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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/588,935	05/08/2017	Christopher Newton	0492-US-C1

CONFIRMATION NO. 2851

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

POA ACCEPTANCE LETTER

OC000000088995586

Date Mailed: 05/21/2025

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/09/2025.

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

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

/qnguyen/

MICROSOFT-1002
Microsoft Corp. v. Sandpiper CDN, LLC
Page 1 of 344 IPR2026-00180

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/588,935	05/08/2017	Christopher Newton	0492-US-C1

CONFIRMATION NO. 2851

83579
LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
931 14th St.
Denver, CO 80202

POWER OF ATTORNEY NOTICE

OC000000088995531

Date Mailed: 05/21/2025

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/09/2025.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

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

/qnguyen/

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 09/30/2025. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
15/588,935	May 8, 2017

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 26111

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Sandpiper CDN, LLC

☐ Inventor or Joint Inventor (title not required below)

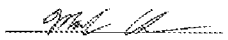
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	
Name	Mark Chen		
Title	General Counsel		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0035. Public burden for this form is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, 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.

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
15/588,935	**05/09/2025 11:42:56 PM Z ET**	**0492-US-C1**

Title of Invention

CACHING IN A CONTENT DELIVERY FRAMEWORK

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	10701173
CONFIRMATION #	2851	FILED BY	LaTishia Tillman
PATENT CENTER #	70373344	FILING DATE	05/08/2017
CUSTOMER #	83579	FIRST NAMED INVENTOR	Christopher Newton
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Jason Eisenberg

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
PTOAIA96-10701173.pdf	2	Assignee showing of ownership per 37 CFR 3.73	222 KB
PTOAIA82B-10701173.pdf	1	Power of Attorney	294 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
PTOAIA96-10701173.pdf	1FD7FD1C08117D93C83AC073FEEE3472E11B4FCBC630415F D9A4024ADC8BDD2C3683F01E5B8BB92A65B5237442574F2B FC10B024379912E3EEFACB17E6946BFA
PTOAIA82B-10701173.pdf	08692A645752EF878C28B10BF56B4959F5072D8BF51A70D2C1 70626D1617C80DA3A705410B0BF3010F838EE225F24303B60C

EEBD4CDD2D27D9AC08ACBCE914CE

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 filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

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

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

New International Application Filed with the USPTO as a Receiving Office

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

PTO/AIA/96 (11-23)
Approved for use through 11/30/2027. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

First Named Inventor/Patent Owner: Sandpiper CDN, LLC

Application No./Patent No.: 10,701,173 Filed/Issue Date: June 30, 2020

Titled: CACHING IN A CONTENT DELIVERY FRAMEWORK

Sandpiper CDN, LLC, a Corporation

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

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

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

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

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

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

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

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

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

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

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

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

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

1. From: NEWTON, CHRISTOPHER To: LEVEL 3 COMMUNICATIONS, LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 042415, Frame 0361, or for which a copy thereof is attached*.

2. From: CROWDER, WILLIAM To: LEVEL 3 COMMUNICATIONS, LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 042415, Frame 0404, or for which a copy thereof is attached*.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. 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 this form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (11-23)
Approved for use through 11/30/2027. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: LEVEL 3 COMMUNICATIONS, LLC To: SANDPIPER CDN, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 068256, Frame 0091, or for which a copy thereof is attached*.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached*.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached*.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached*.

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

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

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

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

/Jason D. Eisenberg/	May 9, 2025
Signature	Date
Jason D. Eisenberg	43,447
Printed or Typed Name	Title or Registration Number

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
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	06/30/2020	10701173	0492-US-C1	2851

83579 7590 06/10/2020

LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

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):

Level 3 Communications, LLC, Broomfield, CO;
Christopher Newton, Westlake Village, CA;
William Crowder, Camarillo, CA;

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/588,935	Confirmation No.	:	2851
First Applicant	:	NEWTON	Art Unit	:	2458
Filed	:	May 8, 2017	Examiner	:	Khanh W. Dinh
Title	:	CACHING IN A CONTENT DELIVERY FRAMEWORK			
Docket No.	:	0492-US-C1			

Submitted Via EFS-Web

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Dear Sir:

Applicant acknowledges the Notice of Allowance in the present application by the Examiner with appreciation. Applicant notes that the reasons for allowance set forth in the Notice of Allowance are not the only reasons that the claims are allowable. As the Examiner's reasons for allowance are not exhaustive, such reasons for allowance do not establish an estoppel against Applicant with regard to the scope of any claim in the present application or any related applications, including without limitation any continuation applications claiming priority to the present application.

If there are any questions, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: May 20, 2020

/DDW/

David D. Wier, Reg. No. 48,229
USPTO Customer No. 83579
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-3539

Electronic Acknowledgement Receipt

EFS ID:	39488481
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	20-MAY-2020
Filing Date:	08-MAY-2017
Time Stamp:	09:01:37
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	Post Allowance Communication - Incoming	492USC1_csra.pdf	18877 fc58d74abb842207f7e3c51466c56e726dec e41c	no	1
Warnings:					10

Information:	
Total Files Size (in bytes):	18877

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
15588935	08-May-2017	Christopher Newton	0492-US-C1	2851

TITLE OF INVENTION :

CACHING IN A CONTENT DELIVERY FRAMEWORK

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2458	213000	KHANH DINH

Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
$1000	$0	$1000	17-Aug-2020	$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
83579 LEVEL 3 COMMUNICATIONS, LLC Attn: Patent Docketing 1025 Eldorado Blvd. Broomfield CO 80021 UNITED STATES 720-888-3381 patent.docketing@centurylink.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status

Change in Entity Status

○ Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.
Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.

○ Applicant asserting small entity status. See 37 CFR 1.27.
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.

◉ Applicant changing to regular undiscounted fee status.
Note: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:

☒ Issue Fee

☐ I authorize USPTO to apply my previously paid issue fee to the current fees due

☐ Publication Fee

☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____

☐ Advance Order - # of copies _____

☒ If **in addition to** the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency or credit any overpayment, to Deposit Account Number 505063 . The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1.

2.

3.

5.Assignee Name(s) and Residence Data To Be Printed

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.

Name	City	State	Country	Category
Level 3 Communications, LLC	Broomfield	COLORADO	united states	other

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/David D. Wier/	**Date**	05-20-2020
Name	David Dewey Wier	**Registration Number**	48229

Electronic Patent Application Fee Transmittal

Application Number:	15588935
Filing Date:	08-May-2017
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Filer:	David Dewey Wier/Kathleen McInnish
Attorney Docket Number:	0492-US-C1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt

EFS ID:	39488476
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	20-MAY-2020
Filing Date:	08-MAY-2017
Time Stamp:	09:01:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	E20205J001005179
Deposit Account	505063
Authorized User	Kathleen McInnish

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

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges) 16

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)	Web85b.pdf	45939 179c1a5a18cc81799cf0e766f9165708cc240350	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32100 ef0ea80b53fb86043a0550731c23712d2c5a784e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	78039		

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.

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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.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

83579 7590 05/15/2020
LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

EXAMINER
DINH, KHANH Q

ART UNIT	PAPER NUMBER
2458	

DATE MAILED: 05/15/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

TITLE OF INVENTION: CACHING IN A CONTENT DELIVERY FRAMEWORK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	08/17/2020

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)

83579 7590 05/15/2020
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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.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

TITLE OF INVENTION: CACHING IN A CONTENT DELIVERY FRAMEWORK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	08/17/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
DINH, KHANH Q	2458	709-213000

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. _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

83579 7590 05/15/2020

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1025 Eldorado Blvd.
Broomfield, CO 80021

EXAMINER	
DINH, KHANH Q	
ART UNIT	PAPER NUMBER
2458	

DATE MAILED: 05/15/2020

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.

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.

Notice of Allowability	Application No. 15/588,935	Applicant(s) Newton et al.	
	Examiner KHANH Q DINH	Art Unit 2458	AIA (FITF) Status Yes

-- 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 12/6/19.
   ☐ 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 1-14 . 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 a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

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

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

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

Attachment(s)

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

/KHANH Q DINH/
Primary Examiner, Art Unit 2458

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Allowable Subject Matter

1. Claims 1-14 are allowed.

Reason for allowance

2. This communication warrants no examiner's reason for allowance, as applicant's reply makes evident the reason for allowance, satisfying the record as whole as required by rule 37 CFR 1.104(e). In this case, the substance of applicant's remarks filed on 12/6/19 with respect to the added claim limitation point out the reason claims are patentable over the prior art of record. Thus, the reason for allowance is in all probability evident from the record and no statement for examiner's reason for allowance is necessary (see MPEP 13202.14).

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Dinh whose telephone number is (571) 272-3936. The examiner can normally be reached on Monday through Friday from 8:00 A.m. to 5:00 P.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Bates, can be reached on (571) 272-3980. The fax phone number for this group 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).

