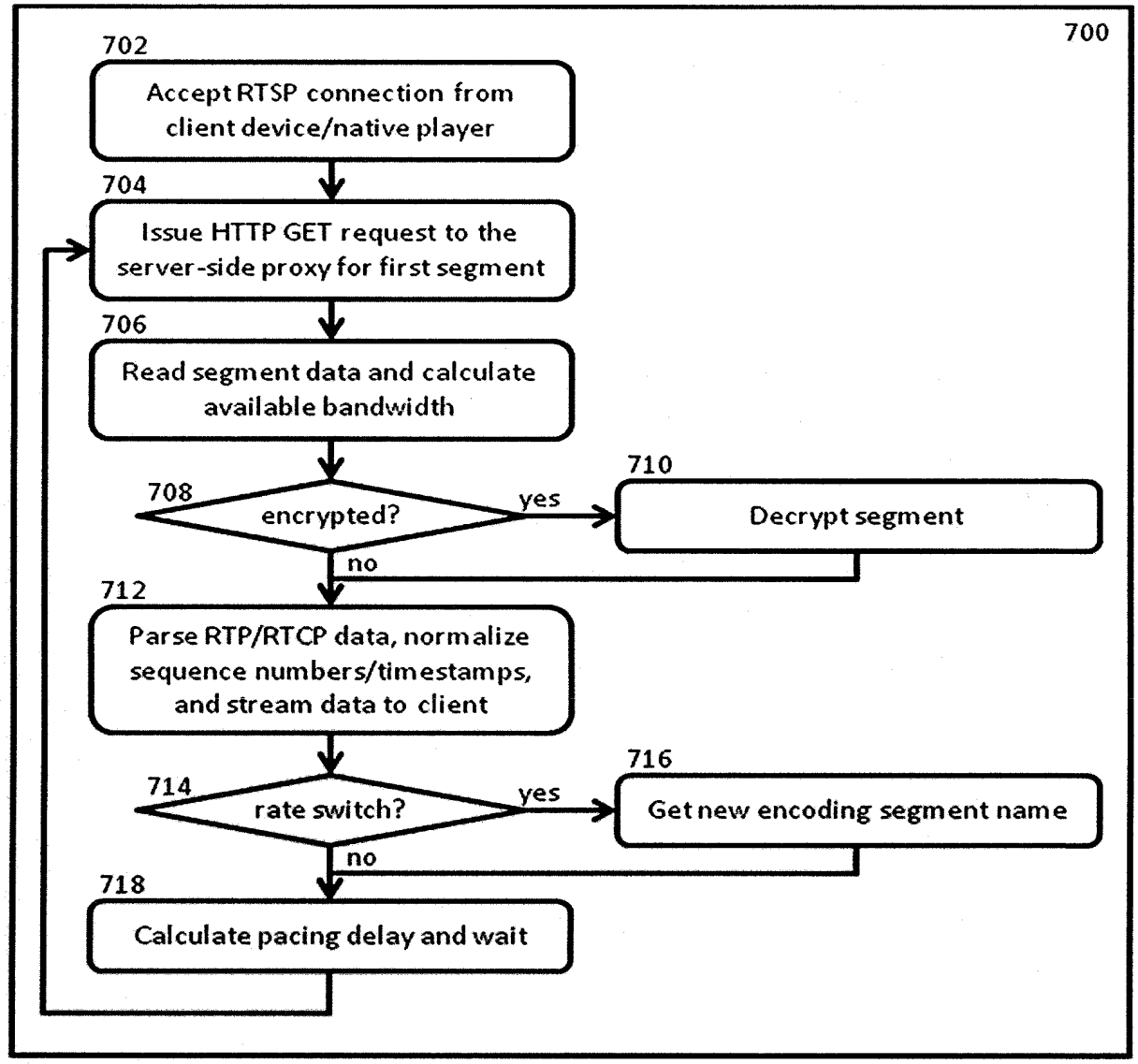

700
702
Accept RTSP connection from client device/native player
704
Issue HTTP GET request to the server-side proxy for first segment
706
Read segment data and calculate available bandwidth
708
encrypted?
yes
710
Decrypt segment
no
712
Parse RTP/RTCP data, normalize sequence numbers/timestamps, and stream data to client
714
rate switch?
yes
716
Get new encoding segment name
no
718
Calculate pacing delay and wait

Fig. 7

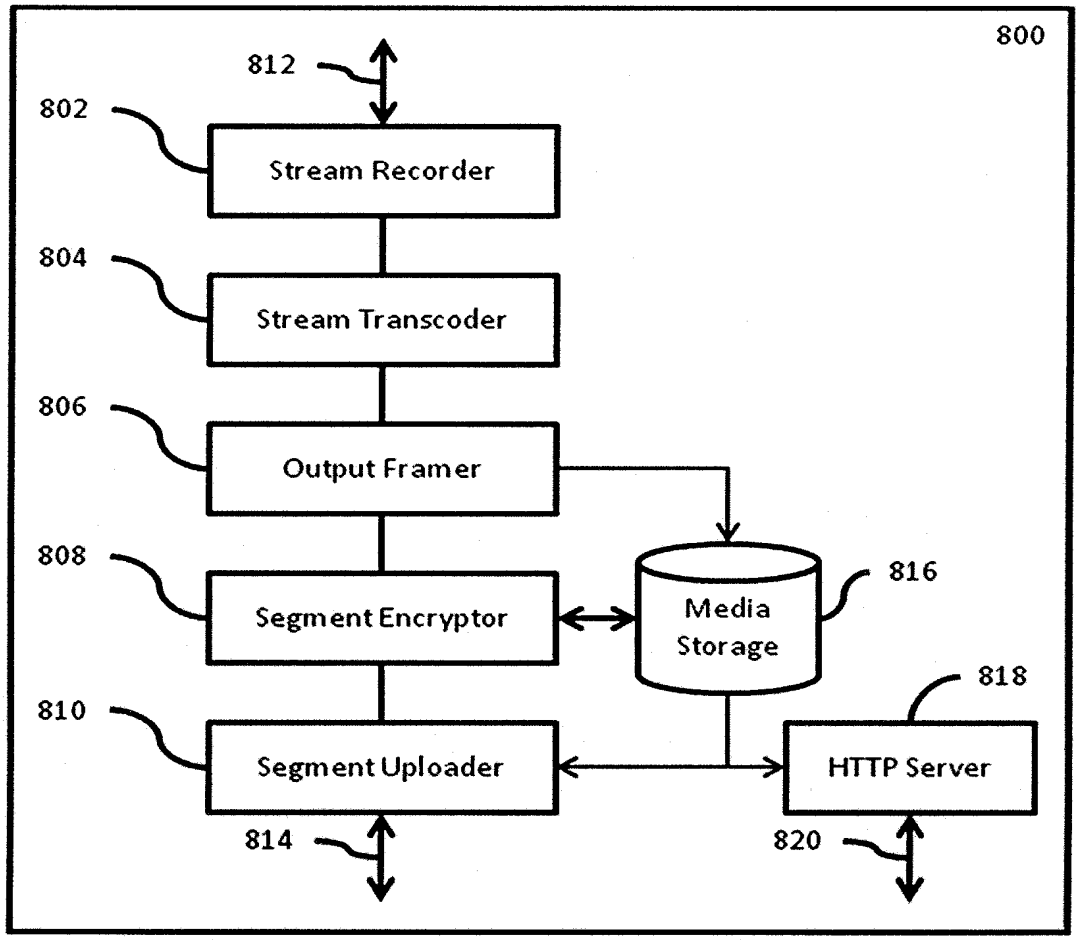

800
812
802
Stream Recorder
804
Stream Transcoder
806
Output Framer
808
Segment Encryptor
816
Media Storage
818
810
Segment Uploader
HTTP Server
814
820

Fig. 8

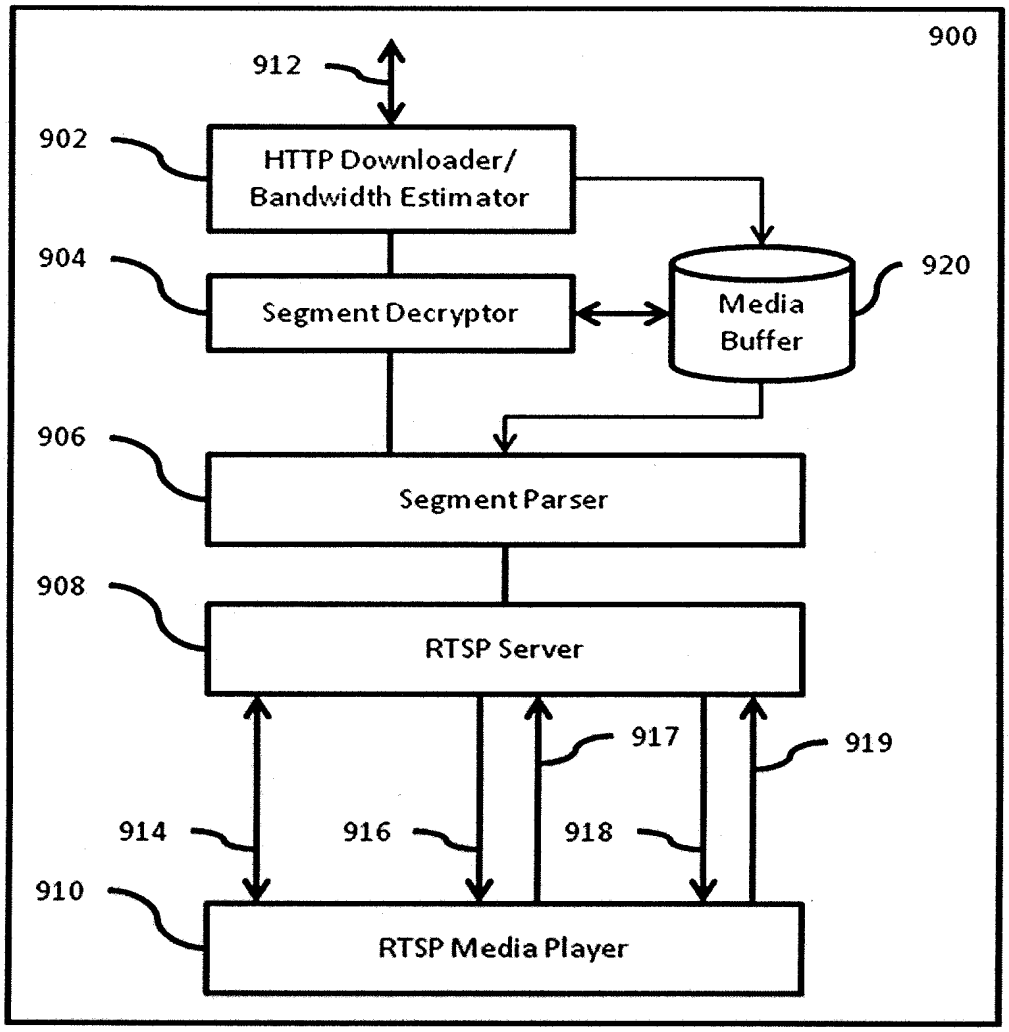

900
912
902
HTTP Downloader/
Bandwidth Estimator
904
Segment Decryptor
920
Media
Buffer
906
Segment Parser
908
RTSP Server
917
919
914
916
918
910
RTSP Media Player

Fig. 9

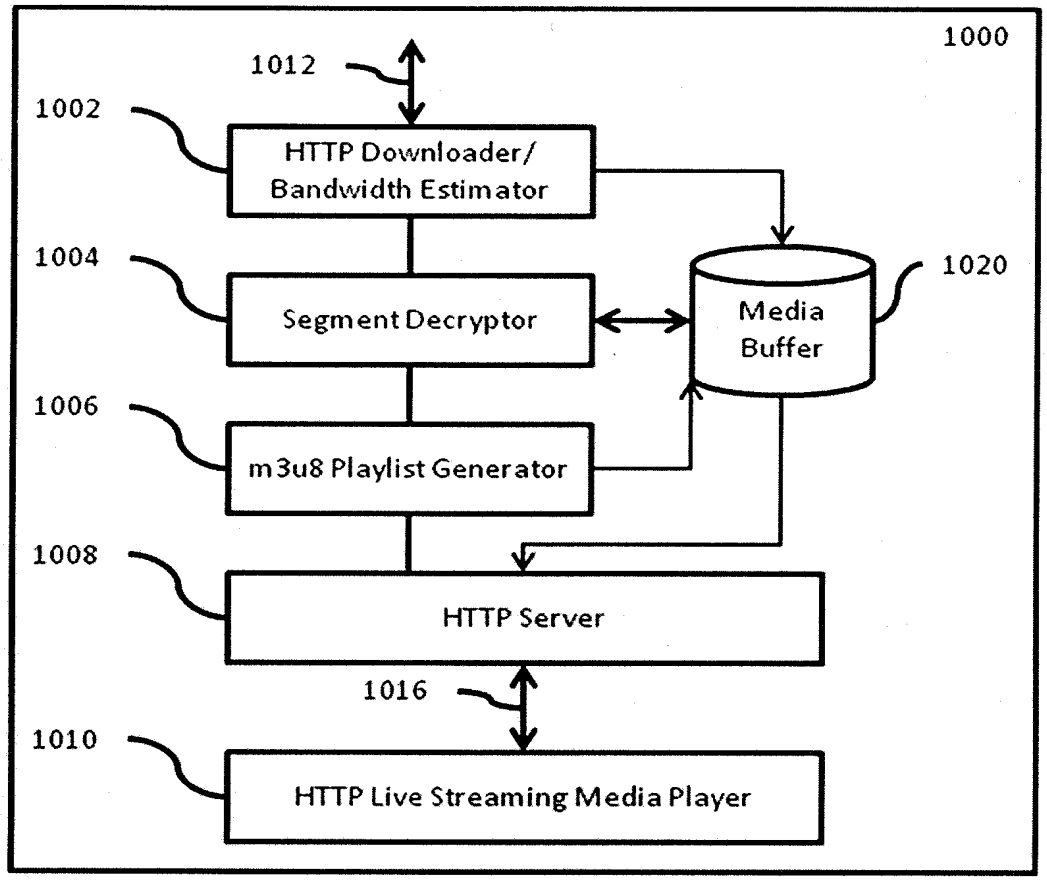

1000
1012
1002
HTTP Downloader/
Bandwidth Estimator
1004
Segment Decryptor
1020
Media
Buffer
1006
m3u8 Playlist Generator
1008
HTTP Server
1016
1010
HTTP Live Streaming Media Player

Fig. 10

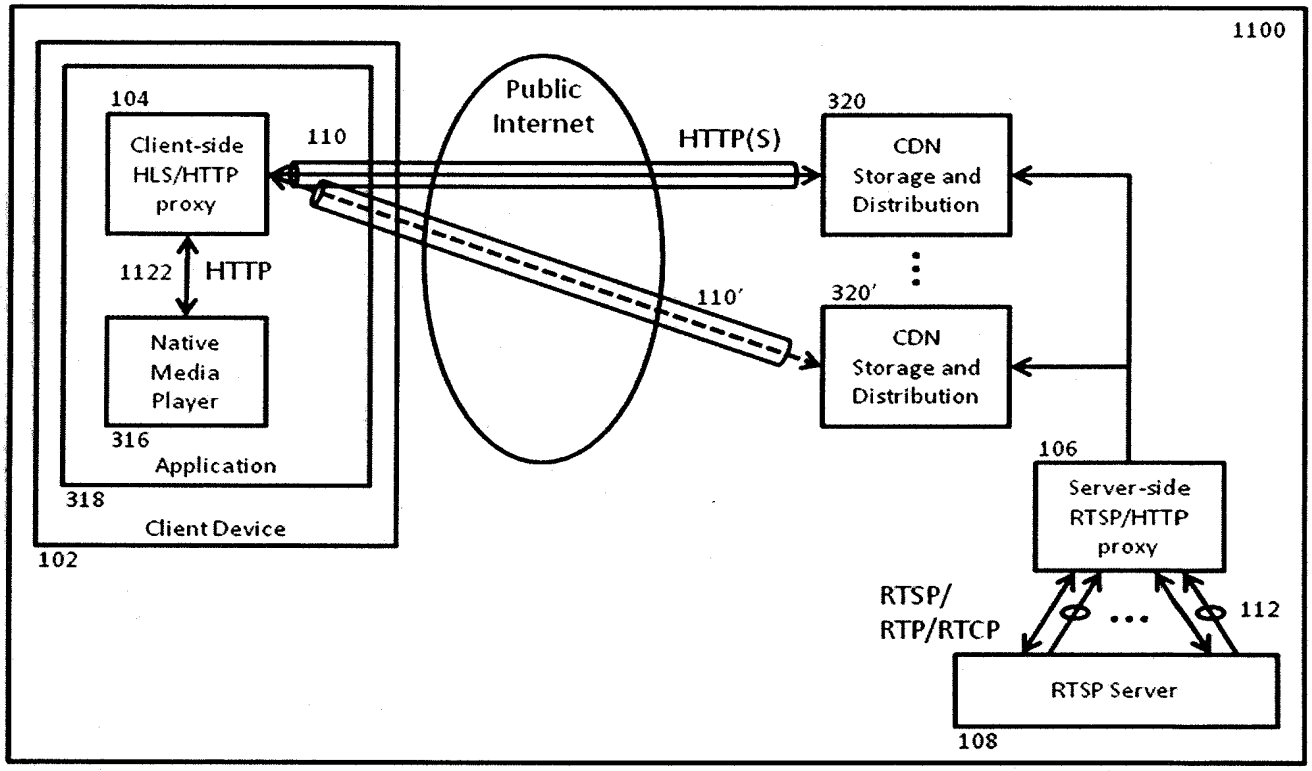

1100
104
Client-side HLS/HTTP proxy
110
1122
HTTP
Native Media Player
316
Application
318
Client Device
102
Public Internet
HTTP(S)
320
CDN Storage and Distribution
110'
320'
CDN Storage and Distribution
106
Server-side RTSP/HTTP proxy
RTSP/ RTP/RTCP
112
RTSP Server
108

Fig. 11

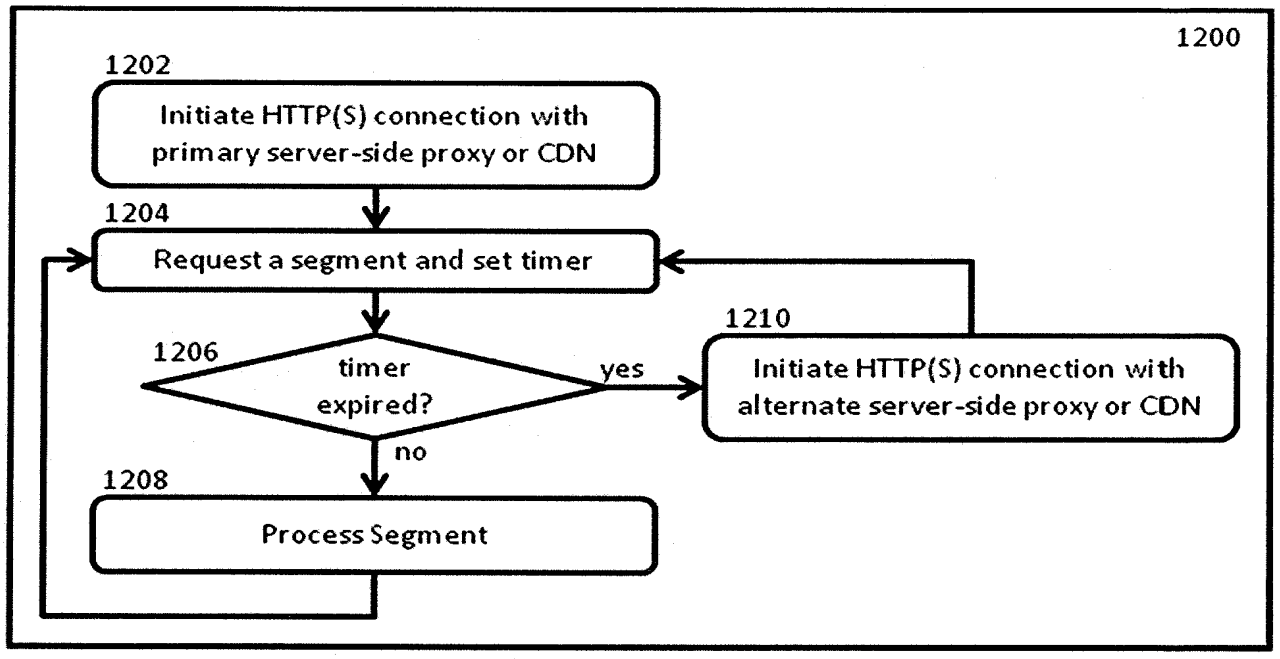

1200
1202
Initiate HTTP(S) connection with primary server-side proxy or CDN
1204
Request a segment and set timer
1206
timer expired?
yes
1210
Initiate HTTP(S) connection with alternate server-side proxy or CDN
no
1208
Process Segment

Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/58306

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06F 15/173 (2010.01)
USPC - 709/226
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)
USPC: 709/226

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 709/223-226, 231-233, 236, 238, 246; 710/52, 56; 370/400, 401, 486 (keyword limited - see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (PGPB, USPT, USOC, EPAB, JPAB); GoogleScholar
Search Terms: streaming data, streaming content, proxy, media, segment, client, server, connection, encrypt, transfer, transcoding, frame, header

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2008/0140719 A1 (Chaney et al.) 12 June 2008 (12.06.2008), entire document, especially; abstract, para. [0003]-[0005], [0007], [0023], [0029], [0030], [0033]	1 - 27
Y	US 2003/0149792 A1 (Goldstein) 07 August 2003 (07.08.2003), entire document, especially; abstract, para. [0009], [0028], [0033], [0036], [0038], [0048], [0058], [0060], [0065]	1 - 27
A	US 2009/0180484 A1 (Igarashi) 16 July 2009 (16.07.2009), entire document	1 - 27

☐ Further documents are listed in the continuation of Box C. ☐

* 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
07 January 2011 (07.01.2011)	24 JAN 2011
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 19459-8100	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US 10/34072	International filing date *(day/month/year)* 07 May 2010 (07.05.2010)	(Earliest) Priority Date *(day/month/year)* 18 May 2009 (18.05.2009)
Applicant HOLA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

   a. the figure of the **drawings** to be published with the abstract is Figure No. 5

   ☒ as suggested by the applicant.

   ☐ as selected by this Authority, because the applicant failed to suggest a figure.

   ☐ as selected by this Authority, because this figure better characterizes the invention.

   b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/34072

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06F 13/00 (2010.01)
USPC - 711/170
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(8): G06F 13/00 (2010.01)
USPC: 711/170

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 711/100, 111, 113, 170, 171, 172; 710/8, 10, 13, 72, 74; 700/1, 3, 5 (text search)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Electronic databases: PubWEST (USPT, PGPB, EPAB, JPAB); Google Scholar; Google Patents.
Search Terms Used: data memory free used cache size application block segment tag metadata parsing device temporary storage command virtual error fault non-deterministic semifree etc.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X – Y	US 5,577,243 A (Sherwood et al.) 19 November 1996 (19.11.1996), entire document, especially Abstract, Fig. 1; and col 2, ln 37-53; col 2, ln 48-53; col 3, ln 14-20; col 4, ln 49-51; col 5, ln 33-35; col 5, ln 44-45; col 6, ln 14-18; col 6, ln 46-51; col 7, ln 27-29.	1-5, 7, 9-14, and 16-18 ---------- 6, 8, and 15
Y	US 2005/0228964 A1 (Sechrest et al.) 13 October 2005 (13.10.2005), entire document, especially para [0051].	6 and 8
Y	US 2008/0086730 A1 (Vertes) 10 April 2008 (10.04.2008), entire document, especially para [0044].	15

☐ Further documents are listed in the continuation of Box C. ☐

* 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 June 2010 (15.06.2010)	01 JUL 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

Electronic Patent Application Fee Transmittal

Application Number:	15957945
Filing Date:	20-Apr-2018
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION
First Named Inventor/Applicant Name:	Derry Shribman
Filer:	Yehuda Binder/Dorit Binder
Attorney Docket Number:	HOLA-005-US4

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($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	120	120
		Total in USD ($)		**120**

Electronic Acknowledgement Receipt

EFS ID:	34908242
Application Number:	15957945
International Application Number:	
Confirmation Number:	7917
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-US4
Receipt Date:	20-JAN-2019
Filing Date:	20-APR-2018
Time Stamp:	05:55:13
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$120
RAM confirmation Number	012219INTEFSW00008181601835
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)	005-US4.pdf	1036999 b6b613914dbc750eb2d20d38ff1581a3329c5cd3	no	8
Warnings:					
Information:					
2	Foreign Reference	003-EP2597869.pdf	1757362 bae880ecd09ee126fac0e65a91dd1458ac259b0f	no	108
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	003-EP-SR.pdf	152626 265f416bd3f19016a8223e304f0b3c81e829f71a	no	5
Warnings:					
Information:					
4	Non Patent Literature	003-On-the-Leakage.pdf	625900 09120e566b90c2903ee3b9065860607d9c95f687	no	6
Warnings:					
Information:					
5	Non Patent Literature	003-rfc2616.pdf	429841 a0382dc37ee717f61c9e697a72f40bf87716568a	no	114
Warnings:					
Information:					
6	Non Patent Literature	003-slice-embedding.pdf	1229806 de5af5f121a7054354176d3921ca6c2564999841	no	16
Warnings:					
Information:					

7	Foreign Reference	003-WO2010090562.pdf	1039023 ae42bd28643d17a379580c0dd6da7180418d3c08	no	33
Warnings:					
Information:					
8	Foreign Reference	003-WO2011068784.pdf	2209776 5e265193718530b6ab0bc3d1b2b10e66931c151b	no	45
Warnings:					
Information:					
9	Other Reference-Patent/App/Search documents	004-WO2010135096-ISR.pdf	101996 85f4357051a8e83e7e713aeadad225f59c32edb4	no	2
Warnings:					
Information:					
10	Non Patent Literature	OL-VIP72-Proxy-Service.pdf	3913217 af2ef07d2b5bf3dc1e9aae73fbd3c86698086bfa	no	38
Warnings:					
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11	Non Patent Literature	OL-Spyeye.pdf	1619534 69b83e9f6762fd09110b140f5ebdb7da873ea84c	no	13
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12	Non Patent Literature	OL-freedman-coral.pdf	391186 0dcb204b43875857966a4b4a0ea5de7e9de0ea72	no	14
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14	Non Patent Literature	OL-Andromeda.pdf	6040279 b3fb8b3e199f7eca9afeba856c1c3d2942c7549f	no	47
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15	Fee Worksheet (SB06)	fee-info.pdf	30398 5e9fefe9b94cdf2339e6f487523240244509 47bf	no	2
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		Total Files Size (in bytes):	21826656		

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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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: HOLA-005-US4

In re Application of:	)	Confirmation No. 7917
	)	
Derry Shribman *et al.*	)	Art Unit: 2459
	)	
Appln. No.: 15/957,945	)	Examiner: Nguyen, Minh Chau
	)	
Filed: April 20, 2018	)	Washington, D.C.
	)	
For: System providing faster and more efficient data communication	)	October 18, 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 September 5, 2018 ("Action"):

Remarks/Arguments begin on page 2 of this paper.

REMARKS / ARGUMENTS

The examiner's action dated September 5, 2018 ("Action") has been received and its contents carefully noted.

Office Action, pages 2-4

Claims 1-29 are rejected under 35 U.S.C. 101 because the claimed invention lacks patentable utility.

Response.

a. Claim 1 is considered abstract since it describes "*abstract idea which similar to the concept of remotely accessing and retrieving user specified information*". The Action is based on over generalization of the abstract idea and oversimplification of the recited claim functions and is untethered from the actual language of the claims. The Examiner has provided no facts and/or evidence to support the Examiner's determination that the recited structure and mechanism is an abstract idea. It is noted that Alice framework cautions that "*describing the claims at such a high level of abstraction and untethered from the language of the claims all but ensures that the exceptions to§ 101 swallow the rule.*" *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1337 (Fed. Cir. 2016).

In particular, claim 1 also recites sending a received content to a server, which cannot be part of "*the concept of remotely accessing and retrieving user specified information*". Hence, the Action fails to consider the claims as a whole, while it is noted that the claims should be analyzed "… ***in their entirety*** *to ascertain whether their character* ***as a whole*** *is directed to excluded subject matter.*" (Emphasis added) Internet Patents Corp., 790 F.3d at 1346. Further, the information exchanged over the network relates to routing or

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
280 of 455

handling OTHER information, which is similar to the case of Enfish, 822 F.3d at 1336, 118 USPQ2d at 1689, where claims to self-referential table for a computer database were not directed to an abstract idea. It is noted that the claims here are even less abstract since the steps involves not only a single generic computer, but few types of devices (servers / clients) communicating over a network.

b. The rejection is based on the case of "*Int. Vent. V. Erie Indemnity '002 patent*". It is noted that this case (*Intellectual Ventures I LLC v. Erie Indemnity Co., 850 F.3d 1315, 1327 (Fed. Cir. 2017)*) involved organizing and accessing records through the creation of an index-searchable database (i.e., locating information in a database). Claim 1 is not involved in any database in general, and any organizing and accessing records in particular, hence this case is not analogous to the claims herein. Specifically, the claim discloses a server receiving information from another server via a client device, which is unique and solves a specific problem such as anonymity when fetching information.

Hence, in light of the specification's description of the problem and the inventors' solution, the claimed invention, as described in paragraphs 0004-0012 of the corresponding publication 2018/0241851, solves a problem of Internet congestion, faster and more efficient content transport by improving the operation of peer-to-peer networking arrangement using a management server, in contrast to '*creating and using an index*', which is the heart of the invention - "*the heart of the claimed invention lies in creating and using an index to search for and retrieve data … an abstract concept*" [*Cf. Intellectual Ventures I v. Erie Indemnity Company, 850 F.3d, 1315, 1328 (Fed. Cir. 2017)*].

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
281 of 455

Hence, similar to the PTAB decision in appeal 2017-011163 dated May 9, 2018, the Examiner's interpretation of the claims as being directed to an abstract idea of creating an index and using that index to search for and retrieve data is an oversimplification of the claims, as the claims do not even mention the creation of an index or the use of such an index or searching and retrieving data, not do the claim mention the words 'index' or 'search'.

c. As admitted in the Action, the claims involve specific networking of physical elements such as servers and clients, connected via various networks forming a specific structure and relationships, which are physical apparatuses, and are NOY a 'generic computer' as stated in the Action. Under Bilski's MoT test, a claimed process can be patent-eligible under § 101 if: (1) **it is tied to a particular machine or apparatus;** or (2) the process transforms a particular article into a different state or thing." (See Bilski, 545 F.3d at 954 (citing Gottschalk v. Benson, 409 U.S. 63, 70 (1972)).

d. The Action states that the arrangement claimed provides '*conventional computer functions*', '*conventional computer implementation*', '*generic computer, generic computer components, or a programmed computer*'. However, the Examiner does not sufficiently establish that the "ordered combination" of the recited elements also fails to "'transform the nature of the claim' into a patent-eligible application." Alice, 134 S. Ct. at 2355. "[A]n inventive concept can be found in the non-conventional and nongeneric arrangement of known, conventional pieces," even if these pieces constitute generic computer-related components. Bascom Global Internet v. AT&T Mobility LLC, 827 F.3d 1341, 1350 (Fed. Cir. 2016). Specifically, the

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
282 of 455

claimed components as a combination perform functions that are not merely generic - It is respectfully submitted that the conventional arrangement involves fetching data by a client device from a server device, while the claims disclose a server receiving information from another server via a client device, which is unique and solves a specific problem such as anonymity when fetching information.

e. It is noted that "*For computer-implemented inventions like the claimed invention, the question in the second step is whether the computer implementation of the abstract idea involves "more than performance of 'well-understood, routine, [and] conventional activities previously known to the industry.'"*" Content Extraction & Transmission LLC v. Wells Fargo Bank. It is noted that "*Whether something is well-understood, routine, and conventional to a skilled artisan at the time of the patent is a factual determination*." Berkheimer v. HP Inc., 881 F.3d 1360, 1369 (Fed. Cir. 2018), and the Action provides no factual evidence regarding to "*well-understood, routine, and conventional*", as required by USPTO memorandum dated April 19, 2018, entitled: "*Changes in Examination Procedure Pertaining to Subject Matter Eligibility, Recent Subject Matter Eligibility Decision (Berkheimer v. HP, Inc.)*".

f. It is respectfully submitted that in a decision of Appeal 2017-010768 dated May 4, 2018 (from application 14/288,506), claims were similarly found to be patent eligible being "*directed to a technical improvement in the communication between computers*". Similarly, in a decision of Appeal 2017-007566 dated May 17, 2018 (from application 14/268,145), claims were similarly found to be patent eligible since they

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
283 of 455

'facilitates the cooperation of "*multiple different kind of computers.*"', and using intermediate computers.

g. It is further noted that software is not automatically an abstract idea, even if performance of a software task involves an underlying mathematical calculation or relationship. See, e.g., Thales Visionix, Inc. v. United States, 850 F.3d 1343, 121 USPQ2d 1898, 1902 ("*That a mathematical equation is required to complete the claimed method and system does not doom the claims to abstraction.*", and also in MPEP §2106.04(a) Abstract Ideas [R-08.2017]. Further, although the claims recite 'servers and devices' the individual steps of the method are **NOT BEING** capable of being performed by a person, either mentally or with paper and pencil, which renders the method not abstract. [See CyberSource Corp. v. Retail Decisions, Inc., 654 F.3d 1366, 1372 (Fed. Cir. 2011)].

h. On page 6 of the Action, the Action admits that the claims provides: "… ***an improvement for an information/communication exchange system*** *in a network*" (Emphasis added). **Hence, the Action itself admits to various improvements in various technologies and fields, and to solve a problem unique to the Internet and computer technology and, thus, amounts to significantly more than an abstract idea.** This is similar to DDR Holdings, LLC v. Hotels.com, L.P., 773 F.3d 1245, 1257-59, 113 USPQ2d 1097, 1106-07 (Fed. Cir. 2014), the claims are admitted by the Office to be directed to a "*solution [that] is necessary rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks*".

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
284 of 455

Office Action, pages 5-15

Claims 1-29 are rejected under 35 U.S.C. 103 as being unpatentable over Fang *et al.* (US 2006/0212542 – hereinafter "Fang"), in view of Zaid *et al.* (US 2011/0035503 – hereinafter "Zaid").

General.

The Action is unclear at least since it is unclear from the rejection what elements of Fang (and also Zaid) are equated to the claim recited elements. For example, it is not clear if the claimed HTTP server is equated to server 332 or server 331 in Figure 3 of the Fang reference. It is noted that "*A rejection must be set forth in sufficiently articulate and informative manner as to meet the notice requirement of § 132, such as by identifying where or how each limitation of the rejected claims is met by the prior art references.*" In re Jung, 637 F.3d 1356, 1363 (Fed. Cir. 2011); see also 37 C.F.R. § 1.104(c)(2) ("*When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified.*"); Gechter v. Davidson 116 F.3d 1454, 1460 (Fed. Cir. 1997) (*PTO must create a record that includes "specific fact findings for each contested limitation and satisfactory explanations for such findings.*").

Non-analogous references.

The Applicant submits that the cited references are directed towards respectively different fields and purposes, and are based on respectively different structures, and thus are not analogous to one another and cannot logically be combined. The Action does not explain, as required by the

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
285 of 455

rules, what is the reasoning behind the combining of the references, and why these references are analogous to each other. **If the Action is based on the reference being in the same field, it is hereby requested that the definition of the field of both the cited references will be included in the next Action. If the Action is based on the reference being pertinent to the same problem, it is hereby requested that the definition of the problem will be included in the next Action.**

Unclear combination.

The Action merely state that the missing limitation of the recited claim may be added to the Fang reference. It is not clear HOW this limitation is added to the Fang described system.

Improper rationale for combining the references

The rationale for combining the Fang and Zaid references is stated as: "… *to provide an improvement for an information/communication exchange system via a network.*". It is noted that this rationale is conclusory and is detached from the specific references, and is not according to MPEP 2143 teaching that: "*Any rationale employed must provide* ***a link*** *between the factual findings and the legal conclusion of obviousness.*" (Emphasis added). It is not clear WHY adding the missing limitation provide ANY improvement to the Fang system, and WHAT is the improvement obtained. The rules further require an explicit motivation to combine because "*the 'improvement' is technology independent and the combination of references results in a product or process that is more desirable, for example because it is stronger, cheaper, cleaner, faster, lighter, smaller, more durable, or more efficient.*" DyStar

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
286 of 455

Textilfarben GmbH & Co. Deutsch/and KG v. CH Patrick Co., 464 F.3d 1356, 1367 (Fed. Cir. 2006).

Regarding claim 1.

a. Limitation not taught by the Fang reference.

Claim 1 recites the limitation of "*receiving, from the second server, the first content identifier*". The rejection is based on paragraphs 0037-0038 that teach (according to the rejection) – "… *the client detects the download event associated with a URL file from server 332*". It is respectfully noted that while the content may be associated with a server, the detecting a download event is performed in and by the client itself and is not related to any server in general, and in particular does not teach any receiving any information from any server. Further, paragraph 0037 itself discloses that a download event starts with a 'click', hence initiated locally by a user and NOT initiated by any EXTERNAL event.

b. Limitation not taught by the Fang reference.

Claim 1 recites the limitation of "*sending, to the first server over the Internet, a Hypertext Transfer Protocol (HTTP) request that comprises the first content identifier*". The rejection is based on paragraphs 0026 and 0037-0038 that teach (according to the rejection) – "… indexing server 331 receives a request/query includes URL of a requested content from a peer list". It is noted that paragraphs 0026 and 0037 are silent regarding any sending of any request to any server.

It seems from the Action that the claimed 'first server' is equated to the 'indexing server 331' of Fang. However, the first server is explicitly claimed as the server that stores the first content, while the 'indexing server 331'

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
287 of 455

in the Fang reference clearly ONLY stores reference to content locations, but does not include any content itself as recited in the claim.

c. Mistake in claim interpretation

Claim 1 recites the limitation of "*receiving, the first content* ***from the first server*** *over the Internet in response to the sending of the first content identifier*" (Emphasis added). The rejection by mistake quote "*receiving, the first content* ***from the second server*** *over the Internet*" (Emphasis added). It is noted that the claimed 'first server' is equated in the second limitation to the 'indexing server 331' and NOT to the file server 332 as stated in the rejection of this limitation.

Further, the claim explicitly recites that the receiving of the first content "*from the first server over the Internet i****n response to the sending*** *of the first content identifier*" (Emphasis added). The Action and the Fang reference are silent regarding any such action in response to the sending of the first content identifier.

Regarding claim 2.

a. Claim 2 defines, inter alia, the limitation of "*storing, by the first client device in response to the receiving from the first server, the first content*". The rejection is based on paragraphs 0150-0152 and 0159-0166 of the Zaid reference. However, the Action and these cited paragraphs are silent regarding any storing of any content in general, and the recited "*storing, by the first client device in response to the receiving from the first server, the first content*" in particular.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
288 of 455

b. The rejection provides no rationale for modifying the Fang reference, serving as the primary reference, to include the recited limitation. The rationale for combining with the Zaid reference in claim 1 rejection involved different limitation that is not relevant to the recited limitation in this claim.

Regarding claims 6 and 8.