/KHANH Q DINH/
Primary Examiner, Art Unit 2458

Notice of References Cited	Application/Control No. 15/588,935	Applicant(s)/Patent Under Reexamination Newton et al.	
	Examiner KHANH Q DINH	Art Unit 2458	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-20140215802-A1	08-2014	GONZALEZ; Orlando A.	B60N3/046	29/525.01
*	B	US-10417134-B2	09-2019	Faldu; Priyank	G06F12/0897	1/1
*	C	US-20140129779-A1	05-2014	Frachtenberg; Eitan	G06F12/122	711/136
*	D	US-20170244804-A1	08-2017	Newton; Christopher	H04L29/06	1/1
*	E	US-20180129613-A1	05-2018	Faldu; Priyank	G06F12/0891	1/1
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	Art Unit
	KHANH Q DINH	2458

CPC - Searched*		
Symbol	Date	Examiner
H04L29/08072, G06F17/30902, H04L29/06	8/7/2017	KD
G06F12/12, G06F12/123	05/11/2020	KD

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	213, 217, 218, 220	8/7/2017	KD
updated searches		2/19/2018	KD

* 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
WEST, INVENTOR SEARCHES	8/7/2017	KD
west	01/22/2019	KD
updated searches	08/05/2019	KD
updated searches	05/11/2020	KD

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
709	206, 220, 224, 226, 228	05/11/2020	KD

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	Art Unit
	KHANH Q DINH	2458

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	Art Unit
	KHANH Q DINH	2458

CPC						
Symbol					Type	Version
H04L	/	67	/	2852	F	2013-01-01
H04L	/	67	/	2842	I	2013-01-01
H04L	/	67	/	02	I	2013-01-01
H04L	/	29	/	06	I	2013-01-01
H04L	/	67	/	34	A	2013-01-01

CPC Combination Sets							
Symbol					Type	Set	Ranking	Version
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	14	
/KHANH Q DINH/ Primary Examiner, Art Unit 2458	11 May 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office — Part of Paper No.: 20200511

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	**Art Unit**
	KHANH Q DINH	2458

INTERNATIONAL CLASSIFICATION				
CLAIMED				
G06F	/	15	/	16

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
709	220

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					
709	206	220	224	226	228	

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 14	
/KHANH Q DINH/ Primary Examiner, Art Unit 2458 (Primary Examiner)	11 May 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 3

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	**Art Unit**
	KHANH Q DINH	2458

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

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10												
	2		11												
	3		12												
	4		13												
	5		14												
	6														
	7														
	8														
	9														

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	14	
/KHANH Q DINH/ Primary Examiner, Art Unit 2458	11 May 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

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per page: 10 20 50 | Relevance

ARTICLE

Evaluating a new approach to strong web cache consistency with snapshots of collected content

Mikhail Mikhailov, Craig E. Wills

WWW '03: Proceedings of the 12th international conference on World Wide Web • May 2003, pp 599–608 • https://doi.org/10.1145/775152.775237

The problem of Web cache consistency continues to be an important one. Current Web caches use heuristic-based policies for determining the freshness of cached objects, often forcing content providers to unnecessarily mark their content as uncacheable ...

13 | 567 | Highlights

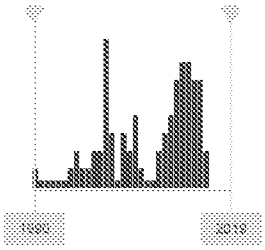
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RESEARCH-ARTICLE

Measurement and Analysis of Mobile Web Cache Performance

Yun Ma, Xuanzhe Liu, Shuhui Zhang, Ruirui Xiang, Yunxin Liu, Tao Xie

WWW '15: Proceedings of the 24th International Conference on World Wide Web • May 2015, pp 691–701 • https://doi.org/10.1145/2736277.2741114

The Web browser is a killer app on mobile devices such as smartphones. However, the user experience of mobile Web browsing is undesirable because of the slow resource loading. To improve the performance of Web resource loading, caching has been adopted ...

12 401 Highlights

ARTICLE

Engineering web cache consistency

Jian Yin, Lorenzo Alvisi, Mike Dahlin, Arun Iyengar

ACM Transactions on Internet Technology (TOIT), Volume 2, Issue 3 • August 2002, pp 224–259 • https://doi.org/10.1145/572326.572329

Server-driven consistency protocols can reduce read latency and improve data freshness for a given network and server overhead, compared to the traditional consistency protocols that rely on client polling. Server-driven consistency protocols appear ...

29 1,211 Highlights

RESEARCH-ARTICLE

In Content We Trust: Network-Layer Trust in Content-Centric Networking

Cesar Ghali, Gene Tsudik, Ersin Uzun

IEEE/ACM Transactions on Networking (TON), Volume 27, Issue 5 • October 2019, pp 1787–1800 • https://doi.org/10.1109/TNET.2019.2928329

Content-Centric Networking CCN, an instance of information-centric networking, is a candidate next-generation Internet architecture that emphasizes on content distribution by making it directly addressable and routable. By opportunistically caching ...

0 81 Highlights

RESEARCH-ARTICLE

A Utility Optimization Approach to Network Cache Design

Mostafa Dehghan, Laurent Massoulie, Don Towsley, Daniel Sadoc Menasche, Y. C. Tay

IEEE/ACM Transactions on Networking (TON), Volume 27, Issue 3 • June 2019, pp 1013–1027 • https://doi.org/10.1109/TNET.2019.2913677

In any caching system, the admission and eviction policies determine which contents are added and removed from a cache when a miss occurs. Usually, these policies are devised so as to mitigate staleness and increase the hit probability. Nonetheless, the .

0 68 Highlights

RESEARCH-ARTICLE

Accounting and Accountability in Content Distribution Architectures: A Survey

Diarmuid Ó Colmáin, Donal Ó Mahony

ACM Computing Surveys (CSUR), Volume 47, Issue 4 • July 2015, Article No.: 59, pp 1–35 • https://doi.org/10.1145/2723701

Many content distribution architectures offer desirable elements that lead to less bandwidth usage, reduced network congestion, higher content availability, and reduced costs. However, their level of adoption and utilization in commercial environments ...

13 706 Highlights

RESEARCH-ARTICLE
PUBLIC ACCESS

Content-based security for the web

Alexander Afanasyev, J. Alex Halderman, Scott Ruoti, Kent Seamons, Yiwei Yu, +2

NSPW '16: Proceedings of the 2016 New Security Paradigms Workshop • September 2016, pp 49–60 • https://doi.org/10.1145/3011883.3011890

The World Wide Web has become the most common platform for building applications and delivering content. Yet despite years of research, the web continues to face severe security challenges related to data integrity and confidentiality. Rather than ...

4 294 Highlights

RESEARCH-ARTICLE
PUBLIC ACCESS

Why Johnny Can't Make Money With His Contents: Pitfalls of Designing and Implementing Content Delivery Apps

Szu-Yu Chiau, Shuisheng Meng, Jiaoyang Wang, Omar Chowdhury, Aniket Kate, Ninghui Li

ACSAC '18: Proceedings of the 34th Annual Computer Security Applications Conference • December 2018, pp 236–251 • https://doi.org/10.1145/3274694.3274752

Mobile devices are becoming the default platform for multimedia content consumption. Such a thriving business ecosystem has drawn interests from content distributors to develop apps that can reach a large number of audience. The business edge of content ...

0 143 Highlights

ARTICLE

Proxy-based acceleration of dynamically generated content on the world wide web: an approach and implementation

Awadya Datta, Kaushik Dutta, Helen Thomas, Debra VanderMeer, Suresha, +1

SIGMOD '02: Proceedings of the 2002 ACM SIGMOD international conference on Management of data • June 2002, pp 97–108 • https://doi.org/10.1145/564691.564703

As internet traffic continues to grow and web sites become increasingly complex, performance and scalability are major issues for web sites. Web sites are increasingly relying on dynamic content generation applications to provide web site visitors with ...

48 934 Highlights

RESEARCH-ARTICLE

CEDO: content-centric dissemination algorithm for delay-tolerant networks

Francisco Hernandez Rivera, Benjamin Bell, Chadi Barakat, Theodoros Spyropoulos, +1

MSWiM '13: Proceedings of the 16th ACM international conference on Modeling, analysis & simulation of wireless and mobile systems • November 2013, pp 377–386 • https://doi.org/10.1145/2507924.2507931

Emerging challenged networks require new protocols and strategies to cope with a high degree of mobility, high delays and unknown, possibly non-existing routes within the network. Researchers have proposed different *store-carry-and-forward* protocols for ...

8 183 Highlights

RESEARCH-ARTICLE

Network-Layer Trust in Named-Data Networking

Cesar Ghali, Gene Tsudik, Ersin Uzun

ACM SIGCOMM Computer Communication Review, Volume 44, Issue 5 • October 2014, pp 12--19 • https://doi.org/10.1145/2677046.2677049

In contrast to today's IP-based host-oriented Internet architecture, Information-Centric Networking (ICN) emphasizes content by making it directly addressable and routable. Named Data Networking (NDN) architecture is an instance of ICN that is being ...