Claim 6 (and 8) recites, inter alia, the limitation of: "*executing, by the first client device, a web browser application or an email application*". The rejection only states paragraphs 0017 and 0033 of the Fang reference. However, the Fang reference in general, and the cited paragraphs in particular, are silent regarding any content-handling software application in general, and the executing "*a web browser application or an email application*" as recited in the claim in particular.

Regarding claim 7.

Claim 7 recites, *inter alia*, using a criterion sent from the client device, and using the criterion for selecting a client device – "*… sending, to the second server over the Internet in response to the identifying, the second content identifier* ***and a criterion;*** *and receiving, over the Internet in response to the sending, from a second client device* ***selected from a plurality of client devices according to the criterion,*** *a part of, or a whole of, the second content*" (Emphasis added). The Fang reference in general, and the cited paragraphs 0026 and 0037-0038 in particular, are silent regarding any criterion in general, and any criterion for selecting client device in particular. To the contrary, the Fang reference only teaches selecting a peer device by a human user ("*… by performing a mouse click*" in paragraph 0037), hence effectively teaches away

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
289 of 455

from any automatic selecting using a criterion as recited in the claim.

Regarding claim 10.

Claim 10 recites that "… *the criterion is based on, or comprises, the geographical location of the plurality of client devices, or a response time when communicating with the first client device*". The Fang reference in general, and the cited paragraphs 0004 and 0029 in particular, are silent regarding any criterion in general, and any criterion for selecting client device in particular, and furthermore any geographic related or time related criterion. To the contrary, the Fang reference only teaches selecting a peer device by a human user ("… *by performing a mouse click*" in paragraph 0037), hence effectively teaches away from any automatic selecting using a criterion as recited in the claim.

Regarding claim 11.

Claim 11 recites that "… t*he second client device is the quickest to respond to queries from the first client device*". The Fang reference in general, and the cited paragraphs 0038 and 0084 in particular, are silent regarding any criterion in general, and any criterion for selecting client device in particular, and furthermore selecting any quickest device. To the contrary, the Fang reference only teaches selecting a peer device by a human user ("… *by performing a mouse click*" in paragraph 0037), hence effectively teaches away from any automatic selecting using a criterion as recited in the claim.

Regarding claim 12.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
290 of 455

Claim 12 recites the step of "… *sending, by the first client device, a notification message to a device from the plurality of client devices that was not selected as part of the selecting*". The Fang reference in general, and the cited paragraphs 0029 and 0052 in particular, are silent regarding any communication with a non-selected peer in general, and sending any message thereto in particular.

Regarding claims 13-14.

Claim 13 recites the step of "… *periodically communicating between the second server and the first client device.*". The Fang reference in general, and the cited paragraph 0029 in particular, are silent regarding any periodic communication in general, and regarding "*periodically communicating between the second server and the first client device*" in particular. Further, the Fang reference is silent regarding any 'keep alive' messages as recited in claim 14.

Regarding claim 15.

Claim 15 recites the step of "… *establishing, by the first client device, a Transmission Control Protocol (TCP)* ***connection*** *with the second server using TCP/IP protocol*" (Emphasis added). While the Fang reference mantions in passing using TCP/IP protocol, the Fang reference in general, and the cited paragraph 0024 in particular, are silent regarding any establishing of a persistent connection in general, and TCP connection in particular.

Regarding claim 17.

The rejection of claim 17 is based on the Zaid reference. However, claim 17 depends from claim 16 that was rejected based on specific passages in the Fang reference, and

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
291 of 455

the cited paragraphs in the Zaid reference are not relevant to the cited Fang reference. Further, the rejection provides no rationale for modifying the Fang reference, serving as the primary reference, to include the recited limitation. The rationale for combining with the Zaid reference stated in claim 1 rejection involved different limitation that is not relevant to the recited limitation in this claim. Further, while the Zaid reference may disclose versions of software, it is silent regarding including any version related information in any message as recited in the claim.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
292 of 455

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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Oxylabs LT, UAB v. Bright Data Ltd.
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293 of 455

Electronic Acknowledgement Receipt

EFS ID:	34043344
Application Number:	15957945
International Application Number:	
Confirmation Number:	7917
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-US4
Receipt Date:	18-OCT-2018
Filing Date:	20-APR-2018
Time Stamp:	06:51:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

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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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(Not for submission under 37 CFR 1.99)

Application Number	15957945
Filing Date	2018-04-20
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	NGUYEN, MINH CHAU
Attorney Docket Number	HOLA-005-US4

U.S.PATENTS Remove

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	1	6868453	B1	2005-03-15	Mitsuhiro Watanabe	
	2	8595786	B2	2013-11-26	In Hwan Choi	

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	1	20030097408	A1	2003-05-22	Masahiro Kageyama	
	2	20070100839	A1	2007-05-03	Deok-ho Kim	
	3	20080256175	A1	2008-10-16	Sang-kwon Lee	
	4	20060212542	A1	2006-09-21	Han Fang	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
296 of 455

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15957945
	Filing Date	2018-04-20
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US4

	5	20110035503	A1	2011-02-10	SAM ZAID	
	6	20050097441	A1	2005-05-05	Jonathan D. Herbach	

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Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
297 of 455

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15957945
	Filing Date	2018-04-20
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	NGUYEN, MINH CHAU
	Attorney Docket Number	HOLA-005-US4

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)	2018-10-18
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.**

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.

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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.

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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.

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.

Electronic Acknowledgement Receipt

EFS ID:	34043388
Application Number:	15957945
International Application Number:	
Confirmation Number:	7917
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-US4
Receipt Date:	18-OCT-2018
Filing Date:	20-APR-2018
Time Stamp:	07:34:03
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	Information Disclosure Statement (IDS) Form (SB08)	IDS3.pdf	1034587 d551626a22daefa2e7e9a93de94016c78e143093	no	4

Warnings:

Information:	
Total Files Size (in bytes):	1034587

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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/957,945	04/20/2018	Derry Shribman	HOLA-005-US4	7917

131926 7590 09/05/2018

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EXAMINER	
NGUYEN, MINH CHAU	

ART UNIT	PAPER NUMBER
2459	

MAIL DATE	DELIVERY MODE
09/05/2018	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.

Office Action Summary	Application No. 15/957,945	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 20 April 2018.

☐ 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) 1-29 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) 1-29 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 See Continuation Sheet 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 04/20/2018.

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

4) ☐ Other: _____.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049

Continuation of Application Papers 11): 20 April 2018

Notice of Pre-AIA or AIA Status

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

DETAILED ACTION

This action is responsive to the application 15/957,945 filed on April 20, 2018. **Claims 1-29** are pending.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-29 are rejected under 35 U.S.C. 101 because the claimed invention is not directed to statutory subject matter.

The framework for determining whether a claim invention is directed to patent eligible subject matter under 35 U.S.C. §101 stands as:

Step 1: *Determining whether the claims are directed to one of the four patent-eligible subject matter categories (process, machine, manufacture, or composition of matter).*

Claims 1-27 recite a method comprising steps. Accordingly, claims 1-26 are directed to a process.

Claim 28 recites an article of manufacture comprising a non-transitory computer readable medium containing computer instructions that when executed by a computer processor to cause the processor to perform the method. Accordingly, claim 28 is directed to an article of manufacture.

Claim 29 recites an apparatus comprising elements of a system which including non-transitory computer readable medium and computer processor. Accordingly, claim 29 is directed to a machine.

Step 2A: *Determining whether the claims whole embrace a judicially recognized exception: laws of nature, natural phenomena, or abstract idea.*

Claim 1 is directed to "*receiving from second server the first content identifier; sending to the first server over the internet, a request that comprises the first content identifier; receiving, the first content from the first server in response to the sending of the first content identifier; and sending, the first content by the first client device to the second server*", which recites an abstract idea.

These steps describe the abstract idea which similar to the concept of remotely accessing and retrieving user specified information that have been identified as abstract by the courts in **Int. Vent. V. Erie Indemnity '002 patent**.

Step 2B: *Do the claim elements, individually or in combination, amount to significantly more than the exception?*

The claims do not include additional elements that are sufficient to amount to significantly more than the abstract idea because the additional computer elements, e.g. "*first and second servers comprises a web server; and first and second client devices*" recited in **claim 1**, which are recited at a high level of generality, provide conventional computer functions that do not add meaningful limits to practicing the abstract idea. There is no indication that the combination of elements improves the functioning of a computer or improves any other

technology. Their collective functions merely provide conventional computer implementation. Merely adding a generic computer, generic computer components, or a programmed computer to perform generic computer functions does not automatically overcome an eligibility rejection.

For the reasons above, **claims 2-29** are rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter. The dependent claims add steps to storing, receiving and sending to selected client device in a list of potential clients, which provided by the server, return the request content. The claims do not include additional elements, alone or in combination, that are sufficient to amount to significantly more than the abstract idea.

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, 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.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-29 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Fang et la. (US 2006/0212542) hereinafter "**Fang**" and in view of Zaid et la. (US 2011/0035503) hereinafter "**Zaid**".

Claim 1

Fang teaches a method for use with a first client device, for use with a first server that comprises a web server that is a Hypertext Transfer Protocol (HTTP) server that responds to HTTP requests, the first server stores a first content identified by a first content identifier, and for use with a second server (Fang, figures 2-4), the method by the first client device comprising:

receiving, from the second server, the first content identifier [i.e. the client detects the download event associated with a URL file from sever 332] (Fang, 0037-0038);

sending, to the first server over the Internet, a Hypertext Transfer Protocol (HTTP) request that comprises the first content identifier [i.e. indexing server 331 receives a request/query includes URL of a requested content from a peer client] (Fang, 0026, 0037-0038);

receiving, the first content from the second server over the Internet in response to the sending of the first content identifier [i.e. the client receives the content file by retrieving from the file server 332] (Fang, 0038).

Fang fails to teach receiving, the first content from the first server; and sending, the first content by the first client device to the second server [i.e. central server], in response to the receiving of the first content identifier.

However, in an analogous art, **Zaid** teaches receiving, the first content from the first server [i.e. publishing server] and sending, the first content by the first client device to the second server, in response to the receiving of the first content identifier (Zaid, 0150-0152, 0159-0166).

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 first content from the first server; and sending, the first content by the first client device to the second server, in response to the receiving of the first content identifier, as disclosed by Zaid, into the teachings of Fang. One would be motivated to do so in order to provide an improvement for an information/communication exchange system via a network.

Claim 2

Fang in combination with Zaid teach the method according to claim 1, further comprising storing, by the first client device in response to the receiving from the first server, the first content (Zaid, 0150-0152, 0159-0166), and wherein the sending, of the HTTP request is in response to the receiving of the first content identifier (Fang, 0026, 0062).

Claim 3

Fang in combination with Zaid teach the method according to claim 2, further comprising:

receiving, from a second client device, the first content identifier (Fang, 0038, 0080-0086); and

sending, the stored first content by the first client device to the second client device, in response to the receiving of the first content identifier from the second client device (Fang, 0080-0086).

Claim 4

Fang in combination with Zaid teach the method according to claim 1, wherein the first or second server is a Transmission Control Protocol / Internet Protocol (TCP/IP) server that communicates over the Internet based on, or according to, using TCP/IP protocol or connection, and wherein the first client device is a Transmission Control Protocol / Internet Protocol (TCP/IP) client that communicates respectively with the first or second server over the Internet based on, or according to, TCP/IP protocol or connection (Fang, 0024).

Claim 5

Fang in combination with Zaid teach the method according to claim 1, wherein the first client device communicates over the Internet based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards (Fang, 0024, 0026).

Claim 6

Fang in combination with Zaid teach the method according to claim 1, wherein the first content comprises web-page, audio, or video content, wherein the first content identifier comprises a Uniform Resource Locator (URL), and wherein the method further comprising executing, by the first client device, a web browser application or an email application (Fang, 0017, 0033).

Claim 7

Fang in combination with Zaid teach the method according to claim 1, for use with a third server that comprises a web server that is Hypertext Transfer Protocol (HTTP) server, the third server responds to HTTP requests and stores a second content identified by a second content identifier, the method by the first client device further comprising:

identifying, an HTTP request for the second content (Fang, 0037-0038);

sending, to the second server over the Internet in response to the identifying, the second content identifier and a criterion (Fang, 0026, 0037-0038); and

receiving, over the Internet in response to the sending, from a second client device selected from a plurality of client devices according to the criterion, a part of, or a whole of, the second content (Fang, 0037-0038).

Claim 8

Fang in combination with Zaid teach the method according to claim 7, further comprising executing, by the first client device, a web browser application or an email application, and wherein the identifying comprises intercepting, by a driver in the first client device, the request for the second content respectively from the web browser application or the email application (Fang, 0034-0037).

Claim 9

Fang in combination with Zaid teach the method according to claim 7, wherein the criterion is stored in the first client device, and the method further comprising selecting, by the first client device, the second client device from the plurality of client devices, according to the stored criterion (Fang, 0038, 0060, 0081-0085).

Claim 10

Fang in combination with Zaid teach the method according to claim 9, wherein the criterion is based on, or comprises, the geographical location of the plurality of client devices, or a response time when communicating with the first client device (Fang, 0004, 0029).

Claim 11

Fang in combination with Zaid teach the method according to claim 9, wherein the second client device is the quickest to respond to queries from the first client device (Fang, 0038, 0084).

Claim 12

Fang in combination with Zaid teach the method according to claim 9, further comprising sending, by the first client device, a notification message to a device from the plurality of client devices that was not selected as part of the selecting (Fang, 0029, 0052).

Claim 13

Fang in combination with Zaid teach the method according to claim 1, further comprising periodically communicating between the second server and the first client device (Fang, 0029).

Claim 14

Fang in combination with Zaid teach the method according to claim 13, wherein the periodically communicating comprises exchanging 'keep alive' messages (Fang, 0029, 0078-0079).

Claim 15

Fang in combination with Zaid teach the method according to claim 1, further comprising establishing, by the first client device, a Transmission Control Protocol (TCP) connection with the second server using TCP/IP protocol (Fang, 0024).

Claim 16

Fang in combination with Zaid teach the method according to claim 1, wherein the first client device is identified by a Media Access Control (MAC) address or a hostname, and wherein the method further comprising sending, by the first client device, during, as part of, or in response to, a start-up of the first client device, a first message to the second server, and wherein the first messages comprises the first IP address, the MAC address, or the hostname (Fang, 0025-0026, 0037).

Claim 17

Fang in combination with Zaid teach the method according to claim 16, for use with a first application stored in the first client device and associated with a first version number, wherein the first message comprises the first version number (Zaid, 0058, 0126-0133).

Claim 18

Fang in combination with Zaid teach the method according to claim 17, for use with a second application that is a version of the first application, is stored in the second server, and is associated with a second version number, wherein the method further comprising receiving, by the first client device from the second server, in response to the first message, a second message that comprises the second version number (Zaid, 0058, 0126-0133).

Claim 19

Fang in combination with Zaid teach the method according to claim 18, wherein the method further comprising downloading over the Internet, by the first client device from the second server, in response to the first message, the second application from the second server, and installing the second application in the first client device as a replacement for the first application (Zaid, 0021, 0058, 0084-0085, 0126-0133).

Claim 20

Fang in combination with Zaid teach the method according to claim 1, wherein the first or second server is a Transmission Control Protocol / Internet Protocol (TCP/IP) server, wherein the first client device communicates over the Internet with the first or second server based on, or according to, using TCP/IP protocol or connection (Fang, 0024).

Claim 21

Fang in combination with Zaid teach the method according to claim 1, further comprising determining, by the first client device, that the received first content, is valid (Fang, 0065-0066).

Claim 22

Fang in combination with Zaid teach the method according to claim 22, wherein the determining is based on the received HTTP header according to, or based on, IETF RFC 2616 (Fang, 0071).

Claim 23

Fang in combination with Zaid teach the method according to claim 22, further comprising:

sending, a message over the Internet in response to the determining that the received first content, is not valid; and receiving, over the Internet in response to the sending of the message, from the second server or from a second client device selected from a plurality of client devices, the first content (Fang, 0065-0066).

Claim 24

Fang in combination with Zaid teach the method according to claim 1, further comprising storing, operating, or using, a client operating system (Fang, 0040, 0048-0050).

Claim 25

Fang in combination with Zaid teach the method according to claim 1, wherein the steps are sequentially executed (Zaid, 0021).

Claim 26

Fang in combination with Zaid teach the method according to claim 1, for use with a software application that includes computer instructions that, when executed by a computer processor, cause the processor to perform the sending of the Hypertext Transfer Protocol (HTTP) request, the receiving and storing of the first content, the receiving of the first content identifier, and the sending of the part of, or the whole of, the stored first content (Fang, 0026, 0062), the method is further preceded by:

downloading, by the first client device from the Internet, the software application (Zaid, 0085, 0126-0131, 0142-0147, 0199); and

installing, by the first client device, the downloaded software application (Zaid, 0021, 0084-0085).

Claim 27

Fang in combination with Zaid teach the method according to claim 26, wherein the software application is downloaded from the second server (Zaid, 0085, 0126-0131, 0142-0147, 0199).

Claim 28 is corresponding claim of claim 1. Therefore, it is rejected under the same rationale.

Claim 29 is corresponding claim of claim 1. Therefore, it is rejected under the same rationale.