37 500 Highlights

RESEARCH-ARTICLE

Joint hop-by-hop and receiver-driven interest control protocol for content-centric networks

Giovanna Carofiglio, Massimo Gallo, Luca Muscariello

ACM SIGCOMM Computer Communication Review, Volume 42, Issue 4 • September 2012, pp 491--496 • https://doi.org/10.1145/2377677.2377772

Content-centric networking (CCN) advocates a new transport model tailored to named-data communication. Three features distinguish CCN transport from the TCP/IP model: unique endpoint of the receiver, pull-based data retrieval in a point to multi-point ...

9 217 Highlights

RESEARCH-ARTICLE

Joint hop-by-hop and receiver-driven interest control protocol for content-centric networks

Giovanna Carofiglio, Massimo Gallo, Luca Muscariello

ICN '12: Proceedings of the second edition of the ICN workshop on Information-centric networking • August 2012, pp 37--42 • https://doi.org/10.1145/2342488.2342497

Content-centric networking (CCN) advocates a new transport model tailored to named-data communication. Three features distinguish CCN transport from the TCP/IP model: unique endpoint at the receiver, pull-based data retrieval in a point to multi-point ...

61 483 Highlights

ARTICLE

Aging through cascaded caches: performance issues in the distribution of web content

Edith Cohen, Haim Kaplan

SIGCOMM '01: Proceedings of the 2001 conference on Applications, technologies, architectures, and protocols for computer communications • August 2001, pp 41–53 • https://doi.org/10.1145/383059.383963

The Web is a distributed system, where data is stored and disseminated from both *origin servers* and *caches*. Origin servers provide the most up-to-date copy whereas caches store and serve copies that had been cached for a while. Origin servers do not ...

Also Published in:

ACM SIGCOMM Computer Communication Review, Volume 31 Issue 4, October 2001

32 1,499 Highlights

ARTICLE

Squirrel: a decentralized peer-to-peer web cache

Sitaram Iyer, Antony Rowstron, Peter Druschel

PODC '02: Proceedings of the twenty-first annual symposium on Principles of distributed computing • July 2002, pp 213–222 • https://doi.org/10.1145/571825.571861

This paper presents a decentralized, peer-to-peer web cache called Squirrel. The key idea is to enable web browsers on desktop machines to share their local caches, to form an efficient and scalable web cache, without the need for dedicated hardware and ...

169 1,178 Highlights

ARTICLE

Secure event types in content-based, multi-domain publish/subscribe systems

Lauri I. W. Pesonen, Jean Bacon

SEM '05: Proceedings of the 5th international workshop on Software engineering and middleware • September 2005, pp 98–105 • https://doi.org/10.1145/1108473.1108491

Publish/subscribe research has so far been mostly focused on efficient event routing, event filtering, and composite event detection. The little research that has been published regarding security in publish/subscribe systems has been tentative at best ...

15 375 Highlights

ARTICLE

A data-oriented (and beyond) network architecture

Teemu Koponen, Mohit Chawla, Byung-Gon Chun, Andrey Ermolinskiy, Kye Hyun Kim, Scott Shenker, Ion Stoica

SIGCOMM '07: Proceedings of the 2007 conference on Applications, technologies, architectures, and protocols for computer communications • August 2007, pp 181–192 • https://doi.org/10.1145/1282380.1282402

The internet has evolved greatly from its original incarnation. For instance, the vast majority of current Internet usage is data retrieval and service access, whereas the architecture was designed around host-to-host applications such as telnet and ...

Also Published in:
ACM SIGCOMM Computer Communication Review: Volume 37 Issue 4, October 2007

998 4,196 Highlights

ARTICLE

A delay-tolerant network architecture for challenged internets

Kevin Fall

SIGCOMM '03: Proceedings of the 2003 conference on Applications, technologies, architectures, and protocols for computer communications • August 2003, pp 27–34 • https://doi.org/10.1145/863955.863960

The highly successful architecture and protocols of today's Internet may operate poorly in environments characterized by very long delay paths and frequent network partitions. These problems are exacerbated by end nodes with limited power or memory ...

883 8,757 Highlights

RESEARCH-ARTICLE

Verifying and enforcing network paths with icing

Jad Naous, Michael Walfish, Antonio Nicolosi, David Mazières, Michael Miller, Arun Seehra

CoNEXT '11: Proceedings of the Seventh COnference on emerging Networking EXperiments and Technologies • December 2011, Article No.: 30, pp 1–12 • https://doi.org/10.1145/2079296.2079326

We describe a new networking primitive, called a Path Verification Mechanism (pvm). There has been much recent work about how senders and receivers express policies about the paths that their packets take. For instance, a company might want fine-grained ...

56 326 Highlights

RESEARCH-ARTICLE

Going Wild: Large-Scale Classification of Open DNS Resolvers

Marc Kührer, Thomas Hupperich, Jonas Bushart, Christian Rossow, Thorsten Holz

IMC '15: Proceedings of the 2015 Internet Measurement Conference • October 2015, pp 355–368 • https://doi.org/10.1145/2815675.2815683

Since several years, millions of recursive DNS resolvers are deliberately or not open to the public. This, however, is counter-intuitive, since the operation of such openly accessible DNS resolvers is necessary in rare cases only. Furthermore, open ...

31 285 Highlights

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A Novel Cache Replacement Policy for ISP Merged CDN
Qiao Li ; Hui He ; Bin-Xing Fang ; Hong-Li Zhang
2012 IEEE 18th International Conference on Parallel and Distributed Systems
Year: 2012 | Conference Paper | Publisher: IEEE
Abstract (526 Kb)

Cache replacement policy based on server distance
Noriaki Kamiyama ; Yuusuke Nakano ; Kohei Shiomoto
2015 IFIP/IEEE International Symposium on Integrated Network Management (IM)
Year: 2015 | Conference Paper | Publisher: IEEE
Abstract (1162 Kb)

IEEE Standard for Content Delivery Protocols of Next Generation Service Overlay Network
IEEE Std 1903.1-2017

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- content policy server
- content profile
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Abstract (6143 Kb)

Deep Reinforcement Learning for Cooperative Content Caching in Vehicular Edge Computing and Networks
Guanhua Qiao ; Supeng Leng ; Sabita Maharjan ; Yan Zhang ; Nirwan Ansari
IEEE Internet of Things Journal
Year: 2020 | Volume: 7, Issue: 1 | Journal Article | Publisher: IEEE
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Abstract (1683 Kb)

Deep Reinforcement Learning for Adaptive Caching in Hierarchical Content Delivery Networks
Alireza Sadeghi ; Gang Wang ; Georgios B. Giannakis
IEEE Transactions on Cognitive Communications and Networking
Year: 2019 | Volume: 5, Issue: 4 | Journal Article | Publisher: IEEE
Cited by: Papers (6)
Abstract (1418 Kb)

Content Delivery in Mobility-Aware D2D Caching Networks
Badiaa Gabr ; Sameh Hosny ; Mohammed Nafie
2018 IEEE Globecom Workshops (GC Wkshps)
Year: 2018 | Conference Paper | Publisher: IEEE
Cited by: Papers (4)
Abstract (302 Kb)

Simulation of content caching in information centric networking
Feliksas Kuliesius ; Petras Paulauskas
2015 Seventh International Conference on Ubiquitous and Future Networks
Year: 2015 | Conference Paper | Publisher: IEEE
Cited by: Papers (2)
Abstract (428 Kb)

A Cache Management Scheme for Efficient Content Eviction and Replication in Cache Networks
Muhammad Bilal ; Shin-Gak Kang
IEEE Access
Year: 2017 | Volume: 5 | Journal Article | Publisher: IEEE
Cited by: Papers (21)
Abstract (4509 Kb)

Deep Reinforcement Learning Approaches for Content Caching in Cache-Enabled D2D Networks
Lixin Li ; Yang Xu ; Jiaying Yin ; Wei Liang ; Xu Li ; Wei Chen ; Zhu Han
IEEE Internet of Things Journal
Year: 2020 | Volume: 7, Issue: 1 | Journal Article | Publisher: IEEE
Cited by: Papers (1)
Abstract (4250 Kb)

Popularity Proportional Cache Size Allocation policy for video delivery on CCN
Haipeng Li ; Hidenori Nakazato ; Andrea Detti ; Nicola Blefari Melazzi

2015 European Conference on Networks and Communications (EuCNC)
Year: 2015 | Conference Paper | Publisher: IEEE
Abstract (946 Kb)

Mobile caching policies for device-to-device (D2D) content delivery networking
Hye J. Kang ; Kown Y. Park ; Kumin Cho ; Chung G. Kang
2014 IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS)
Year: 2014 | Conference Paper | Publisher: IEEE
Cited by: Papers (47)
Abstract (272 Kb)

A Classification-Based Wisdom Caching scheme for Content Centric Networking
Jianfeng Guan ; Yunhang He ; Quan Wei ; Zhang Neng
2016 IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS)
Year: 2016 | Conference Paper | Publisher: IEEE
Cited by: Papers (4)
Abstract (492 Kb)