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

Notice of References Cited	Application/Control No. 15/957,945	Applicant(s)/Patent Under Reexamination	
	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-20060212542-A1	09-2006	Fang; Han	H04L67/104	709/219
*	B	US-20110035503-A1	02-2011	ZAID; SAM	H04L63/0407	709/228
*	C	US-6868453-B1	03-2005	Watanabe; Mitsuhiro	G06F17/30861	707/E17.107
*	D	US-8595786-B2	11-2013	Choi; In Hwan	H04L1/005	725/151
*	E	US-20050097441-A1	05-2005	Herbach, Jonathan D.	G06F21/10	715/229
*	F	US-20060212584-A1	09-2006	Yu; Mingjian	G06F17/30902	709/227
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FOREIGN PATENT DOCUMENTS

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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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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
	15/957,945	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	08/21/2018								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
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	26	✓								
	27	✓								
	28	✓								
	29	✓								

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
321 of 455

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/957,945	Shribman et al.
	Examiner	Art Unit
	MINH CHAU N NGUYEN	2459

CPC - Searched*		
Symbol	Date	Examiner
H04L67/42	08/21/2018	MN
H04L41/046	08/21/2018	MN
H04L67/108	08/21/2018	MN
H04L67/22	08/21/2018	MN

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	202	08/21/2018	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	08/21/2018	MN

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

/MINH CHAU NGUYEN/ Primary Examiner, Art Unit 2459	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
322 of 455

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	4	(("20060212584") or ("7865585")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 22:52
S2	89	servers with (communicat$4 session$1 receiv$4 transmit$4 provid$4 send$4) with ((list$4 group$4) near1 clients)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:05
S3	56	S2 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:06
S4	3	("20080008089").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:14
S5	0	S3 and (server$1 near3 (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 ((content$1 page$1 document$1) near (identifier$1 address$2))) with ((other$1 second$4 another differen$4) near1 (client$1 peer$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:18
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S7	7758	(servers and (peers clients)) same ((content$1 document$1 page$1) near3 (deliver$4 quer$4 inquir$4 retriev$4 search$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:20
S8	77	S7 and (server$1 with (list$1 near3	US-PGPUB;	OR	OFF	2018/08/04

		(node$1 peer$1 terminal$1 device$1) near3 client$1))	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			23:22
S9	1	S8 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 ((content$1 page$1 document$1) near (identifier$1 address$2))) with ((other$1 second$4 another differen$4) near1 (client$1 peer$1 node$1 terminal$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:22
S10	0	S9 and @ad< "20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:22
S11	3	S8 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 content$1 page$1 document$1) with ((other$1 second$4 another differen$4) near1 (client$1 peer$1 node$1 terminal$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:23
S12	0	S1 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 content$1 page$1 document$1) with ((other$1 second$4 another differen$4) near1 (client$1 peer$1 node$1 terminal$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:25
S13	0	S4 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 content$1 page$1 document$1) with ((other$1 second$4 another differen$4) near1 (client$1 peer$1 node$1 terminal$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:25
S14	1	S1 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 content$1 page$1 document$1) with (client$1 peer$1 node$1 terminal$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:26
S15	1	S4 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 content$1 page$1 document$1) with (client$1 peer$1 node$1 terminal$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:29
S16	3498	(server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 content$1 page$1 document$1) with ((other$1 second$4 another differen$4) near1 (client$1 peer$1 node$1 terminal$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2018/08/04 23:29

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049

			IBM_TDB			
S17	1298	S16 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:30
S18	44	S17 and (server$1 with (list$1 near3 (node$1 peer$1 terminal$1 device$1) near3 client$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/04 23:31
S19	5	(("20060212584") or ("20030097408")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/05 08:43
S20	3	S19 and (live online geographic$6 near$4 close$3 location$1 add$1 adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/05 08:44
S21	3	S19 and (live online geographic$6 near$4 close$3 location$1 add$1 adding select$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/05 08:47
S22	5	(("20060212584") or ("20030097408")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:35
S23	3	S22 and (live online geographic$6 near$4 close$3 location$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:35
S24	3	S22 and (live online status$2 geographic$6 near$4 close$3 location$1 add$1 adding select$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:38
S25	2	S22 and (remov$4 delet$4 drop$4 releas$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2018/08/06 08:43

			JPO; DERWENT; IBM_TDB			
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S27	3	S22 and (proxim$6 geographic$6 near$4 close$3 location$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:50
S28	3	S22 and (criteri$4 select$4 proxim$6 geographic$6 near$4 close$3 location$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:50
S29	1	S22 and (overlap$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:52
S30	2	S22 and (mac host$name$1 ip)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:57
S31	1	S22 and (software$1 version$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 08:58
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S33	3	S22 and (stor$4 using operating)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 09:00
S34	2	S22 and (sequen$6)	US-PGPUB; USPAT;	OR	OFF	2018/08/06 09:03

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S35	2	S22 and (processor$1 execut$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 09:04
S36	3	S22 and (processor$1 execut$4 cpu process$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/08/06 09:05

EAST Search History (Interference)

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9/ 4/ 2018 1:09:33 PM
C:\ Users\ mnguyen2\ Documents\ EAST\ Workspaces\ 15957950.wsp

Bibliographic Data

Application No: 15/957,945

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /MINH CHAU NGUYEN/ Examiner's Signature | Initials

Title: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
04/20/2018	709	2459	HOLA-005-US4
RULE			

APPLICANTS

HOLA NEWCO LTD., Netanya, ISRAEL

INVENTORS

Derry Shribman Tel Aviv, ISRAEL

Ofer Vilenski Moshav Hadar Am, ISRAEL

CONTINUING DATA

This application is a CON of 14025109 09/12/2013

14025109 is a DIV of 12836059 07/14/2010 PAT 8560604

12836059 has PRO of 61249624 10/08/2009

FOREIGN APPLICATIONS

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(Not for submission under 37 CFR 1.99)

Application Number	15/957945
Filing Date	04/20/2018
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	MINH-CHAU NGUYEN
Attorney Docket Number	HOLA-005-US4

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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	
	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.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Examiner Name	MINH-CHAU NGUYEN
	Attorney Docket Number	HOLA-005-US4

/M.N/	9	4937781	A	1990-06-26	Lee , et al.	
/M.N/	10	7970835	B2	2011-06-28	Robert St. Jacques	

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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	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.	

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	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	MINH-CHAU NGUYEN
	Attorney Docket Number	HOLA-005-US4

/M.N/	8	20030204602	A1	2003-10-30	Hudson Michael D.	
	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	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
331 of 455

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15/957945
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	Art Unit	2459
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	Attorney Docket Number	HOLA-005-US4

/M.N/	19	20100293555	A1	2010-15-11	VEPSALAINEN; Ari M.	
	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.	
	24	20080109446	A1	2008-05-08	Wang Matrix XIN	
	25	20020133621	A1	2002-09-19	Talmon Marco et al	
	26	20040107242	A1	2004-06-03	John Vert et al	
	27	20070073878	A1	2007-03-29	Alfredo C. Issa	
	28	20090319502	A1	2009-12-24	Olivier Chalouhi et al	
	29	20060212584	A1	2006-09-21	Mingjian Yu 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]
/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		
	6	2007280388	JP		2007-25-10	Xerox Corporation		
	7	1020090097034	KR		2009-15-09	KT Corporation		
	8	2343536	RU	C2	2009-10-01	Microsoft Corporation		
	9	101075242	CN	A	2007-11-21	TENGXUN SCIENCE & TECHNOLOGY		

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
333 of 455

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	Attorney Docket Number	HOLA-005-US4

/M.N/	10	101179389	CN	A	2008-05-14	Wang Matrix XIN		

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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)	
	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.	
	3	Notice of Preliminary Rejection in KR Application No. 10-2012-7011711 dated July 15, 2016	
	4	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	

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EXAMINER SIGNATURE

Examiner Signature	/MINH CHAU NGUYEN/	Date Considered	08/21/2018

*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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Filing Date	04/20/2018
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	MINH-CHAU NGUYEN
	Attorney Docket Number	HOLA-005-US4

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)	2018-04-19
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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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.

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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.

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15/957945
Filing Date	04/20/2018
First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	MINH-CHAU NGUYEN
Attorney Docket Number	HOLA-005-US4

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	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	
	5	7865585		2011-01-04	Allen Samuels, et al.	
	6	7120666		2006-10-10	Steven McCanne, et al.	
	7	7203741		2007-04-10	Talmon Marco, et al.	

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Examiner Name	MINH-CHAU NGUYEN
Attorney Docket Number	HOLA-005-US4

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	20030009518	A1	2003-01-09	Harrow, Ivan P. ; et al.	
	2	20030074403	A1	2003-04-17	Harrow, Ivan P. ; et al.	
	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	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
338 of 455

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15/957945
	Filing Date	04/20/2018
	First Named Inventor	Derry Shribman
	Art Unit	2459
	Examiner Name	MINH-CHAU NGUYEN
	Attorney Docket Number	HOLA-005-US4

/M.N/	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	
	14	20160021430	A1	2016-01-21	LaBosco; Mark ; et al.	
	15	20110087733	A1	2011-04-14	Derry Shribman; et al.	
	16	20030174648	A1	2003-09-18	Mea Wang; et al.	
	17	20080008089	A1	2008-01-10	Claudson F. Bornstein; et al.	
	18	20040088646	A1	2004-05-06	William J. Yeager; et al.	
	19	20030009583	A1	2003-01-09	Chung Chan; et al.	
	20	20080235391	A1	2008-09-25	Christopher Painter; et al.	
	21	20070156855	A1	2007-07-05	Moses Johnson	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
339 of 455

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Application Number	15/957945
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First Named Inventor	Derry Shribman
Art Unit	2459
Examiner Name	MINH-CHAU NGUYEN
Attorney Docket Number	HOLA-005-US4

/M.N/	22	20020007413	A1	2002-01-17	JJ Garcia-Luna-Aceves, et al.	
	23	20030210694	A1	2003-11-13	Suresh Jayaraman, et al.	
	24	20030200307	A1	2003-10-23	Jyoti Raju, et al.	

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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]
	1							

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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]
/M.N/	1	International Search Report issued in PCT Application No. PCT/US2010/051881 dated 09 December 2010	
/M.N/	2	Supplementary European Search Report issued in EP Application No. 10822724 dated 24 April 2013	

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EXAMINER SIGNATURE

Examiner Signature	/MINH CHAU NGUYEN/	Date Considered	08/21/2018

*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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15/957945
	Filing Date	04/20/2018
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	Art Unit	2459
	Examiner Name	MINH-CHAU NGUYEN
	Attorney Docket Number	HOLA-005-US4

[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. 2049
341 of 455

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	MINH-CHAU NGUYEN
	Attorney Docket Number	HOLA-005-US4

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)	2018-04-19
Name/Print	Yehuda BINDER	Registration Number	73612

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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.

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	10677	(servers and (peers clients)) same ((content$1 document$1 page$1) with (deliver$4 quer$4 inquir$4 retriev$4 search$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/03 23:18
L2	995	1 and (server$1 with (receiv$4 quer$4 transmit$4 inquir$4 send$4) with (url$1 ((content$1 page$1 document$1) near (identifier$1 address$2))) with (client$1 peer$1 node$1 terminal$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/03 23:19
L3	477	2 and @ad<"20091008"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/04 00:00
L4	233	3 and (live online) and (geographic$6 location$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/04 00:02
L5	29	4 and (software$1 with version$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/04 00:02
L6	0	5 and (server$1 with (list$1 near3 (node$1 peer$1 terminal$1 device$1) near3 client$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/04 00:02
L7	1	4 and (server$1 with (list$1 near3 (node$1 peer$1 terminal$1 device$1) near3 client$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/04 00:02
L8	7	3 and (server$1 with (list$1 near3 (node$1 peer$1 terminal$1 device$1) near3 client$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/04 00:22
L9	7	8 and @ad<"20091008"	US-PGPUB; USPAT;	OR	OFF	2018/09/04 00:28

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EAST Search History (Interference)

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/957,945	04/20/2018	Derry Shribman	HOLA-005-US4

CONFIRMATION NO. 7917

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

PUBLICATION NOTICE

OC00000101796678

Title:SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

Publication No.US-2018-0241851-A1
Publication Date:08/23/2018

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 Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, 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 https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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IPR2024-00126, EX. 2049
346 of 455

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/957,945	04/20/2018	Derry Shribman	HOLA-005-US4	7917

131926 7590 05/30/2018

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

EXAMINER	

ART UNIT	PAPER NUMBER
2459	

MAIL DATE	DELIVERY MODE
05/30/2018	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.
IPR2024-00126, EX. 2049
347 of 455

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 15/957,945	**Applicant(s)** Shribman et al.	
	Examiner JoAnne Burke	**Art Unit** OPET	**AIA (First Inventor to File) Status** No

1. THE REQUEST FILED 20 April 2018 IS **GRANTED** .

The above-identified application has met the requirements for prioritized examination

A. ☑ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination**. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;

B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims** , or a multiple dependent claim;

C. filing a **request for continued examination** ;

D. filing a notice of appeal;

E. filing a request for suspension of action;

F. mailing of a notice of allowance;

G. mailing of a final Office action;

H. completion of examination as defined in 37 CFR 41.102; or

I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to JoAnne Burke at (571)272-4584. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/JOANNE L BURKE/ Paralegal Specialist, OPET	

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
348 of 455

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: HOLA-005-US4

In re Application of:	)	Confirmation No. 7917
	)	
Derry SHRIBMAN	)	Art Unit:
	)	
Appln. No.: 15/957,945	)	Examiner:
	)	
Filed: April 20, 2018	)	Washington, D.C.
	)	
For: SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	)	May 29, 2018

PRELIMINARY AMENDMENT:

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

Sir:

Amendments to the drawings begin on page 2 of this paper.

Amendments to the drawings

Submitted herewith is Figure 7 wherein the line quality has been improved.

No new matter was added.

Respectfully submitted,

By / Yehuda Binder /

Yehuda Binder
Registration No. 73,612

Tel: +972-54-4444577
Fax: +972-9-7442619
e-mail: yehuda@maypatents.com

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IPR2024-00126, EX. 2049
350 of 455

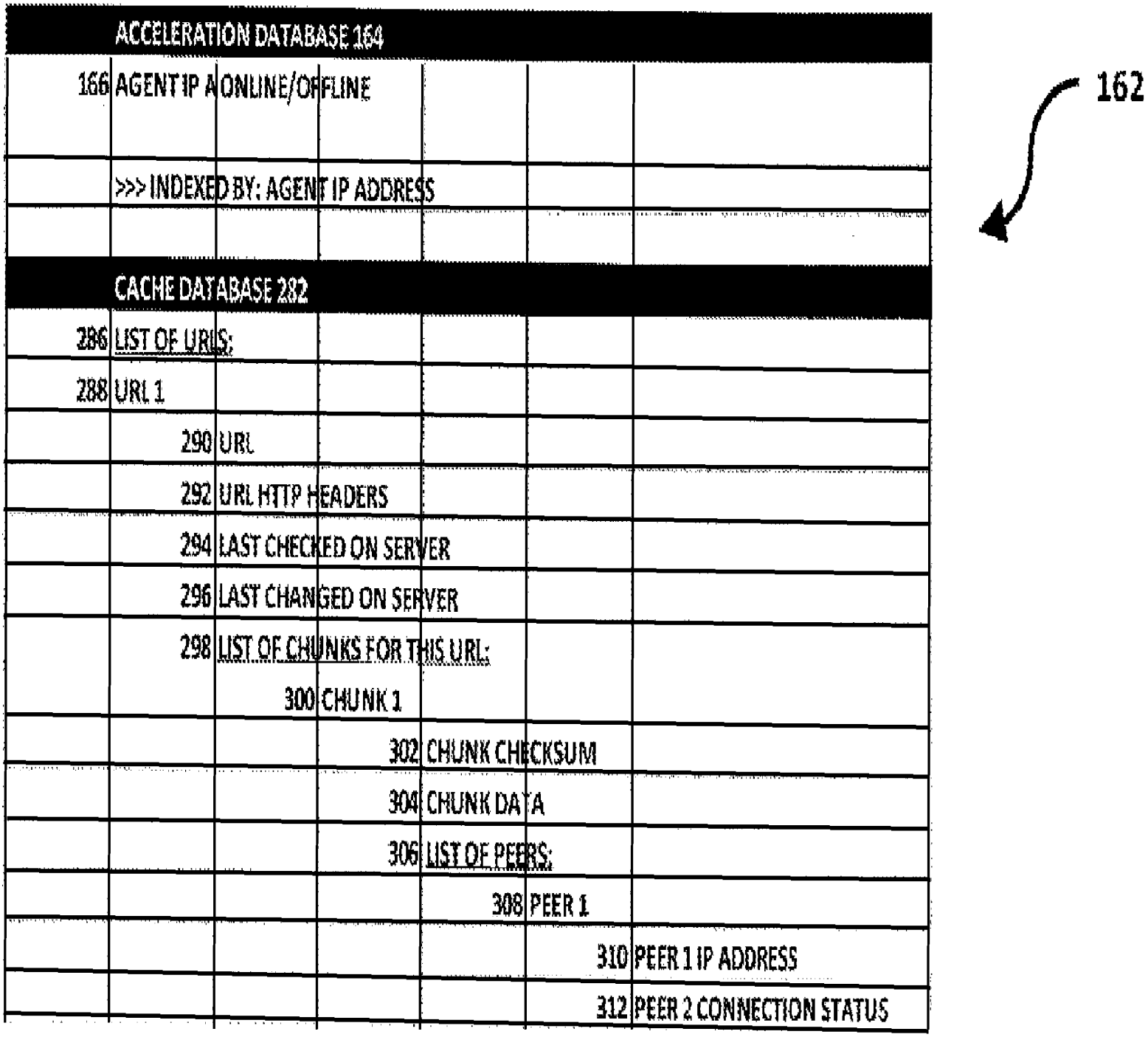

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292 URL HTTP HEADERS
294 LAST CHECKED ON SERVER
296 LAST CHANGED ON SERVER
298 LIST OF CHUNKS FOR THIS URL:
300 CHUNK 1
302 CHUNK CHECKSUM
304 CHUNK DATA
306 LIST OF PEERS:
308 PEER 1
310 PEER 1 IP ADDRESS
312 PEER 2 CONNECTION STATUS
162

FIG. 7

Electronic Acknowledgement Receipt

EFS ID:	32739321
Application Number:	15957945
International Application Number:	
Confirmation Number:	7917
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-US4
Receipt Date:	29-MAY-2018
Filing Date:	20-APR-2018
Time Stamp:	11:50:11
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	Preliminary Amendment	Preliminary-Amendment.pdf	103501 7f490ad4004d8dd27b352eb38d5f3b9ac7a00fea	no	2

Warnings:

Information:					
2	Drawings-only black and white line drawings	Corrected_FIG7.pdf	52370 b56d80d6e2a6ebcd36986a16a5372c049653e6a7	no	1

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

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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.

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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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/957,945	04/20/2018	2447	1235	HOLA-005-US4	29	1

CONFIRMATION NO. 7917

FILING RECEIPT

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

OC000000099301691

Date Mailed: 05/14/2018

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 CON of 14/025,109 09/12/2013
which 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: Yes

Permission to Access Search Results: Yes

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: 05/14/2018

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
354 of 455

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/957,945**

Projected Publication Date: 08/23/2018

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.

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Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
355 of 455

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
356 of 455

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/957,945

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	75		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	330		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	29 minus 20 =	* 9	x 50 =	450	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	x 230 =	0.00			
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	1235		TOTAL	

APPLICATION AS AMENDED - PART II

		(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($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	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	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	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.

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/SB/424 (12-11)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Derry Shribman	Nonprovisional Application Number (if known):	
Title of Invention:	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i), the prioritized examination fee set forth in 37 CFR 1.17(c), and if not already paid, the publication fee set forth in 37 CFR 1.18(d) have been filed with the request. The basic filing fee, search fee, examination fee, and any required excess claims and application size fees are filed with the request or have been already been paid.

2. The application contains or is amended to contain no more than four independent claims and no more than thirty total claims, and no multiple dependent claims.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed oath or declaration under 37 CFR 1.63 is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Yehuda Binder/	Date 2018-04-20
Name (Print/Typed) Yehuda Binder	Practitioner Registration Number 73612

Note: *Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required in accordance with 37 CFR 1.33 and 11.18. Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below*.*

☑ *Total of 1 forms are submitted.

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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.
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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.
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.

SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation application of U.S. non-provisional patent application no. 14/025,109, filed Sep. 12, 2013, which is a divisional application of U.S. non-provisional patent application entitled "SYSTEM AND METHOD FOR PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION" having Ser. No. 12/836,059, filed Jul. 14, 2010 and issued as U.S. Patent No. 8,560,604 on Oct. 15, 2013, and claims priority to U.S. provisional patent application entitled "SYSTEM AND METHOD FOR REDUCING INTERNET CONGESTION," having Ser. No. 61/249,624, filed Oct. 8, 2009, 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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
360 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
361 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
362 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
363 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
364 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
365 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
366 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
367 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
368 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
369 of 455

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

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
371 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
372 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
373 of 455

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,

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
374 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
375 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
376 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
377 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
378 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
379 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
380 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
381 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
382 of 455

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:

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
383 of 455

(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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
384 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
385 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
386 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
387 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
388 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
389 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
390 of 455

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

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
391 of 455

herein within the scope of this disclosure and the present invention and protected by the following claims.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
392 of 455

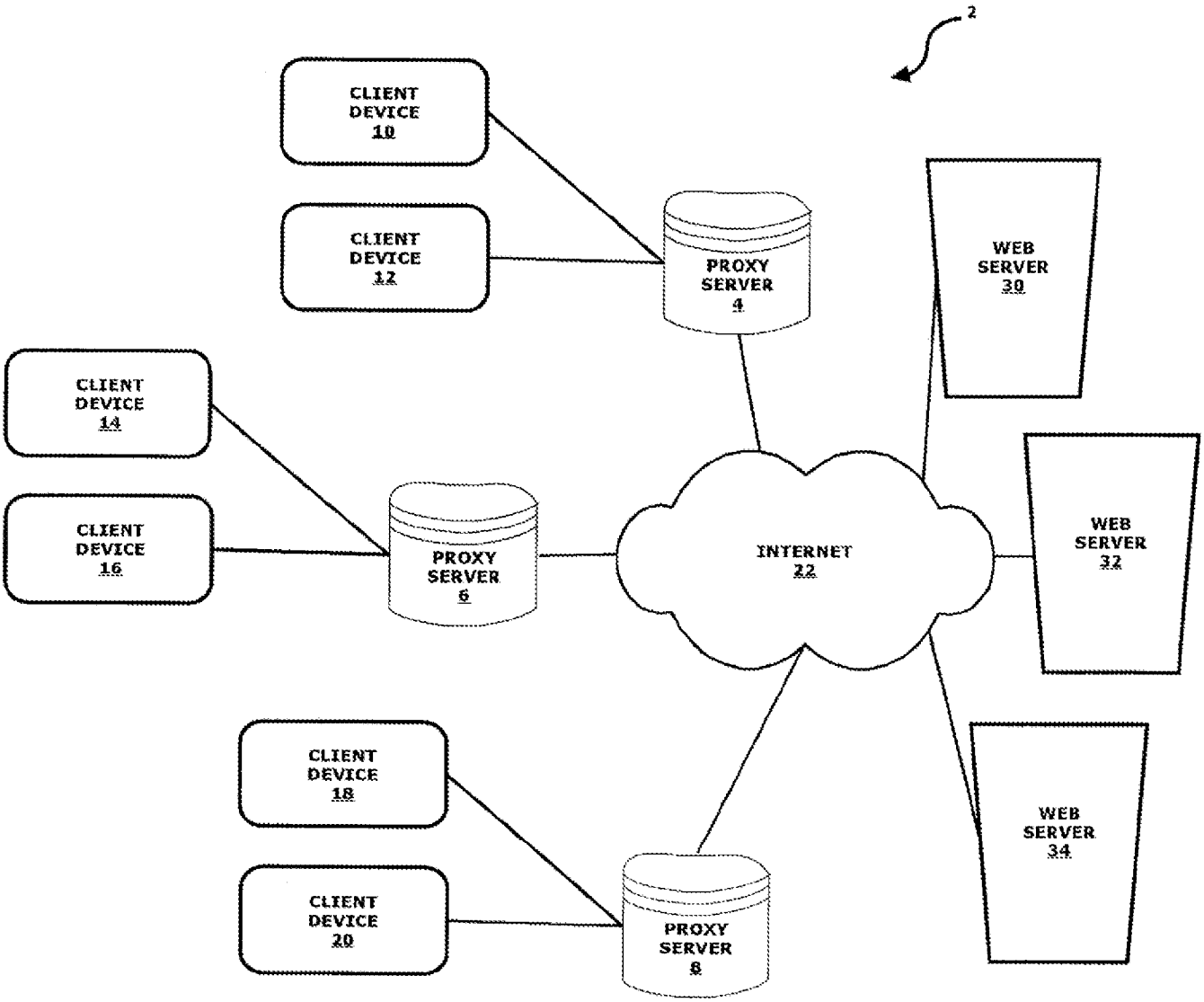

2
CLIENT DEVICE 10
CLIENT DEVICE 12
PROXY SERVER 4
WEB SERVER 30
CLIENT DEVICE 14
CLIENT DEVICE 16
PROXY SERVER 6
INTERNET 22
WEB SERVER 32
CLIENT DEVICE 18
CLIENT DEVICE 20
PROXY SERVER 8
WEB SERVER 34

FIG. 1

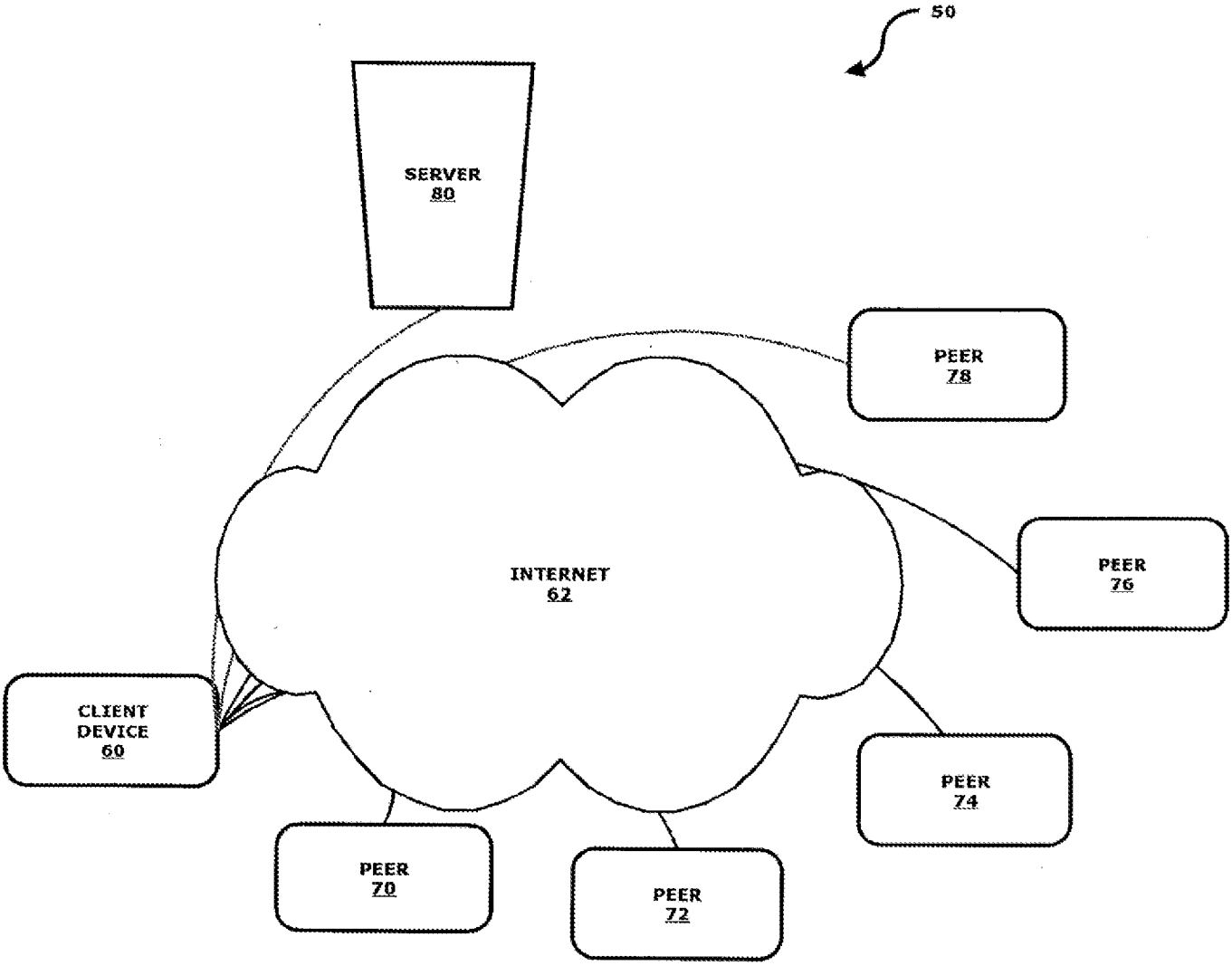

50
SERVER
80
PEER
78
INTERNET
62
PEER
76
CLIENT
DEVICE
60
PEER
74
PEER
70
PEER
72

FIG. 2

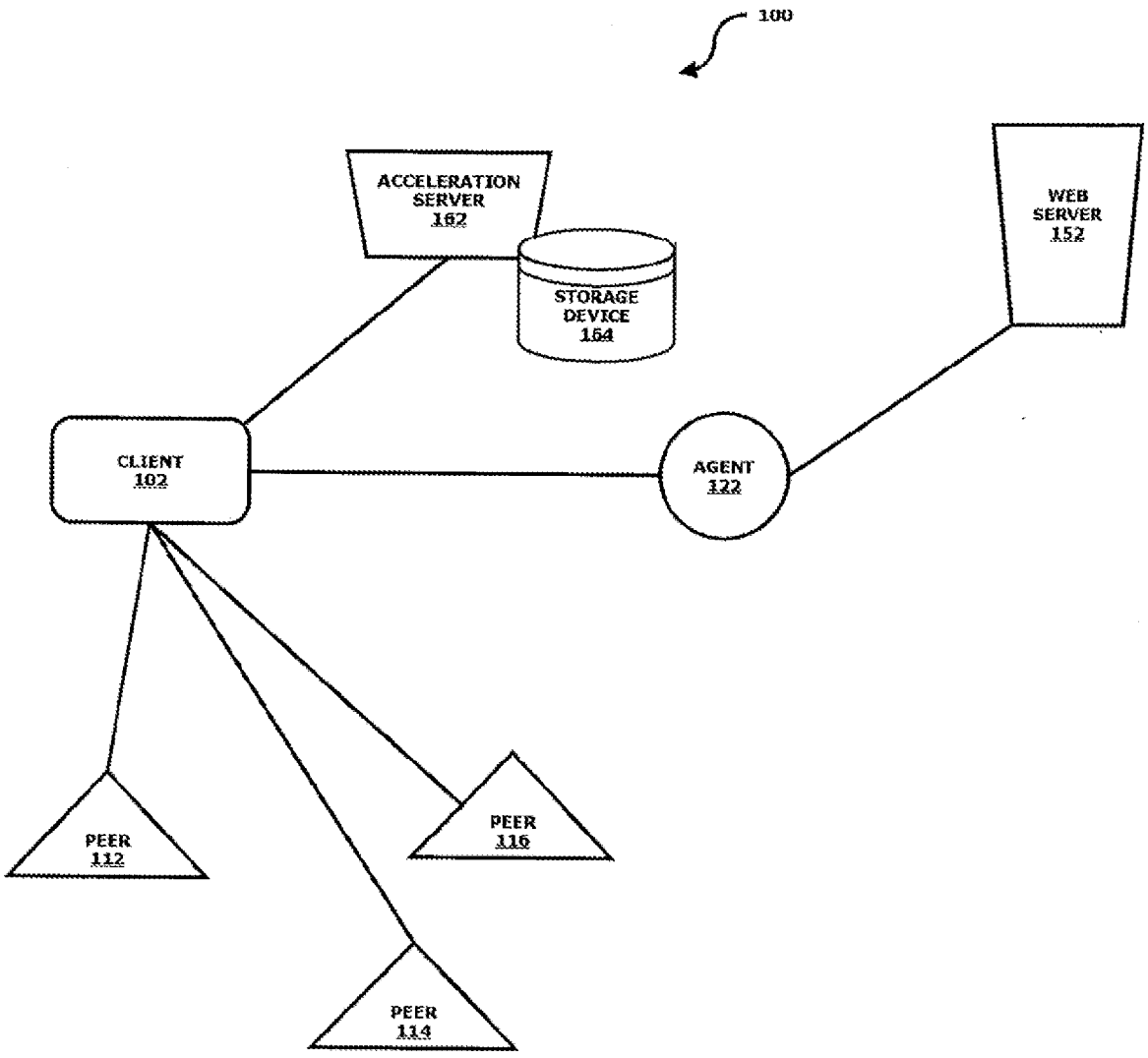

100
ACCELERATION SERVER 162
STORAGE DEVICE 164
WEB SERVER 152
CLIENT 102
AGENT 122
PEER 112
PEER 116
PEER 114

FIG. 3

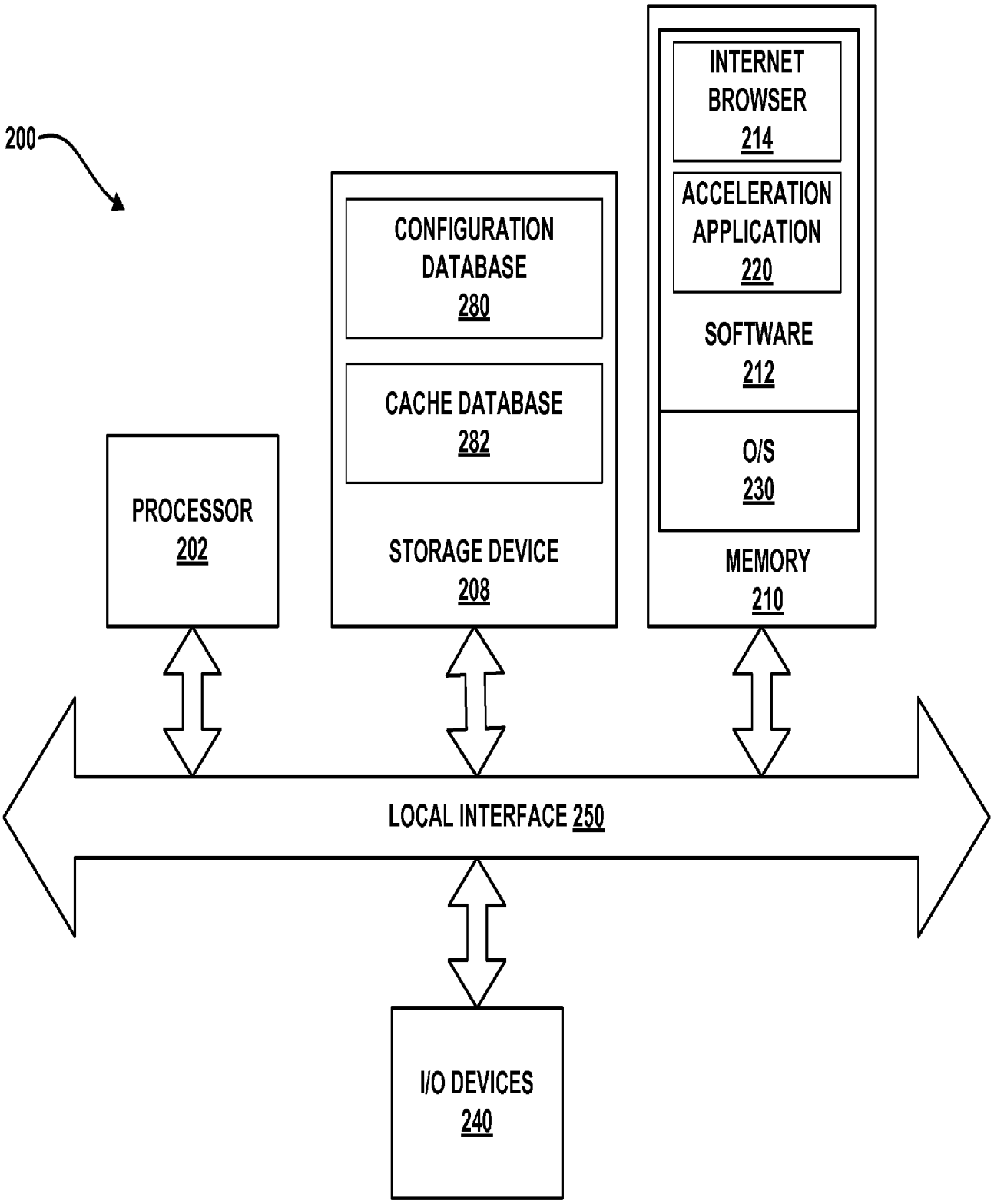

200
INTERNET BROWSER 214
ACCELERATION APPLICATION 220
SOFTWARE 212
O/S 230
MEMORY 210
CONFIGURATION DATABASE 280
CACHE DATABASE 282
STORAGE DEVICE 208
PROCESSOR 202
LOCAL INTERFACE 250
I/O DEVICES 240

FIG. 4

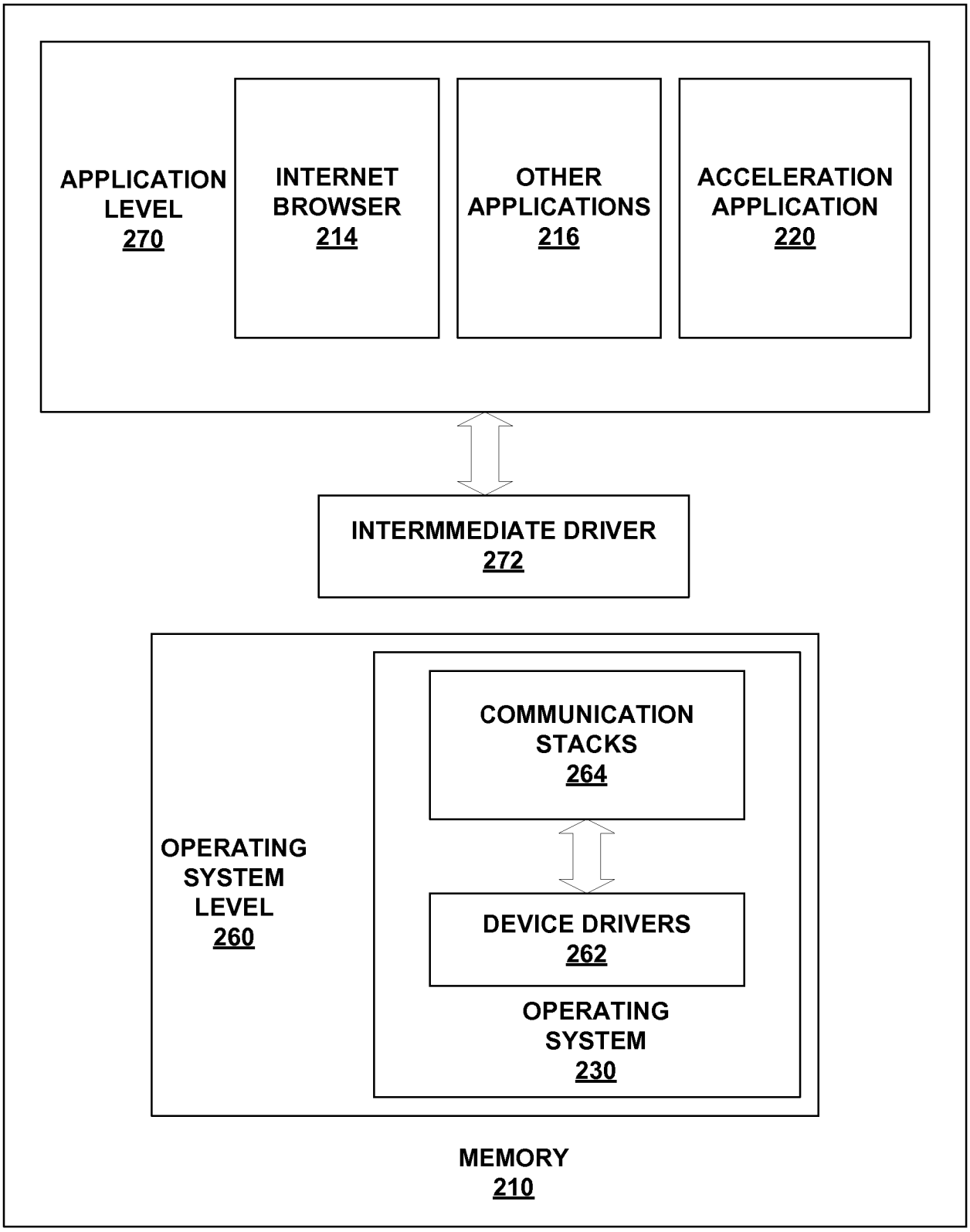

APPLICATION LEVEL 270
INTERNET BROWSER 214
OTHER APPLICATIONS 216
ACCELERATION APPLICATION 220
INTERMMEDIATE DRIVER 272
OPERATING SYSTEM LEVEL 260
COMMUNICATION STACKS 264
DEVICE DRIVERS 262
OPERATING SYSTEM 230
MEMORY 210