Secure dynamic flow policy for content delivery networks
Md. Mahiuddin ; Kazi Ashrafuzzaman ; Md. Atikur Rahman
2012 15th International Conference on Computer and Information Technology (ICCIT)
Year: 2012 | Conference Paper | Publisher: IEEE
Abstract (338 Kb)

Reinforcement Learning Policy for Adaptive Edge Caching in Heterogeneous Vehicular Network
Jiayin Chen ; Wenchao Xu ; Nan Cheng ; Huaqing Wu ; Shan Zhang ; Xuemin Shen
2018 IEEE Global Communications Conference (GLOBECOM)
Year: 2018 | Conference Paper | Publisher: IEEE
Cited by: Papers (3)
Abstract (407 Kb)

Joint Content Caching and Delivery Policy for Heterogeneous Cellular Networks
Mingyi Liu ; Yinglei Teng ; Kang Cheng ; Yi Man ; Bin Zhang
2018 IEEE 29th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC)
Year: 2018 | Conference Paper | Publisher: IEEE
Abstract (300 Kb)

Fairness and Transmission-Aware Caching and Delivery Policies in OFDMA-Based HetNets
Sepehr Rezvani ; Nader Mokari ; Mohammad R. Javan ; Eduard A. Jorswieck
IEEE Transactions on Mobile Computing
Year: 2020 | Volume: 19, Issue: 2 | Journal Article | Publisher: IEEE
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Abstract (1697 Kb) Media

Exploiting Caching and Multicast for 5G Wireless Networks
Konstantinos Poularakis ; George Iosifidis ; Vasilis Sourlas ; Leandros Tassiulas
IEEE Transactions on Wireless Communications
Year: 2016 | Volume: 15, Issue: 4 | Journal Article | Publisher: IEEE
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Abstract (925 Kb)

JOINT CONTENT POPULARITY PREDICTION AND CONTENT DELIVERY POLICY FOR CACHE-ENABLED D2D NETWORKS: A DEEP REINFORCEMENT LEARNING APPROACH
Jiaying Yin ; Lixin Li ; Yang Xu ; Wei Liang ; Huisheng Zhang ; Zhu Han
2018 IEEE Global Conference on Signal and Information Processing (GlobalSIP)
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Abstract (775 Kb)

Optimal Cooperative Content Caching and Delivery Policy for Heterogeneous Cellular Networks
Wei Jiang ; Gang Feng ; Shuang Qin
IEEE Transactions on Mobile Computing
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Abstract (1223 Kb)

Responsive Content-Centric Delivery in Large Urban Communication Networks: A LinkNYC Use-Case
Hassan Sinky ; Bassem Khalfi ; Bechir Hamdaoui ; Ammar Rayes
IEEE Transactions on Wireless Communications
Year: 2018 | Volume: 17, Issue: 3 | Journal Article | Publisher: IEEE
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Abstract (4777 Kb)

An Efficient Cache Strategy in Information Centric Networking Vehicle-to-Vehicle Scenario
Weicheng Zhao ; Yajuan Qin ; Deyun Gao ; Chuan Heng Foh ; Han-Chieh Chao
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Abstract (5891 Kb)

Energy-efficient wireless content delivery with proactive caching
Samuel O. Somuyiwa ; András György ; Deniz Gündüz
2017 15th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt)
Year: 2017 | Conference Paper | Publisher: IEEE
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Abstract (322 Kb)

Resource Pooling in Large-Scale Content Delivery Systems
Kota Srinivas Reddy ; Sharayu Moharir ; Nikhil Karamchandani
IEEE Transactions on Communications

Year: 2020 | Volume: 68, Issue: 3 | Journal Article | Publisher: IEEE
Abstract (1300 Kb)

Secure and Optimal Content-centric Networking Caching Design
Karan Thakker ; Chung-Horng Lung ; Prathamesh Morde
2015 Second International Conference on Trustworthy Systems and Their Applications
Year: 2015 | Conference Paper | Publisher: IEEE
Cited by: Papers (1)
Abstract (214 Kb)

Delivery-Secrecy Tradeoff for Cache-Enabled Stochastic Networks: Content Placement Optimization
Qian Yang ; Hui-Ming Wang ; Tong-Xing Zheng
IEEE Transactions on Vehicular Technology
Year: 2018 | Volume: 67, Issue: 11 | Journal Article | Publisher: IEEE
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	Complete if Known
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2458
Examiner Name	Khanh Q. Dinh

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS

Examiner Initial *	Cite No	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear
		20020198953	Dec 26, 2002	O'Rourke, Bret P., et al.	

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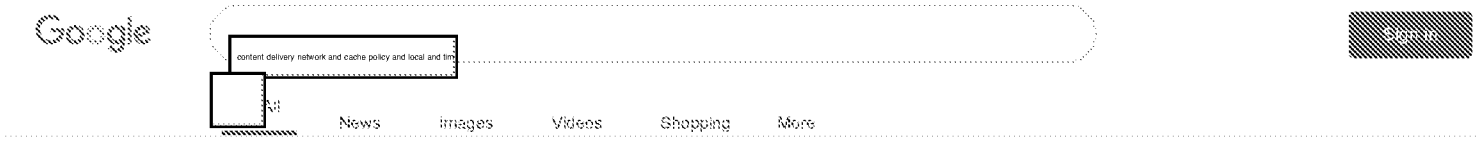
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	L26	L24 and L7	29	L26	L26	L26
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Date	L49	L48 and expir$4	0	L49	L49	L49
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Date	L46	L45 and l6	10	L46	L46	L46
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Date	L40	cache same expiration same time	5272	L40	L40	L40
Date	L39	cach same expiration same time	628	L39	L39	L39
Date	L38	9648127.pn.	3	L38	L38	L38

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L34	L24 and L5	170	L34	L34	L34
L33	L24 and L15	0	L33	L33	L33
L25	L24 and L7	29	L25	L25	L25
L24	L6 and (h04l29/06 or ho4l29/08072 or h04l67/34)	819	L24	L24	L24
L23	L22 and (h04l29/06 or ho4l29/08072 or h04l67/34)	2	L23	L23	L23
L22	L21 and L6 and L7	23	L22	L22	L22
L21	cdn or content delivery network	38306	L21	L21	L21
L20	(check$4 or detect$4) same identical same cache	2569	L20	L20	L20
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L8	new version same content	8148	L8	L8	L8
L7	cache policy	3127	L7	L7	L7
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www.imperva.com › learn › performance › cdn-caching

Web (HTTP/S) Cache and Caching Proxy | CDN Guide | Imperva

Caching is at the heart of content delivery network (CDN) services. ... Having this content delivered from a local server significantly improves access speed and user experience. ... delivery of multiple file versions, especially for compressed files cached ... Imperva CDN Guide: Time-sensitive archive and expiry policies.

docs.microsoft.com › Azure › Networking › CDN

Control Azure CDN caching behavior with caching rules ...

Mar 19, 2019 - Azure Content Delivery Network (CDN) offers two ways to control how your ... network (CDN) caching rules to set or modify default cache expiration ... Azure CDN configuration changes can take some time to propagate through the network: ... Previous Version Docs · Blog · Contribute · Privacy & Cookies ...

Missing: ~~loeal~~ | Must include: local

docs.microsoft.com › Azure › Networking › CDN

How caching works | Microsoft Docs

Apr 30, 2018 - Caching is the process of storing data locally so that future requests for that ... Similarly, caching is used by a content delivery network on edge servers ... is not compared to the version on the origin server every time it is accessed. ... Overrides the Expires header, if both it and Cache-Control are defined.

Missing: ~~policy~~ | Must include: policy

www.cloudflare.com › learning › cdn › what-is-caching

What is Caching? | How is a Website Cached? | Cloudflare

Learn more about CDN caches, DNS caching, and browser caches. ... A CDN, or content delivery network, caches content (such as images, videos, ... go to their local grocery store, which still requires some travel but is much closer. ... Browsers store these files until their TTL expires or until the hard drive cache is full.

www.keycdn.com › blog › http-cache-headers

HTTP Cache Headers - A Complete Guide - KeyCDN

May 24, 2018 - Either the local browser cache or in the cache of a CDN. ... considered the best requests: local copies of the responses allow the elimination of network latency ... Every time users request this asset, requests are sent to the server. ... previous headers (e.g. Expires) used to specify response caching policies.

www.globaldots.com › content-delivery-network-explai...

What is a CDN? Content Delivery Network Explained by ...

What are Content Delivery Networks, what are the main benefits of using a ... Request: the user requests from the Content Provider to view or locally store data (content) ... content from origin nodes based on Cache Expiration Rules (Pull CDNs). ... Content Provider has to proactively "push" content every time it is updated.

www.sciencedirect.com › topics › computer-science › con...

content delivery network - an overview | ScienceDirect Topics

Content Delivery Network (CDN) essentially replicates content to multiple ... With passive replication, content is replicated (for example, cached) to a ... static and streaming Web content so that the transfer time is reduced as much as possible. ... the original version from the origin server if the content is not found or expired ...

developer.akamai.com › blog › 2017/03/28 › what-you...

What You Need to Know About Caching - Part 1 | Akamai ...

Mar 28, 2017 - Caching is key to any Content Delivery Network (CDN). ... It provided a time and day when a file should "expire". ... Cache Control: is the default SUPER header for controlling the cache behavior in the newer versions of HTTP. ... The device stores files in its local cache so that no further bandwidth is used ...

developer.mozilla.org › ... › HTTP

HTTP caching - HTTP | MDN

Apr 9, 2020 - Web caches reduce latency and network traffic and thus lessen the time ... browser and proxy caches, but there are also gateway caches, CDN, ... Use this header to define your caching policies with the variety of directives it provides. ... Contrary to Expires , this directive is relative to the time of the request.

Ad · explore.fastly.com/

Fastly Content Delivery | Real Time CDN

Deliver Fast & Highly Personalized Experiences to Customers Around the World! Put Our Edge Cloud Platform to Work and Take Your Business Further. Test for Free! Secure Your Business Move Beyond Your CDN. Ensure Scalable Video Gain Real-Time Insights
Explore Our Platform · Enhanced Content Delivery

Searches related to content delivery network and cache policy and local and time expiration and version

the cache **remains active in edge location for days by default azure**

cache-control

cache-control best practices

cache-control: max-age=0

the cache **remains active in edge location for how many days by default**

web caching

browser cache expiration

cdn cache-control

Gooooooooooogle >

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

	Complete if Known
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2458
Examiner Name	Khanh Q. Dinh

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS					
Examiner Initial *	**Cite No**	**Document Number**	**Publication Date**	**Name of Patentee or Applicant of Cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	**Cite No**	**Foreign Patent Document**	**Publication Date**	**Name of Patentee or Applicant of cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]
		JP-2000181843	Jun 30, 2000	Matsumoto, Shigeru et al.		

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	**Cite No [1]**	**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, page(s), volume-issue number(s), publisher, city and/or country where published.**	T[2]
		Japan Notice of Reasons for Refusal, dated October 28, 2019, Application No. 2017-530734, filed December 14, 2015; Dkt. No. 0492-JP-01 , 5 pgs.	

EXAMINER /KHANH Q DINH/ **DATE CONSIDERED** 05/11/2020

Substitute Disclosure Statement Form (PTO-1449)

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.[1] Applicant's unique citation designation number (optional) [2] Applicant is to place a check mark here if English language Translation is attached

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.Q.D/

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..

Substitute for form 1449A/PTO

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Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS					
Examiner Initial *	**Cite No**	**Document Number**	**Publication Date**	**Name of Patentee or Applicant of Cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear
		20020198953	Dec 26, 2002	O'Rourke, Bret P., et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	**Cite No**	**Foreign Patent Document**	**Publication Date**	**Name of Patentee or Applicant of cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	**T[2]**

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	**Cite No [1]**	**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, page(s), volume-issue number(s), publisher, city and/or country where published.**	**T[2]**
		Chinese First Office Action, dated March 3, 2020, Application No. 201580068159.X, filed December 14, 2015; Dkt. No. 0492-CN-01, 14 pgs.	

EXAMINER **DATE CONSIDERED**

Electronic Acknowledgement Receipt

EFS ID:	39116220
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	09-APR-2020
Filing Date:	08-MAY-2017
Time Stamp:	17:09:25
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	Transmittal Letter	492USC1_IDS.pdf	37010 5cc3f0369ec278e7d3638220d55575b5c01876a8	no	5
Warnings:					54

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	492USC1_sb08.pdf	29450 a15d6a56ede6c4e91ff6f6df16b3218fc19091e6	no	1
Warnings:					
Information:					
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3	Other Reference-Patent/App/Search documents	CN201580068159X_ExRpt_3Mar20_492CN01.pdf	3959117 47849ff662a3cad2568105edb9168877457542f9	no	14
Warnings:					
Information:					
		Total Files Size (in bytes):	4025577		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/588,935	Confirmation No.	:	2851
First Applicant	:	NEWTON, et al.	Art Unit	:	2458
Filed	:	May 8, 2017	Examiner	:	Khanh Q. Dinh
Title	:	CACHING IN A CONTENT DELIVERY FRAMEWORK			
Docket No.	:	0492-US-C1			

Submitted Via EFS-Web

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT PURSUANT TO 37 C.F.R. §§ 1.56, 1.97, AND 1.98

Sir:

The Examiner is respectfully requested to consider the patents, patent applications, publications, or other information cataloged on the enclosed Form (e.g., PTO-1449, PTO-892, PTO/SB/08, etc.) during examination of the above-identified patent application. The order of presentation of the references should not be construed as an indication of importance. These references are submitted for the Examiner's consideration and are submitted pursuant to an Applicant's duty of disclosure under 37 C.F.R. § 1.56.

Copies of all of the cited documents:

☐ are enclosed unless otherwise indicated on the enclosed Form PTO/SB/08a.

☐ have been previously furnished to the Office in prior application No. __, filed ___, which the present application relies upon for an earlier effective filing date under 35 U.S.C. § 120. Therefore, no copies of the cited documents are included herewith pursuant to 37 C.F.R. § 1.98(d); MPEP § 609(III)(A)(2).

☒ are enclosed unless they are U.S. patents or U.S. patent application publications pursuant to 37 C.F.R. § 1.98(a).

I
BASIS

This information disclosure statement is filed pursuant to

☒ 37 C.F.R. § 1.97(b).
This information disclosure statement is filed either (1) within three months of the filing date of a national application other than a continued prosecution application under 37 C.F.R. § 1.53(d); (2) within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application; (3) before the mailing date of a first Office action on the merits; (4) concurrently with the filing of a request for continued examination under 37 C.F.R. § 1.114; or (5) before the mailing of a first Office action after the filing of a request for continued examination under 37 C.F.R. § 1.114, whichever event occurs last.

Accordingly, this information disclosure statement requires no fee and no certification.

☐ 37 C.F.R. § 1.97(c).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing date of any of (1) a final action under 37 C.F.R. § 1.113; (2) a notice of allowance under 37 C.F.R. § 1.311; or (3) an action that otherwise closes prosecution in the application.

Accordingly, this information disclosure statement requires either the fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c), or a statement under 37 C.F.R. § 1.97(e).

☐ 37 C.F.R. § 1.97(d).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(c) since a:

☐ final action under 37 C.F.R. § 1.113

☐ notice of allowance under 37 C.F.R. § 1.311

was mailed to the Applicant on ___.

Accordingly, this information disclosure statement requires the fee set forth in 37 C.F.R. § 1.17(p) to consider an information disclosure statement under 37 C.F.R. § 1.97(d), and a statement under 37 C.F.R. § 1.97(e).

If this statement crosses in the mail with an Office action, or is otherwise not in the indicated category of 37 C.F.R. § 1.97, it is respectfully requested that this statement be treated in the next appropriate category and made of record. To the extent required, please treat this paper as a conditional petition for acceptance of the information disclosure statement.

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $240 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

☐ Please charge the required fee to Deposit Account No. 505063.

☒ The Commissioner is hereby authorized to charge any additional required fees or credit any overpayments associated with this information disclosure statement to the account.

III

CERTIFICATION

Pursuant to 37 C.F.R. § 1.97(e), I state as follows:

☒ No statement is necessary.

☐ Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(1).

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to my knowledge after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(2).

Pursuant to 37 C.F.R. § 1.704(d), I state as follows:

☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of this information disclosure statement.

IV
FOREIGN LANGUAGE REFERENCES

Pursuant to 37 C.F.R. § 1.98(a)(3)(i), any information disclosure statement filed under 37 C.F.R. § 1.97 shall include a concise explanation of the relevance, as it is presently understood by the individual designated in § 1.56(c) most knowledgeable about the content of the information, of each patent, publication, or other information listed that is not in the English language. The concise explanation may be either separate from the specification or incorporated therein. In compliance with the rules, the Applicant states as follows:

☐ No concise explanation is required since all cited references are in English.

☐ A concise explanation of the relevance of one or more foreign language references is attached.

☐ According to the procedural policy adopted by the PTO with regard to disclosure requirements, the Applicant is satisfying the disclosure requirement pursuant to MPEP § 609.04(a)(III) by submitting herewith the following:

- ☐ English language versions of any non-English language documents.
- ☐ English language versions of one or more search reports or other actions by one or more foreign patent offices in one or more counterpart foreign applications, which indicate the degree of relevance found by the foreign office(s).
- ☐ Pursuant to 37 C.F.R. § 1.98(a)(3)(ii), a copy of a translation is not submitted herewith because a written English-language translation of a non-English-language document, or portion thereof, is not within the possession, custody, or control of, or is readily available to any individual designated in § 1.56(c).

The Applicant has not analyzed these documents and, therefore, declines to comment on their relevance at this time.

☐ One or more English language abstracts for the non-English language references are also enclosed.

V
REMARKS

It is respectfully requested that:

(1) The Examiner sign the enclosed Form to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application; and

(2) The citations for the cited information be printed on any patent that issues from this application.