FIG. 5

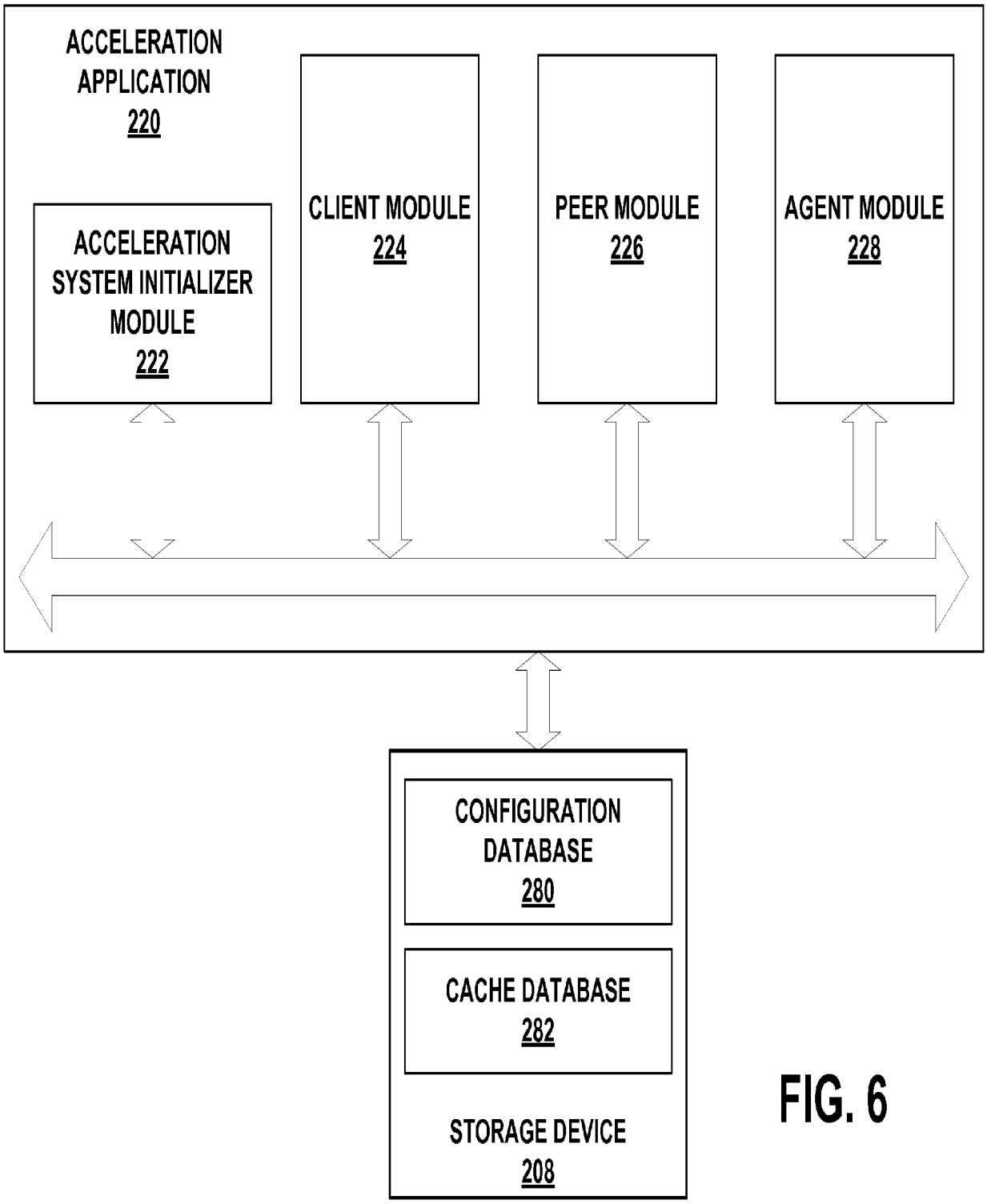

ACCELERATION APPLICATION 220
ACCELERATION SYSTEM INITIALIZER MODULE 222
CLIENT MODULE 224
PEER MODULE 226
AGENT MODULE 228
CONFIGURATION DATABASE 280
CACHE DATABASE 282
STORAGE DEVICE 208

FIG. 6

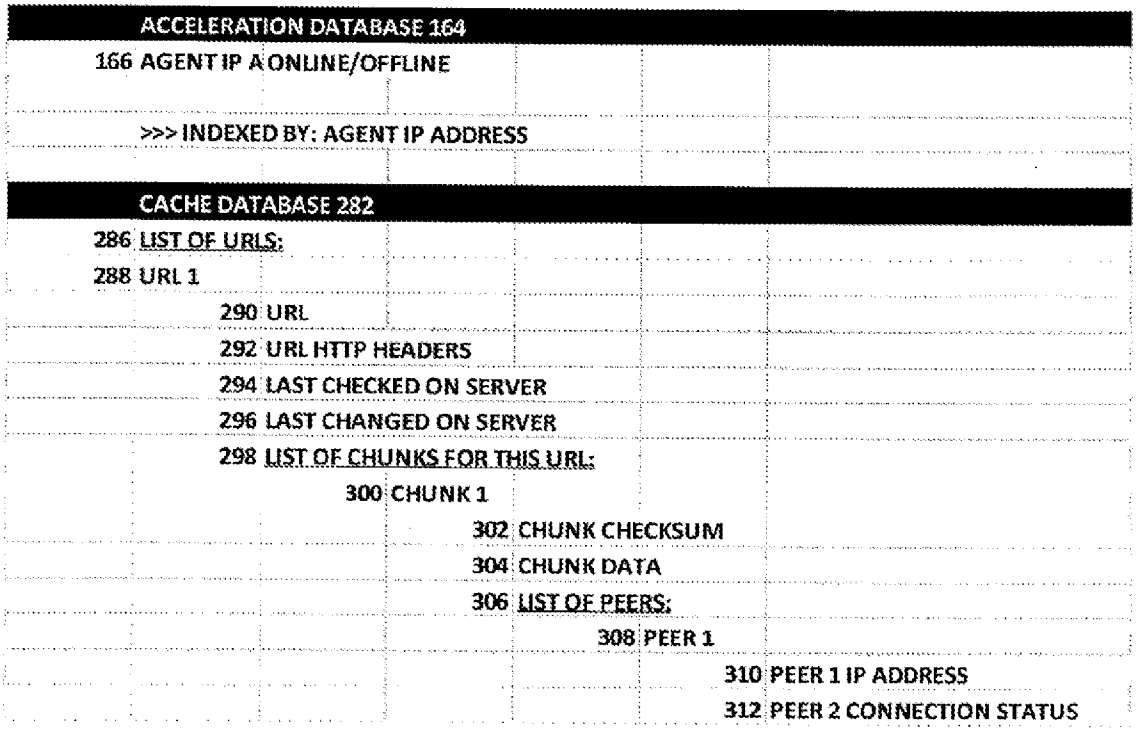

ACCELERATION DATABASE 164
166 AGENT IP ADDRESS
ONLINE/OFFLINE
>>> INDEXED BY: AGENT IP ADDRESS
CACHE DATABASE 282
286 LIST OF URLS:
288 URL 1
290 URL
292 URL HTTP HEADERS
294 LAST CHECKED ON SERVER
296 LAST CHANGED ON SERVER
298 LIST OF CHUNKS FOR THIS URL:
300 CHUNK 1
302 CHUNK CHECKSUM
304 CHUNK DATA
306 LIST OF PEERS:
308 PEER 1
310 PEER 1 IP ADDRESS
312 PEER 2 CONNECTION STATUS
162

FIG. 7

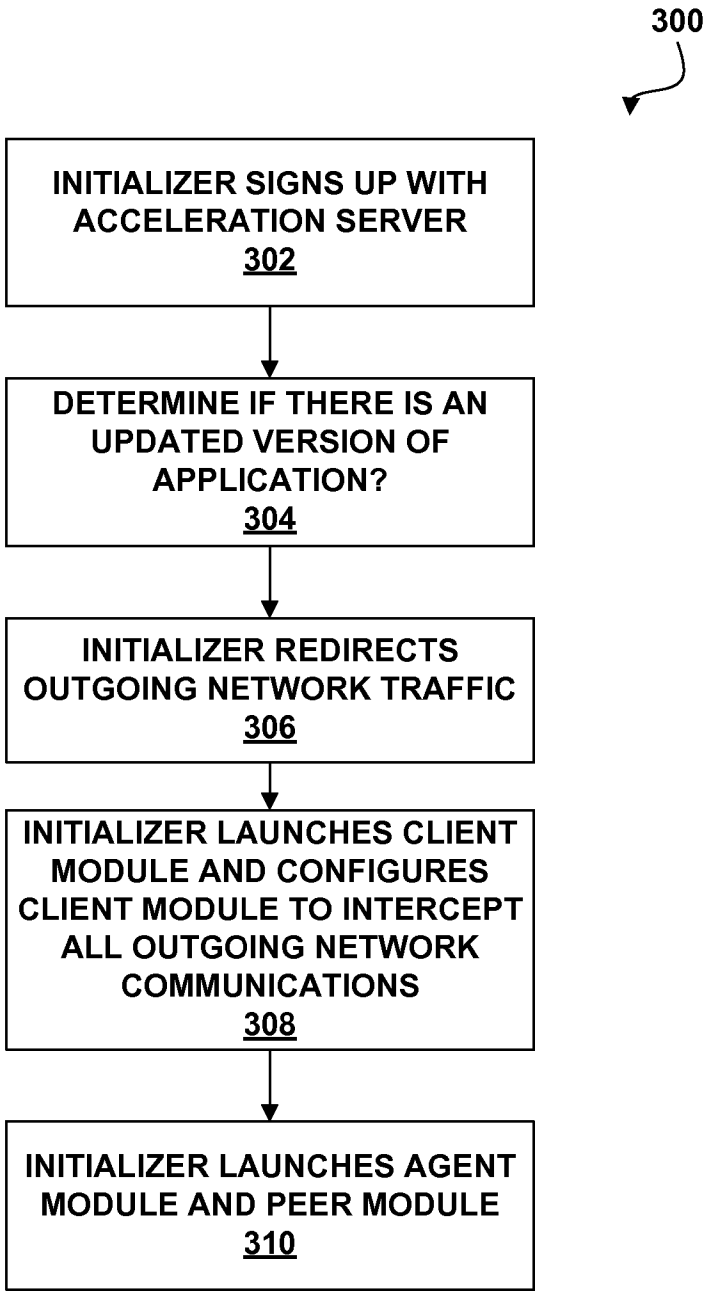

300
INITIALIZER SIGNS UP WITH ACCELERATION SERVER
302
DETERMINE IF THERE IS AN UPDATED VERSION OF APPLICATION?
304
INITIALIZER REDIRECTS OUTGOING NETWORK TRAFFIC
306
INITIALIZER LAUNCHES CLIENT MODULE AND CONFIGURES CLIENT MODULE TO INTERCEPT ALL OUTGOING NETWORK COMMUNICATIONS
308
INITIALIZER LAUNCHES AGENT MODULE AND PEER MODULE
310

FIG. 8

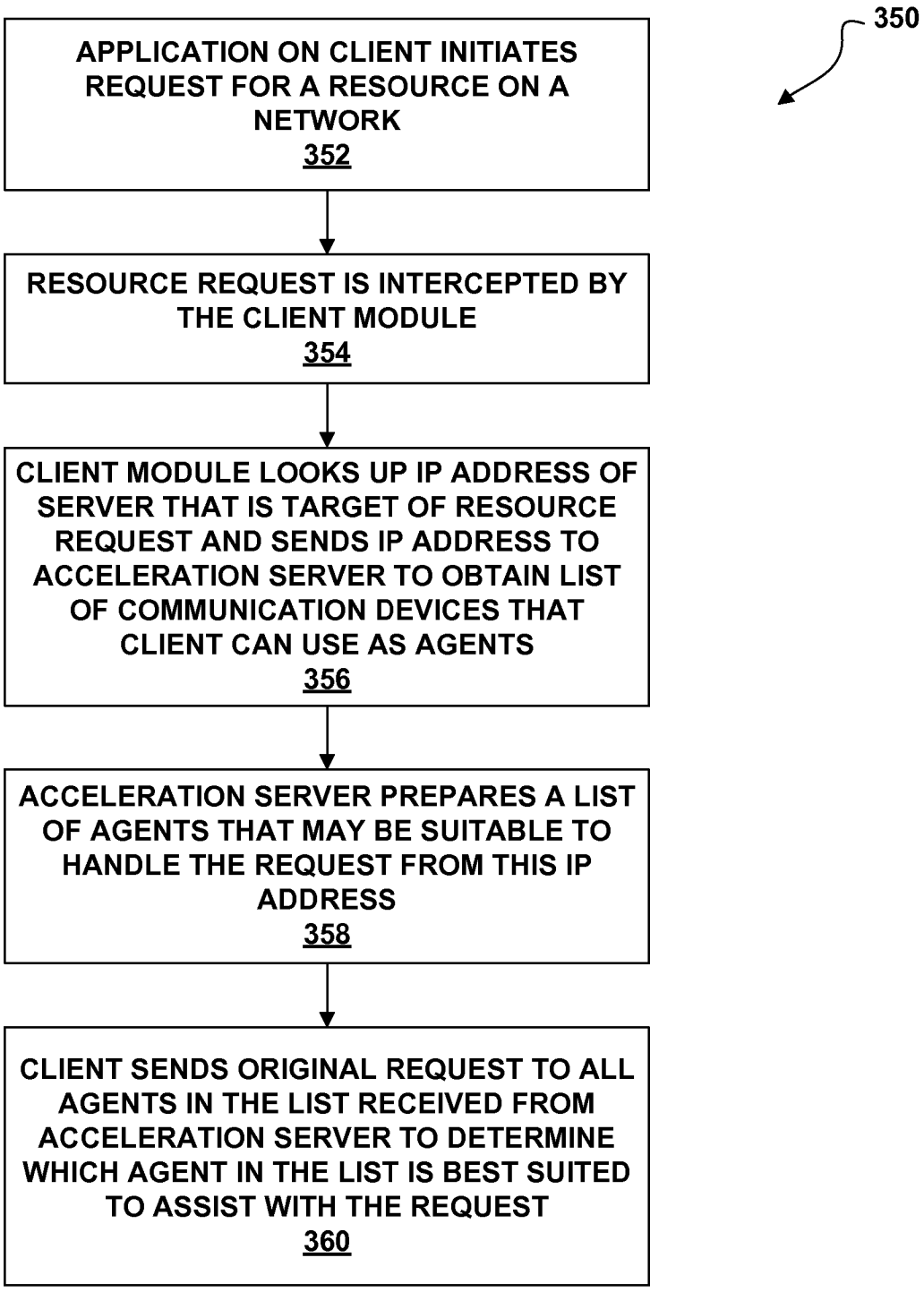

350
APPLICATION ON CLIENT INITIATES REQUEST FOR A RESOURCE ON A NETWORK
352
RESOURCE REQUEST IS INTERCEPTED BY THE CLIENT MODULE
354
CLIENT MODULE LOOKS UP IP ADDRESS OF SERVER THAT IS TARGET OF RESOURCE REQUEST AND SENDS IP ADDRESS TO ACCELERATION SERVER TO OBTAIN LIST OF COMMUNICATION DEVICES THAT 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

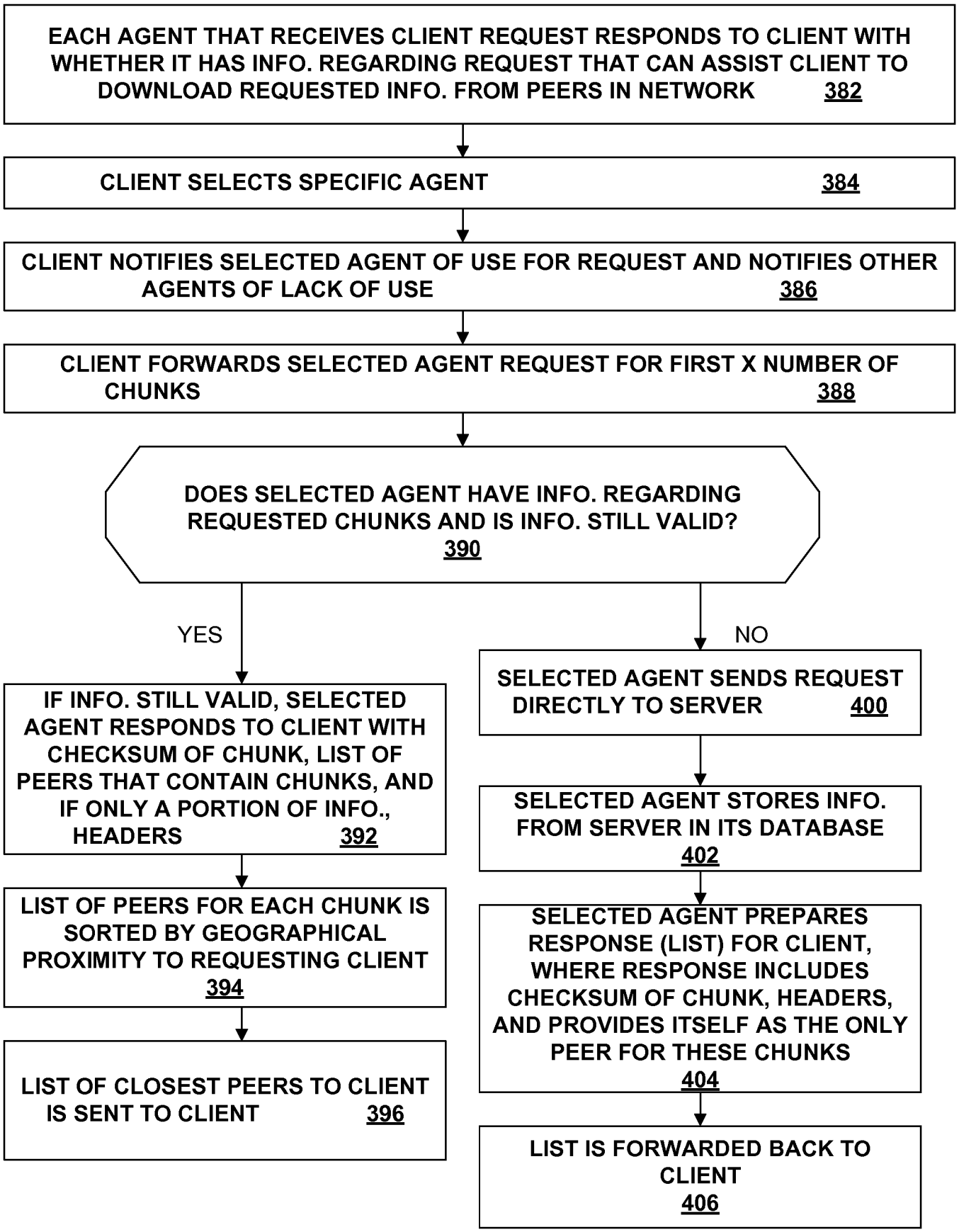

EACH AGENT THAT RECEIVES CLIENT REQUEST RESPONDS TO CLIENT WITH WHETHER IT HAS INFO. REGARDING REQUEST THAT CAN ASSIST CLIENT TO DOWNLOAD REQUESTED INFO. FROM PEERS IN NETWORK 382
CLIENT SELECTS SPECIFIC AGENT 384
CLIENT NOTIFIES SELECTED AGENT OF USE FOR REQUEST AND NOTIFIES OTHER AGENTS OF LACK OF 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