The submission of this information disclosure statement by the Applicant shall not be construed as a representation that a search has been performed or that no other material information under 37 C.F.R. § 1.56 exists. See 37 C.F.R. § 1.97(g).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, material to the patentability of one or more of the pending claims in this application pursuant to 37 C.F.R. § 1.56(b), unless specifically designated by the Applicant as such. See 37 C.F.R. § 1.97(h).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, or even qualifies as "prior art" under 35 U.S.C. § 102 with respect to this invention, unless specifically designated by the Applicant as such.

Notwithstanding any statements by the Applicant, the Examiner is urged to form his or her own conclusion regarding the relevance of the cited information.

VI
CONCLUSION

The Examiner is encouraged to contact the undersigned attorney to discuss any questions concerning this information disclosure statement or any of the information cited or referred to herein.

Respectfully submitted,

Date: April 9, 2020

/DDW/

David D. Wier, Reg. No. 48,229
USPTO Customer No. 83579
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-3539

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2458
Examiner Name	Khanh Q. Dinh

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS					
Examiner Initial *	**Cite No**	**Document Number**	**Publication Date**	**Name of Patentee or Applicant of Cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear

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		JP-2000181843	Jun 30, 2000	Matsumoto, Shigeru et al.		

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	**Cite No [1]**	**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, page(s), volume-issue number(s), publisher, city and/or country where published.**	**T[2]**
		Japan Notice of Reasons for Refusal, dated October 28, 2019, Application No. 2017-530734, filed December 14, 2015; Dkt. No. 0492-JP-01 , 5 pgs.	

EXAMINER **DATE CONSIDERED**

Substitute Disclosure Statement Form (PTO-1449)
* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.1 Applicant's unique citation designation number (optional) 2 Applicant is to place a check mark here if English language Translation is attached

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2000－181843
（P2000－181843A）
(43)公開日　平成12年６月30日(2000.6.30)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｇ０６Ｆ　13/00	３５４	Ｃ０６Ｆ　13/00	３５４Ｄ	５Ｂ０８９
Ｈ０４Ｌ　12/54		Ｈ０４Ｌ　11/20	１０１Ｂ	５Ｋ０３０
12/58				９Ａ００１

審査請求　未請求　請求項の数10　ＯＬ　（全 19 頁）

(21)出願番号　特願平10－361124

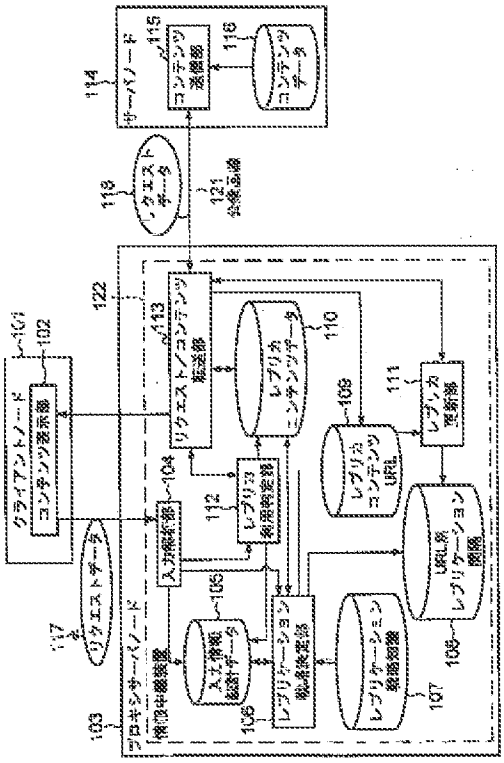
(22)出願日　平成10年12月18日(1998.12.18)

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弁理士　鈴江　武彦　（外６名）

最終頁に続く

(54)【発明の名称】　情報中継装置及び記憶媒体

(57)【要約】
【課題】　本発明は、オリジナルコンテンツの更新頻度が高く、さらにクライアントから不特定多数のサーバへの情報提供要求が出力される場合において、その平均レスポンスタイムを向上させることができる。
【解決手段】　ネットワーク121上に配置され、クライアント計算機からのデータ提供要求をサーバ計算機へ転送し、サーバ計算機からの提供データをクライアント計算機へ転送する中継機能を有する情報中継装置122において、クライアント計算機から過去にデータ提供要求されたサーバ計算機上のデータについて、データ提供要求と非同期に、その要求データを複製し保持するレプリケーション手段113,110,109,111,108と、クライアント計算機からデータ提供要求されたとき、レプリケーション手段が保持する複製データ110をクライアント計算機に返す複製返却手段113とを備えた情報中継装置。



【特許請求の範囲】
【請求項１】　情報提供者となるサーバ計算機と情報利用者となるクライアント計算機の間を繋ぐネットワーク上に配置され、クライアント計算機からのデータ提供要求をサーバ計算機へ転送し、サーバ計算機からの提供データをクライアント計算機へ転送する中継機能を有する情報中継装置において、
前記クライアント計算機から過去にデータ提供要求されたサーバ計算機上のデータについて、データ提供要求と非同期に、その要求データを複製し保持するレプリケーション手段と、
前記クライアント計算機からデータ提供要求されたとき、前記レプリケーション手段が保持する複製データを前記クライアント計算機に返す複製返却手段とを備えたことを特徴とする情報中継装置。
【請求項２】　前記レプリケーション手段は、設定された時間間隔で複製データを最新状態に更新することを特徴とする請求項１記載の情報中継装置。
【請求項３】　複数の複製データについての各々の更新時間間隔を、各データに対するクライアント計算機からのデータ提供要求の頻度に基づいて変更するレプリケーション間隔決定手段を備えたことを特徴とする請求項２記載の情報中継装置。
【請求項４】　複数の複製データについての各々の更新時間間隔を、各データに関するサーバ計算機上でのデータ変更頻度に基づいて変更するレプリケーション間隔決定手段を備えたことを特徴とする請求項２又は３記載の情報中継装置。
【請求項５】　前記データ提供要求を受けた場合に、前記レプリケーション手段が保持する複製データが有効期限内のものであるか否かを判断するレプリカ利用判定手段を備え、
前記レプリケーション手段は、前記レプリカ利用判定手段により複製データが有効期限外と判定された場合には、サーバ計算機に複製データに対応したデータの属性情報を問い合わせ、その属性情報から該当データがサーバ計算機上で更新されていると判断したときには、サーバ計算機からデータを取得し直すとともに、その取得データを前記中継機能に引き渡すことを特徴とする請求項１乃至４のうち何れか１項記載の情報中継装置。
【請求項６】　前記サーバ計算機は、提供用のデータに変更が起きた場合、データ提供登録されたデータについてその登録を行ったデータ提供対象に、更新後のデータを送信するものである場合に、
前記レプリケーション手段は、クライアント計算機から複製データを保持していないデータについてのデータ提供要求を受けると、前記サーバ計算機に、要求されたデータをデータ提供するよう登録することを特徴とする請求項１記載の情報中継装置。
【請求項７】　前記レプリケーション手段は、前記複製データとともにその複製データについてのアクセス制限情報を取得し保持するとともに、
前記複製返却手段は、前記アクセス制限情報に基づき、アクセス許可されるクライアントからのデータ提供要求にのみ複製データを返すことを特徴とする請求項１乃至６のうち何れか１項記載の情報中継装置。
【請求項８】　情報提供者となるサーバ計算機と情報利用者となるクライアント計算機の間を繋ぐネットワーク上に配置され、クライアント計算機からのデータ提供要求をサーバ計算機へ転送し、サーバ計算機からの提供データをクライアント計算機へ転送する中継機能を有する情報中継装置を制御するプログラムであって、
コンピュータに、
前記クライアント計算機から過去にデータ提供要求されたサーバ計算機上のデータについて、データ提供要求と非同期に、その要求データを複製させ保持させるレプリケーション手段と、
前記クライアント計算機からデータ提供要求されたとき、前記レプリケーション手段が保持させる複製データを前記クライアント計算機に返させる複製返却手段とを有するプログラムを記憶したコンピュータ読み取り可能な記憶媒体。
【請求項９】　前記レプリケーション手段は、設定された時間間隔で複製データを最新状態に更新させることを特徴とする請求項８記載の記憶媒体。
【請求項１０】　前記サーバ計算機は、提供用のデータに変更が起きた場合、データ提供登録されたデータについてその登録を行ったデータ提供対象に、更新後のデータを送信するものである場合に、
前記レプリケーション手段は、クライアント計算機から複製データを保持していないデータについてのデータ提供要求を受けると、前記サーバ計算機に、要求されたデータをデータ提供するよう登録させることを特徴とする請求項８記載の記憶媒体。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明は情報中継装置及び記憶媒体、更に詳しくは、ネットワーク上のサーバ計算機で生成される情報について、これを参照するクライアント計算機と間にあって両者の情報授受を中継する情報中継装置及び記憶媒体に関する。
【０００２】
【従来の技術】ＷＷＷ（Ｗｏｒｌｄ　Ｗｉｄｅ　Ｗｅｂ）やＦＴＰ（Ｆｉｌｅ　Ｔｒａｎｓｆｅｒ　Ｐｒｏｔｏｃｏｌ）サービスに代表される分散計算機システムでは、一塊の情報（以下、コンテンツと呼ぶ）を特定するユニークな識別文字列がＵＲＬという形でコンテンツ毎に関連付けられている。クライアントシステム（以下、クライアントという）からはＵＲＬを指定することでサーバシステム（以下、サーバという）からコンテンツを

引き出すことができる。

【0003】このようなシステムを利用する際、クライアントとサーバの間にプロキシ（Ｐｒｏｘｙ）サーバと呼ばれる情報中継装置を介在させる場合がある。プロキシサーバはいくつかの機能を持つが、その１つにキャッシング機能がある。

【0004】このキャッシング機能を利用することにより、クライアントが一度参照したコンテンツがプロキシサーバを通過する際にそのキャッシュエリアに格納される。このデータキャッシュにより、クライアントから再びそのコンテンツを見たいという要求が出されたとき、キャッシュ内のデータを返すためプロキシサーバとサーバ間のネットワークデータ転送を省くことができ、クライアントの要求に高速に答えることができる。

【0005】現在実現されている一般的なキャッシングプロキシサーバの動作は以下のようになる。ここではＷＷＷの例を示す。

【0006】１．クライアントからの表示要求を受け、キャッシュエリアを調べる。

【0007】２．キャッシュエリアにクライアントから要求されたコンテンツの複製が存在する場合には、複製が有効期限内であればそれを返す。有効期限は、サーバからコンテンツを取得する際に一緒に送られてくる。

【0008】３．有効期限をすぎている場合、それが最新のものかどうかを確認するため、オリジナルが置かれているＷＷＷサーバに当該コンテンツの最終更新日時を問い合わせる。

【0009】４．オリジナルの最終更新日時が複製の更新日時と一致した場合は、キャッシュ内のコンテンツをクライアントに返す。

【0010】５．オリジナルの最終更新日時がキャッシュより新しい場合は、改めてオリジナルのコンテンツをダウンロードし、クライアントに返すと共に、キャッシュを更新する。

【0011】以下、上記２または４の状況を「キャッシュがヒットした」と表現する。

【0012】ここで、クライアントからの情報提供要求に対し、キャッシュがヒットするための条件を整理すると以下のようになる。

【0013】・要求されたＵＲＬのコンテンツがキャッシュに存在する（以下、存在性という）。

【0014】・キャッシュに存在する当該コンテンツがサーバと同じものである（以下、最新性という）。

【0015】これらの条件の性質からして、キャッシュ上の複製データに存在性と最新性の両条件が成り立ったときのみ、キャッシュがヒットすることになる。

【0016】一方、データベースのレプリケーションシステムやプッシュ（Ｐｕｓｈ）テクノロジーと呼ばれる技術では、あらかじめ設定したコンテンツに対し、サーバ上のコンテンツに内容更新が起こった時点で複製を持つクライアントに変更が通知され、複製が最新状態に変更される。

【0017】プロキシサーバのキャッシュ管理にプッシュ技術を利用することにより、あらかじめ設定されたＵＲＬのコンテンツに対しては常に最新状態のものがキャッシュエリアに保持される。このため、一般的なプロキシサーバよりもクライアントからの要求に対するキャッシュのヒット確率が高くなり、クライアントから見た平均レスポンス時間が短くなる効果がある。サーバ上のコンテンツが頻繁に更新される場合、この効果が顕著になる。

【0018】また、厳密にいえばプッシュ技術とはいえないが、一般にプッシュ技術といわれているものにインテリジェントプル（ｐｕｌｌ）と呼ばれる技術がある。上記したプッシュ技術ではサーバ側から積極的にコンテンツを送るのに対し、このインテリジェントプルではクライアント側から定期的にコンテンツを取得することで見かけ上プッシュ技術を用いたのと同様な状態を実現しようとする。

【0019】このインテリジェントプル技術をプロキシサーバに適用した例として、米国Ｍａｒｉｍｂａ社のＣａｓｔａｎｅｔがある。

【0020】Ｍａｒｉｍｂａ社のＣａｓｔａｎｅｔはサーバ機能を持つトランスミッタとクライアント機能を持つチューナから構成される。チューナはあらかじめチューナ上で設定したＵＲＬのコンテンツがトランスミッタ上で更新されたかを定期的にチェックし、更新があったコンテンツをダウンロードして、チューナ上の複製ファイルを更新する。

【0021】ユーザからコンテンツの参照要求があると、チューナ上の複製コンテンツを表示する。したがって、チューナをＷＷＷブラウザのプロキシサーバとして利用すると、高速なレスポンスが実現できる。この場合、ＷＷＷブラウザからの参照要求が、チューナ上にキャッシュされているコンテンツなら複製が返され、そうでない場合はオリジナルのサーバからコンテンツをダウンロードする。

【0022】チューナにキャッシュされているコンテンツは定期的に最新状態に更新されているため、一般的なプロキシサーバを利用する場合に比べ、キャッシュの最新性が成立する確率が高くなる。

【0023】また、特開平１０－２１１３４には、２つのプロキシのプロセスを用意しておき、１つ目のプロキシのプロセスは通常のプロキシの機能を有し、２つ目のプロキシは１つ目のプロキシが生成するアクセスログに記載されているＵＲＬを順にＷｅｂサーバにあるオリジナルから読み込んでキャッシュに記憶させる技術が記載されている。つまり、プロキシのキャッシュにクライアントが取得しようとしている目的のコンテンツが見つからない場合、もしくは見つかっても有効期限が切れてい

る場合はオリジナルを読み込んできて、目的のコンテンツで、有効期限内のコンテンツを見つけた場合は、そのままクライアントに返すのである。

【００２４】

【発明が解決しようとする課題】ところが、上述のキャッシングプロキシサーバのキャッシング機能を用いた場合は、サーバに置かれているオリジナルコンテンツの内容更新頻度が低い場合、キャッシングプロキシサーバのキャッシュ機能は有効に働く。しかし、オリジナルコンテンツの更新頻度が高い場合、キャッシュの最新性が成立する確率は低くなるため、キャッシュのヒット率が下がり、プロキシサーバがキャッシングする効果が低くなるという問題がある。

【００２５】また、上記プッシュ技術やインテリジェントプル技術を用いた場合においては、あらかじめ設定されたコンテンツしか複製が作られない。したがって、WWWのようにオリジナルコンテンツが不特定なシステムではキャッシュの存在性が成立する確率が下がり、ヒット率が低くなる問題がある。仮に、十分多くのコンテンツをあらかじめプッシュ対象に設定することによって存在性を向上させた場合、必要なキャッシュの大きさが大きくなりすぎるという問題が発生し、現実的とはいえない。

【００２６】さらに、特開平１０－２１１３４記載の技術では、コンテンツをキャッシュするタイミングが、１つ目のプロキシのアクセスログが増加するタイミングでアクセスログに基づいて行われるため、クライアントからのリクエストが無い限り、キャッシュの更新は行われず、有効期限内にオリジナルのコンテンツが変更されていても、クライアントには新しいコンテンツをクライアントが入手できない場合が生じうる。

【００２７】本発明は、このような実情を考慮してなされたもので、オリジナルコンテンツの更新頻度が高く、さらにクライアントから不特定多数のサーバへの情報提供要求が出力される場合において、その平均レスポンスタイムを向上させることができる情報中継装置及び記憶媒体を提供することを目的とする。

【００２８】

【課題を解決するための手段】上記課題を解決するために、請求項１に対応する発明は、情報提供者となるサーバ計算機と情報利用者となるクライアント計算機の間を繋ぐネットワーク上に配置され、クライアント計算機からのデータ提供要求をサーバ計算機へ転送し、サーバ計算機からの提供データをクライアント計算機へ転送する中継機能を有する情報中継装置についてなされたものである。

【００２９】この情報中継装置においては、レプリケーション手段により、クライアント計算機から過去にデータ提供要求されたサーバ計算機上のデータについて、データ提供要求と非同期に、その要求データが複製され保持される。

【００３０】また、クライアント計算機からデータ提供要求されたときには、複製返却手段によって、レプリケーション手段が保持する複製データがクライアント計算機に返される。

【００３１】本発明では、このようなに、データ提供要求とは非同期な複製更新を行うことから、オリジナルコンテンツの更新頻度が高い場合でも適切な複製返却を可能とすることができ、また、過去に要求されたデータについて、複製を行うようにしているので、クライアントから不特定多数のサーバへの情報提供要求が出力される場合にその平均レスポンスタイムを向上させることができる。

【００３２】次に、請求項２に対応する発明は、請求項１に対応する発明において、レプリケーション手段は、設定された時間間隔で複製データを最新状態に更新する。

【００３３】したがって、より効率的に、複製データの返却を行うことができる。

【００３４】次に、請求項３に対応する発明は、請求項２に対応する発明において、レプリケーション間隔決定手段が設けられ、同間隔決定手段によって、複数の複製データについての各々の更新時間間隔が、各データに対するクライアント計算機からのデータ提供要求の頻度に基づいて変更される。