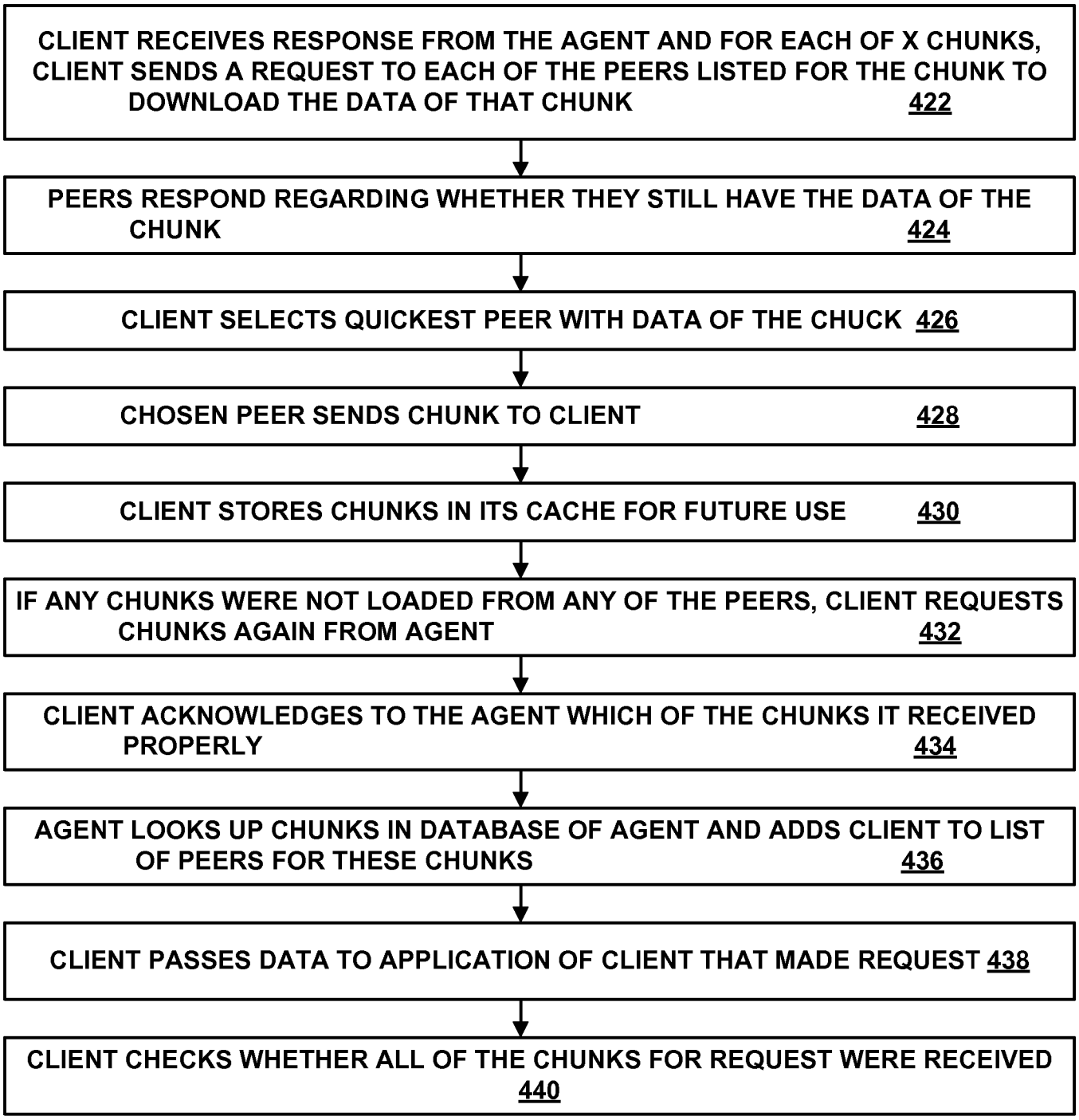

CLIENT RECEIVES RESPONSE FROM THE AGENT AND FOR EACH OF X CHUNKS, CLIENT SENDS A REQUEST TO EACH OF THE PEERS LISTED FOR THE CHUNK TO DOWNLOAD THE DATA OF THAT CHUNK 422
PEERS RESPOND REGARDING WHETHER THEY STILL HAVE THE DATA OF THE CHUNK 424
CLIENT SELECTS QUICKEST PEER WITH DATA OF THE CHUCK 426
CHOSEN 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

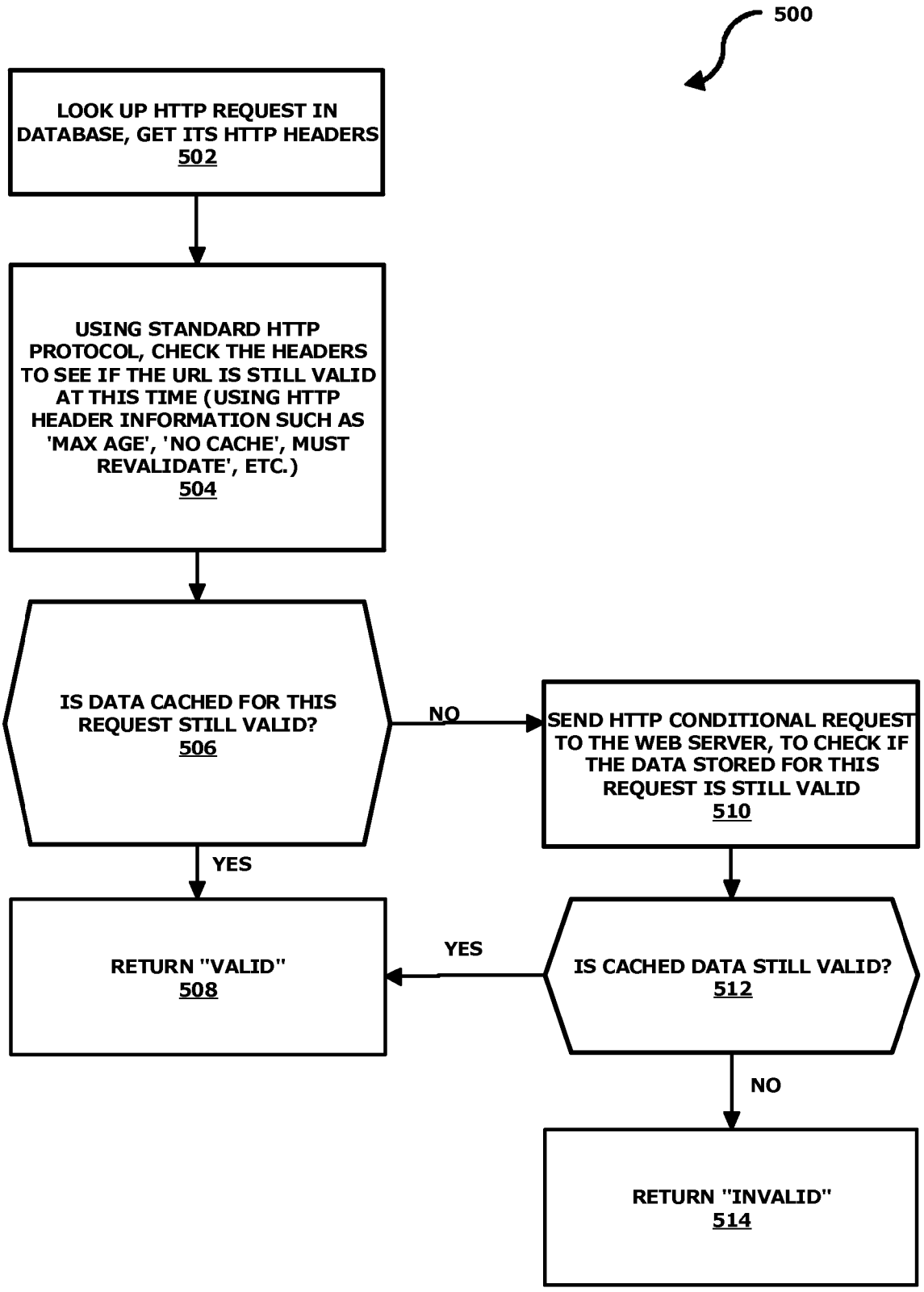

500
LOOK UP HTTP REQUEST IN DATABASE, GET ITS HTTP HEADERS
502
USING STANDARD HTTP PROTOCOL, CHECK THE HEADERS TO SEE IF THE URL IS STILL VALID AT THIS TIME (USING HTTP HEADER INFORMATION SUCH AS 'MAX AGE', 'NO CACHE', MUST REVALIDATE', ETC.)
504
IS DATA CACHED FOR THIS REQUEST STILL VALID?
506
NO
SEND 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

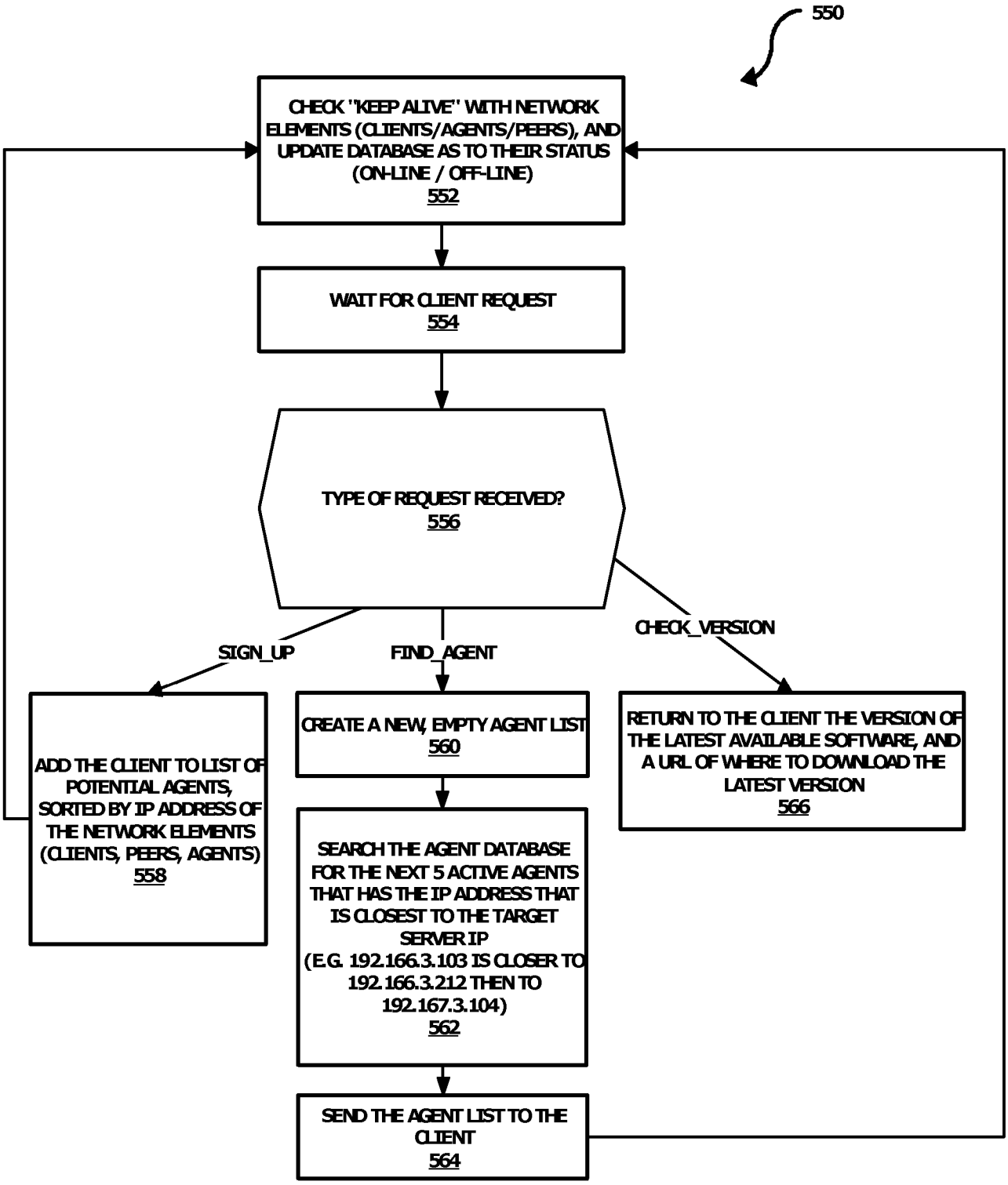

550
CHECK "KEEP ALIVE" WITH NETWORK ELEMENTS (CLIENTS/AGENTS/PEERS), AND UPDATE DATABASE AS TO THEIR STATUS (ON-LINE / OFF-LINE)
552
WAIT FOR CLIENT REQUEST
554
TYPE OF REQUEST RECEIVED?
556
SIGN_UP
FIND_AGENT
CHECK_VERSION
ADD THE CLIENT TO LIST OF POTENTIAL AGENTS, SORTED BY IP ADDRESS OF THE NETWORK 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

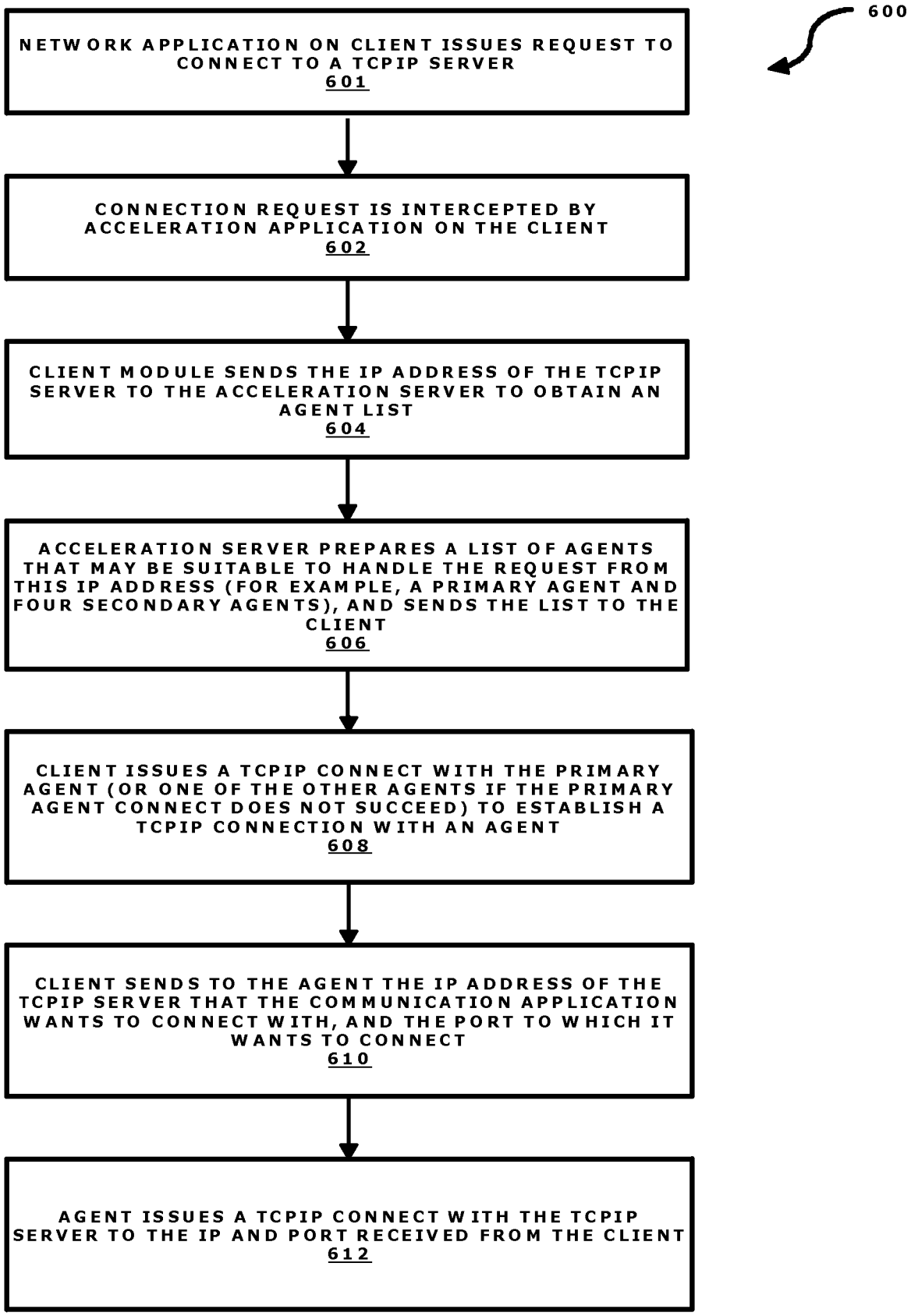

600
NETWORK APPLICATION ON CLIENT ISSUES REQUEST TO CONNECT TO A TCPIP SERVER
601
CONNECTION REQUEST IS INTERCEPTED BY ACCELERATION APPLICATION ON THE CLIENT
602
CLIENT MODULE SENDS THE IP ADDRESS OF THE TCPIP SERVER TO THE ACCELERATION SERVER TO OBTAIN AN AGENT LIST
604
ACCELERATION SERVER PREPARES 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

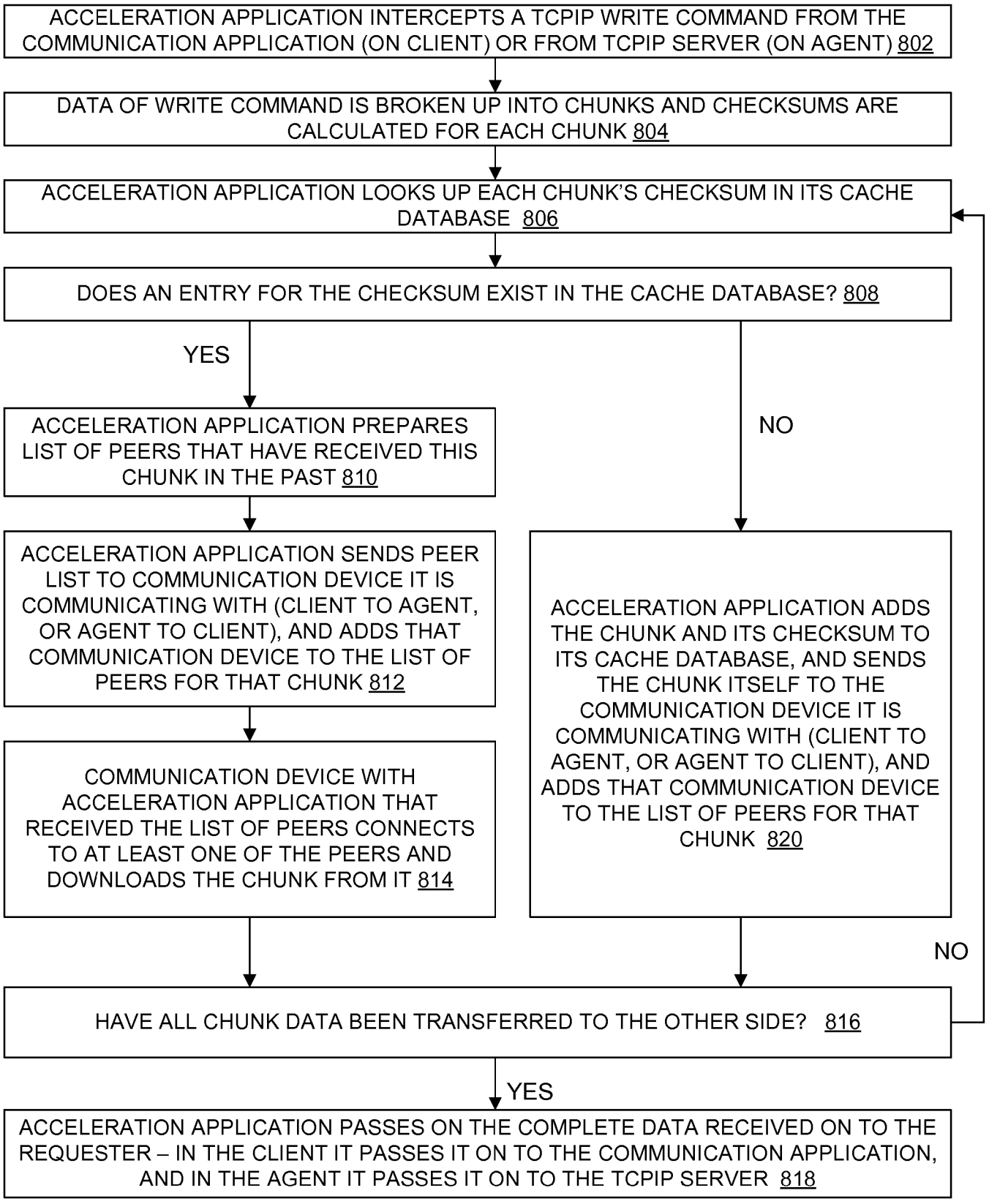

ACCELERATION APPLICATION INTERCEPTS A TCPIP WRITE COMMAND FROM THE COMMUNICATION APPLICATION (ON CLIENT) OR FROM TCPIP SERVER (ON AGENT) 802
DATA OF WRITE COMMAND IS BROKEN UP INTO CHUNKS AND CHECKSUMS ARE CALCULATED FOR EACH CHUNK 804
ACCELERATION APPLICATION LOOKS UP EACH CHUNK'S CHECKSUM IN ITS CACHE 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	HOLA-005-US4
	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

City	Country of Residence [i]
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Mailing Address of Inventor:

Address 1	9/6 Beylinson St.,
Address 2	
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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

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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:

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IPR2024-00126, EX. 2049
408 of 455

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	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	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-US4	**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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IPR2024-00126, EX. 2049

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

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	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	14/025109	2013-09-12

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. Add

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. Add

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	
Title of Invention	SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION	

☐ 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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	
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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	
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 — Remove

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.		
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. Add

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.

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IPR2024-00126, EX. 2049

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	
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.

Remove

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. Add

Signature:

Remove

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)	2018-04-20
First Name	Yehuda	Last Name	BINDER	Registration Number	73612

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HOLA-005-US4
	Application Number	
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.

Claims

1. A method for use with a first client device, for use with a first server that comprises a web server that is a Hypertext Transfer Protocol (HTTP) server that responds to HTTP requests, the first server stores a first content identified by a first content identifier, and for use with a second server, the method by the first client device comprising:

receiving, from the second server, the first content identifier;

sending, to the first server over the Internet, a Hypertext Transfer Protocol (HTTP) request that comprises the first content identifier;

receiving, the first content from the first server over the Internet in response to the sending of the first content identifier; and

sending, the first content by the first client device to the second server, in response to the receiving of the first content identifier.

2. The method according to claim 1, further comprising storing, by the first client device in response to the receiving from the first server, the first content, and wherein the sending, of the HTTP request is in response to the receiving of the first content identifier.

3. The method according to claim 2, further comprising:

receiving, from a second client device, the first content identifier; and

sending, the stored first content by the first client device to the second client device, in response to the

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
417 of 455

receiving of the first content identifier from the second client device.

4. The method according to claim 1, wherein the first or second server is a Transmission Control Protocol / Internet Protocol (TCP/IP) server that communicates over the Internet based on, or according to, using TCP/IP protocol or connection, and wherein the first client device is a Transmission Control Protocol / Internet Protocol (TCP/IP) client that communicates respectively with the first or second server over the Internet based on, or according to, TCP/IP protocol or connection.

5. The method according to claim 1, wherein the first client device communicates over the Internet based on, or according to, one out of UDP, DNS, TCP, FTP, POP#, SMTP, or SQL standards.

6. The method according to claim 1, wherein the first content comprises web-page, audio, or video content, wherein the first content identifier comprises a Uniform Resource Locator (URL), and wherein the method further comprising executing, by the first client device, a web browser application or an email application.

7. The method according to claim 1, for use with a third server that comprises a web server that is Hypertext Transfer Protocol (HTTP) server, the third server responds to HTTP requests and stores a second content identified by a second content identifier, the method by the first client device further comprising:

identifying, an HTTP request for the second content;

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
418 of 455

sending, to the second server over the Internet in response to the identifying, the second content identifier and a criterion; and

receiving, over the Internet in response to the sending, from a second client device selected from a plurality of client devices according to the criterion, a part of, or a whole of, the second content.

8. The method according to claim 7, further comprising executing, by the first client device, a web browser application or an email application, and wherein the identifying comprises intercepting, by a driver in the first client device, the request for the second content respectively from the web browser application or the email application.

9. The method according to claim 7, wherein the criterion is stored in the first client device, and the method further comprising selecting, by the first client device, the second client device from the plurality of client devices, according to the stored criterion.

10. The method according to claim 9, wherein the criterion is based on, or comprises, the geographical location of the plurality of client devices, or a response time when communicating with the first client device.

11. The method according to claim 9, wherein the second client device is the quickest to respond to queries from the first client device.

12. The method according to claim 9, further comprising sending, by the first client device, a notification message to a device from the plurality of client devices that was not selected as part of the selecting.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
419 of 455

13. The method according to claim 1, further comprising periodically communicating between the second server and the first client device.
14. The method according to claim 13, wherein the periodically communicating comprises exchanging ‘keep alive’ messages.

15. The method according to claim 1, further comprising establishing, by the first client device, a Transmission Control Protocol (TCP) connection with the second server using TCP/IP protocol.

16. The method according to claim 1, wherein the first client device is identified by a Media Access Control (MAC) address or a hostname, and wherein the method further comprising sending, by the first client device, during, as part of, or in response to, a start-up of the first client device, a first message to the second server, and wherein the first messages comprises the first IP address, the MAC address, or the hostname.

17. The method according to claim 16, for use with a first application stored in the first client device and associated with a first version number, wherein the first message comprises the first version number.
18. The method according to claim 17, for use with a second application that is a version of the first application, is stored in the second server, and is associated with a second version number, wherein the method further comprising receiving, by the first client device from the second server, in response to the first message, a second message that comprises the second version number.
19. The method according to claim 18, wherein the method further comprising downloading over the Internet, by the first

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
420 of 455

client device from the second server, in response to the first message, the second application from the second server, and installing the second application in the first client device as a replacement for the first application.

20. The method according to claim 1, wherein the first or second server is a Transmission Control Protocol / Internet Protocol (TCP/IP) server, wherein the first client device communicates over the Internet with the first or second server based on, or according to, using TCP/IP protocol or connection.

21. The method according to claim 1, further comprising determining, by the first client device, that the received first content, is valid.

22. The method according to claim 22, wherein the determining is based on the received HTTP header according to, or based on, IETF RFC 2616.

23. The method according to claim 22, further comprising:

sending, a message over the Internet in response to the determining that the received first content, is not valid; and

receiving, over the Internet in response to the sending of the message, from the second server or from a second client device selected from a plurality of client devices, the first content.

24. The method according to claim 1, further comprising storing, operating, or using, a client operating system.

25. The method according to claim 1, wherein the steps are sequentially executed.

26. The method according to claim 1, for use with a software application that includes computer instructions that, when

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
421 of 455

executed by a computer processor, cause the processor to perform the sending of the Hypertext Transfer Protocol (HTTP) request, the receiving and storing of the first content, the receiving of the first content identifier, and the sending of the part of, or the whole of, the stored first content, the method is further preceded by:

downloading, by the first client device from the Internet, the software application; and

installing, by the first client device, the downloaded software application.

27. The method according to claim 26, wherein the software application is downloaded from the second server.

28. A non-transitory computer readable medium containing computer instructions that, when executed by a computer processor, cause the processor to perform the method according to claim 1.

29. A client device comprising a non-transitory computer readable medium containing computer instructions that, when executed by a computer processor, cause the processor to perform the method according to claim 1.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
422 of 455

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.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
423 of 455

MAY PATENTS LTD.
Yehuda BINDER, U.S. Patent Agent
B.Sc.E.E.; M.Sc.E.E; M.B.A

April 20, 2018

U.S. Patent and Trademark Office (USPTO)
Customer Service Window
Mail Stop Patent Application
401 Dulany Street
Alexandria, VA 22314

Re: **New Utility Patent Application in U.S.**
Applicant(s): **HOLA NEWCO LTD.**
Title: ***SYSTEM PROVIDING FASTER AND MORE EFFICIENT DATA COMMUNICATION***
Attorney Docket No.: HOLA-005-US4

Sir/Madam,

Attached herewith is the above-identified application for Letters Patent including:

1. A request for prioritized examination under 37 CFR 1.102(e) (PTO/SB/424);
2. Applicant asserts small entity status. See 37 CFR 1.27.
3. Application Data Sheet (PTO/AIA/14);
4. Specification (33 pages), Claims 1-29 (6 pages) and abstract (1 page).
5. Fifteen (15) sheets of Drawings (Figures 1-15).
6. Declaration

   [X] Newly executed [ ] Copy from prior application no. _____
7. Assignment submitted through EPAS

   [X] Newly executed [ ] Copy from prior application no. _____
8. Power of Attorney
9. Information Disclosure Statement (PTO/SB/08).

   Certain documents were previously filed or cited to the USPTO in the prior application 14/025,109, which is relied upon under 35 U.S.C. § 120.

   Applicant(s) identify these documents by attaching an Information Disclosure Statement listing these documents and request that they be considered and made of record in accordance with 37 CFR § 1.98(d). Per Section 1.98(d),

   copies of these documents need not be filed in the application.

e-mail: yehuda@maypatents.com; Mobile: +972-54-4444577

MAY PATENTS LTD.
Yehuda BINDER, U.S. Patent Agent
B.Sc.E.E.; M.Sc.E.E; M.B.A

10. Electronic Payment in the amount of US$ 3,435 is being made by deposit account no. 506726 to cover filing fee calculated as follows:

Application as Filed				**Fee (US$)**
Basic Filing Fee				75.00
Search Fee				330.00
Examination Fee				380.00
Publication Fee				130.00
Prioritized Examination Processing Fee				70.00
Prioritized Examination Fee				2,000.00
Total Sheets	**Extra Sheets**		**Rate**	
55/100	--		200.00	--
Claims	**# Filed**	**# Extra**	**Rate**	
Total Claims	1-29	9	50.00	450.00
Independent Claims	3	--	230.00	--
Multiple Dependent Claim			410.00	--
Total Filing Fee				3,435.00

1. As in the prior application 14/025,109, please associate the above referenced application with **Customer No. 131926**.
2. The Correspondence Address associated with **Customer No. 131926.**

Submitted by,
May Patents Ltd.

By: /Yehuda Binder/
Yehuda Binder
Registration No. 73,612

e-mail: yehuda@maypatents.com; Mobile: +972-54-4444577

PTO/SB/08a (03-15)
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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	HOLA-005-US4

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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
	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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	Attorney Docket Number	HOLA-005-US4

	9	4937781	A	1990-06-26	Lee , et al.	
	10	7970835	B2	2011-06-28	Robert St. Jacques	

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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	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.	

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	Attorney Docket Number	HOLA-005-US4

	8	20030204602	A1	2003-10-30	Hudson Michael D.	
	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	

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	Attorney Docket Number	HOLA-005-US4

	19	20100293555	A1	2010-15-11	VEPSALAINEN; Ari M.	
	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.	
	24	20080109446	A1	2008-05-08	Wang Matrix XIN	
	25	20020133621	A1	2002-09-19	Talmon Marco et al	
	26	20040107242	A1	2004-06-03	John Vert et al	
	27	20070073878	A1	2007-03-29	Alfredo C. Issa	
	28	20090319502	A1	2009-12-24	Olivier Chalouhi et al	
	29	20060212584	A1	2006-09-21	Mingjian Yu 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		
	6	2007280388	JP		2007-25-10	Xerox Corporation		
	7	1020090097034	KR		2009-15-09	KT Corporation		
	8	2343536	RU	C2	2009-10-01	Microsoft Corporation		
	9	101075242	CN	A	2007-11-21	TENGXUN SCIENCE & TECHNOLOGY		

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IPR2024-00126, EX. 2049

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	10	101179389	CN	A	2008-05-14	Wang Matrix XIN		

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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]
	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.	
	3	Notice of Preliminary Rejection in KR Application No. 10-2012-7011711 dated July 15, 2016	
	4	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	

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	Application Number	
	Filing Date	
	First Named Inventor	Derry Shribman
	Art Unit	
	Examiner Name	
	Attorney Docket Number	HOLA-005-US4

CERTIFICATION STATEMENT

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☐ 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.

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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)	2018-04-19
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 information provided by you in this form will be subject to the following routine uses:

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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.

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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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	HOLA-005-US4

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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
	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	
	5	7865585		2011-01-04	Allen Samuels, et al.	
	6	7120666		2006-10-10	Steven McCanne, et al.	
	7	7203741		2007-04-10	Talmon Marco, et al.	

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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.	
	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	

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	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	
	14	20160021430	A1	2016-01-21	LaBosco; Mark ; et al.	
	15	20110087733	A1	2011-04-14	Derry Shribman; et al.	
	16	20030174648	A1	2003-09-18	Mea Wang; et al.	
	17	20080008089	A1	2008-01-10	Claudson F. Bornstein; et al.	
	18	20040088646	A1	2004-05-06	William J. Yeager; et al.	
	19	20030009583	A1	2003-01-09	Chung Chan; et al.	
	20	20080235391	A1	2008-09-25	Christopher Painter; et al.	
	21	20070156855	A1	2007-07-05	Moses Johnson	

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	Attorney Docket Number	HOLA-005-US4

	22	20020007413	A1	2002-01-17	JJ Garcia-Luna-Aceves, et al.	
	23	20030210694	A1	2003-11-13	Suresh Jayaraman, et al.	
	24	20030200307	A1	2003-10-23	Jyoti Raju, et al.	

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	1	International Search Report issued in PCT Application No. PCT/US2010/051881 dated 09 December 2010	
	2	Supplementary European Search Report issued in EP Application No. 10822724 dated 24 April 2013	

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Signature	/Yehuda Binder/	Date (YYYY-MM-DD)	2018-04-19
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.**

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.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 17459-8101	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US 10/51881	International filing date *(day/month/year)* 08 October 2010 (08.10.2010)	(Earliest) Priority Date *(day/month/year)* 08 October 2009 (08.10.2009)
Applicant HOLA NETWORKS, LTD.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 3

☐ as suggested by the applicant.

☒ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
441 of 455

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

A system 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 is transmitted to the acceleration server, which provides a list of agents to use for this IP address. 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. The client then downloads the data from these peers in parts and in parallel, thereby speeding up the Web transfer.

Oxylabs LT, UAB v. Bright Data Ltd.
IPR2024-00126, EX. 2049
442 of 455

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G01R 31/08, G06F 11/00, G08C 15/00 (2010.01)
USPC - 370/230
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)
USPC: 370/230

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 370/229, 230, 351, 389, 400, 401, 464, 465, 468; 709/217, 219; 707/705, 781, 783, 784, 785, 786, 788, E17.031, E17.12, 999.002, 999.01; 718/100, 102 (keyword limited - see search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (PGPB, USPT, USOC, EPAB, JPAB); GOOGLE; Google Scholar
Terms: internet, protocol, speed, faster, content, server, web, request, agent, module, url, http, header, packet, network, fetch, proxy, chunk, portion, cooperate, ftp, smtp, load, geography, optimal, maximize, cache, server, checksum.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/0174648 A1 (WANG et al.) 18 September 2003 (18.09.2003) entire document, especially abstract, para [0003], [0007], [0014], [0030], [0031], [0033], [0043], [0092], [0204], [0219], [0232], [0246], [0417], [0573], [0598], [0610], [0823], [1006], [1146], [1150], [1156], [1177].	1-45
Y	US 2008/0008089 A1 (BORNSTEIN et al.) 10 January 2008 (10.01.2008) entire document, especially abstract, para [0007], [0010], [0011], [0030], [0033], [0084], [0086].	1-45
A	US 2004/0088646 A1 (YEAGER et al.) 06 May 2004 (06.05.2004) entire document, especially abstract, para [0009], [0010], [0077], [0078], [0081], [0084], [0088].	1-45

☐ Further documents are listed in the continuation of Box C. ☐

* 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
22 November 2010 (22.11.2010)	09 DEC 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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:	Yehuda Binder
Attorney Docket Number:	HOLA-005-US4

Filed as Small Entity

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
REQUEST FOR PRIORITIZED EXAMINATION	2817	1	2000	2000
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	9	50	450
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70

Petition:	
Patent-Appeals-and-Interference:	
Post-Allowance-and-Post-Issuance:	
Extension-of-Time:	
Miscellaneous:	
Total in USD ($)	**3305**

Electronic Acknowledgement Receipt

EFS ID:	32393125
Application Number:	15957945
International Application Number:	
Confirmation Number:	7917
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-US4
Receipt Date:	20-APR-2018
Filing Date:	
Time Stamp:	07:33:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$3305
RAM confirmation Number	042018INTEFSW00008084506726
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	TrackOne Request	sb0424.pdf	140370 bad6222ea626436f20a0d09262275157c8b223ed	no	2
Warnings:					
Information:					
2	Specification	Spec.pdf	3057660 5b9f3ae3e121bf653db2f7921f45a64c3ec77b53	no	33
Warnings:					
Information:					
3	Drawings-only black and white line drawings	Drawings-14025109.pdf	258016 fa77c1f6c6442922c86a9e390fa2a1ba55639fe3	no	15
Warnings:					
Information:					
4	Application Data Sheet	ADS.pdf	1823472 3318c3858daae06245fad40a8362282c1dc5fc5d	no	9
Warnings:					
Information:					
5	Oath or Declaration filed	Signed-oath-Derry.pdf	862135 6a2192d0180f49adf2112bf067a659cb3f1f8144	no	2
Warnings:					
Information:					
6	Oath or Declaration filed	Signed-oath-Ofer.pdf	871562 164ffbaa7776b17398cb08bf75bfa2cac4e62d20	no	2
Warnings:					
Information:					

7	Power of Attorney	Signed-POA.pdf	888347 74a4d32b0579bb0e33a0f6ea26cf96059db06d46	no	2
Warnings:					
Information:					
8	Claims	Claims-Tunnel.pdf	103352 8241ec969ea347d0a5388bd8f0367c3fc90fbe38	no	6
Warnings:					
Information:					
9	Abstract	Abstract.pdf	119286 23f763b6b527ef1a4ee2e1116d2eac110f917c06	no	1
Warnings:					
Information:					
10	Power of Attorney	Transmittal-letter.pdf	456932 f9bcf858c57b0d0e3f54685e975d356584b41333	no	2
Warnings:					
Information:					
11	Information Disclosure Statement (IDS) Form (SB08)	IDS.pdf	1037437 03c57837ce4ca170bd1ce47f6e04ed4c71674797	no	8
Warnings:					
Information:					
12	Information Disclosure Statement (IDS) Form (SB08)	IDS2.pdf	1036361 88c5fa37ce2739924d60266233d8f46f0a518aec	no	7
Warnings:					
Information:					
13	Non Patent Literature	EP-SR.pdf	98640 e1c76ee63a0e4422c734cb5c1bd1e4cbcd033232	no	4
Warnings:					
Information:					

14	Non Patent Literature	WO2011044402-ISR.pdf	129414 57c68e1f16f744e4d0bfdb6bc9924ac6d44a1adf	no	3
Warnings:					
Information:					
15	Fee Worksheet (SB06)	fee-info.pdf	41369 78e9ad00e063712dca4d32be9020aed62235fc3d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	10924353		

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/81 (01-09)
Approved for use through 11/30/2011. OMB 0651-0035
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.

POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	
Filing Date	
First Named Inventor	Derry Shribman
Title	SYSTEM PROVIDING FASTER AND MORE EFFICIENT
Art Unit	
Examiner Name	
Attorney Docket Number	HOLA-005-US3

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 _____.

SIGNATURE of Applicant or Assignee of Record

Signature		Date	March 13, 2018
Name	Derry Shribman	Telephone	
Title and Company	CEO of HOLA NEWCO 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 1 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.

Privacy Act Statement

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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.
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PTO/AIA/01 (06-12)
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
- [ ] United States application or PCT international application number _____ filed on _____.

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: 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.

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 1.11 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.**

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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.
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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.
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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 _____
  filed on _____.

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 Vilensk _____ 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.

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 1.11 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.

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.
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