【００３５】したがって、データ要求頻度に応じて適切な複製更新を行うことができる。

【００３６】次に、請求項４に対応する発明は、請求項２又は３に対応する発明において、レプリケーション間隔決定手段によって、複数の複製データについての各々の更新時間間隔が、各データに関するサーバ計算機上でのデータ変更頻度に基づいて変更される。

【００３７】したがって、クライアントの要求のみならず、サーバ側での状況をも考慮した複製更新を行うことができる。

【００３８】次に、請求項５に対応する発明は、請求項１～４に対応する発明において、レプリカ利用判定手段によって、データ提供要求を受けた場合に、レプリケーション手段が保持する複製データが有効期限内のものであるか否かが判断されるようになっている。

【００３９】このレプリカ利用判定手段により複製データが有効期限外と判定された場合には、さらに、レプリケーション手段により、サーバ計算機に複製データに対応したデータの属性情報が問い合わせられ、その属性情報から該当データがサーバ計算機上で更新されていると判断されたときに、サーバ計算機からデータが取得し直されるとともに、その取得データが前記中継機能に引き渡される。

【００４０】したがって、実際にはサーバ側のデータが変更されていない場合に、サーバ～中継装置間で重複し

てデータ送信されることを防止することができ、効率的なデータ転送を行うことができる。

【００４１】次に、請求項６に対応する発明は、請求項１に対応する発明において、サーバ計算機は、提供用のデータに変更が起きた場合、データ提供登録されたデータについてその登録を行ったデータ提供対象に、更新後のデータを送信するものである場合に情報中継装置に適用されるものである。なお、このサーバ計算機は例えばプッシュ技術が使用されたものである。

【００４２】この場合に、レプリケーション手段は、クライアント計算機から複製データを保持していないデータについてのデータ提供要求を受けると、サーバ計算機に、要求されたデータをデータ提供するよう登録する。

【００４３】したがって、情報中継装置からプッシュ技術等を用いたサーバ計算機にプッシュ対象データを登録するよう働きかけることで、請求項１の発明と同様な効果を奏することができる。

【００４４】次に、請求項７に対応する発明は、請求項１に対応する発明において、レプリケーション手段によって、複製データとともにその複製データについてのアクセス制限情報が取得され保持されるようになっている。

【００４５】さらに、複製返却手段によって、アクセス制限情報に基づき、アクセス許可されるクライアントからのデータ提供要求にのみ複製データが返されるようになっている。

【００４６】したがって、アクセス権限を有するクライアントに対してのみ、データ返却することが可能となる。

【００４７】次に、請求項８に対応する発明は、請求項１に対応する発明をコンピュータに実現させるプログラムを記録した記録媒体である。

【００４８】この記録媒体から読み出されたプログラムにより制御されるコンピュータは、請求項１の情報中継装置として機能する。

【００４９】次に、請求項９に対応する発明は、請求項２に対応する発明をコンピュータに実現させるプログラムを記録した記録媒体である。

【００５０】この記録媒体から読み出されたプログラムにより制御されるコンピュータは、請求項２の情報中継装置として機能する。

【００５１】次に、請求項１０に対応する発明は、請求項６に対応する発明をコンピュータに実現させるプログラムを記録した記録媒体である。

【００５２】この記録媒体から読み出されたプログラムにより制御されるコンピュータは、請求項６の情報中継装置として機能する。

【００５３】

【発明の実施の形態】以下、本発明の実施の形態について説明する。

（発明の第１の実施の形態）図１は本発明の第１の実施形態に係る情報中継装置を適用したプロキシサーバを含むネットワークシステムの構成例を示すブロック図である。

【００５４】このネットワークシステムは、公衆回線１２１を介して多数のサーバノード１１４やクライアントノード１０１が接続されてなるインターネットである。また、クライアントノード１０１はプロキシサーバノード１０３を介して公衆回線１２１に接続され、サーバノード１１４に対するコンテンツ要求をプロキシサーバ１０３に行うようになっている。このプロキシサーバノード１０３に本実施形態の情報中継装置１２２が組み込まれている。

【００５５】本実施形態では、各ノード１０１，１０３，１１４が接続されている場合について説明するが、ネットワークが介在することは発明の必須要件ではなく、例えばクライアントノード１０１と情報中継装置が同一のコンピュータ内のソフトウェアプロセスとして存在することも可能である。

【００５６】また、図１では各ノード１０１，１０３，１１４が１つしか記載されていないが、クライアントノード１０１及びサーバノード１１４は同一の構成を持つ複数の装置が存在していてもよい。さらに、各ノード１０１，１０３，１１４は、通信機能を有する計算機システムからなり、そのＣＰＵやメモリ等のハードウエア資源、並びに制御プログラム等のソフトウエア資源から図１に示す種々の機能実現手段を構成する。また、図１においては機能実現に必要な各種のデータが示されているが、これらは図示しない各計算機内のメモリやハードディスク等の記憶手段（図示せず）に記憶されるものである。

【００５７】以下に、上記各要素の構成について説明する。

【００５８】クライアントノード１０１には、WWWブラウザ等の情報表示機能を有するコンテンツ表示部１０２が設けられる。コンテンツ表示部１０２は、クライアントからサーバに向けてのコンテンツ取得リクエスト１１７を出力するとともに、サーバから送られてきたコンテンツを表示する。

【００５９】次に、サーバノード１１４は、WWWサーバ等の情報発信機能を有するコンテンツ送信部１１５及びコンテンツデータ１１６を備えている。

【００６０】コンテンツ送信部１１５は、クライアントもしくはプロキシサーバ１０３からのリクエスト１１７もしくは１１８を受けて、対応するコンテンツを送信する。

【００６１】コンテンツデータ１１６は、クライアントもしくは情報中継装置からのリクエスト１１７もしくは１１８を受けて、コンテンツ送信部１１５から送信されるコンテンツの集合であり、図示しない記憶手段に格納

されている。また、個別のコンテンツを識別するＩＤ（WWWの場合はＵＲＬ）とコンテンツ内容実体との組で1つのコンテンツが表現される。以下の説明では、ＩＤがＵＲＬである場合について説明する。

【００６２】図2はＵＲＬと送信元のＩＤの一例を示す図である。

【００６３】同図に示す情報は、クライアントノード１０１が取得したいコンテンツを指定するリクエストデータ１１７や１１８に含まれる識別情報の形態例である。

【００６４】次にプロキシサーバノード１０３は、クライアントノード１０１の代理としてインターネットとの通信等を行うサーバであって、本実施形態では、この中に情報中継装置１２２が設けられている。

【００６５】情報中継装置１２２は、入力情報統計データ１０５，レプリケーション戦略知識１０７，レプリカコンテンツＵＲＬ１０９，ＵＲＬ別レプリケーション間隔１０８及びレプリカコンテンツデータ１１０の各データを保持する。また、これらの各データ及びリクエストデータ１１７に基づき、所定の処理を実行する入力解析部１０４，レプリケーション戦略決定部１０７，レプリカ利用判定部１１２，リクエスト／コンテンツ転送部１１３及びレプリカ更新部１１１を備えている。

【００６６】ここでまず、入力解析部１０４は、クライアントから送られたリクエスト１１７を解析し、入力情報統計データ１０５を作成する。また、リクエストの全情報をレプリカ利用判定部１１２に送る。

【００６７】入力情報統計データ１０５は、図示しない記憶手段に過去のリクエストの解析情報等が保存されてなるものである。例えば図3（ａ）の項目に付いて、図4に示す形態でリクエストの統計情報を保持する。

【００６８】図3は入力情報統計データ及びレプリケーション戦略決定部で使用されるデータの内容例を示す図である。

【００６９】図4は入力情報統計データの保存形態の一例を示す図である。

【００７０】なお、図3（ａ）に示す各項目のうち、ＵＲＬ（１）、最新リクエスト発行時刻（２）、総リクエスト回数（３）、リクエスト発生頻度（４）については、入力解析部１０４が受信したリクエスト１１７に基づき、解析あるいは計算されて更新されるものである。また、レプリカ使用回数（５）については、後述するレプリカ利用判定部１１２によってレプリカが使用されたときにインクリメントされる。

【００７１】レプリケーション戦略決定部１０６は、レプリケーション戦略知識１０７に基づいて入力情報統計データ１０５を利用し、どのコンテンツをレプリケーションの対象にし、どの程度の間隔でレプリカを最新状態に更新するか等を決定し、その結果をＵＲＬ別レプリケーション間隔１０８に出力する。ここで、レプリケーション戦略知識１０７は、レプリケーション戦略決定部１０６で利用する知識データであり、例えば図5に示す形態で知識を保持する。

【００７２】図5はレプリケーション戦略知識の内容例を示す図である。

【００７３】同図に示すレプリケーション戦略知識１０７の各例に対応して、レプリケーション戦略決定部１０６がどのようなレプリケーション間隔決定を行うかを説明すると以下の通りである。

【００７４】レプリケーション戦略決定部１０６は、各ＵＲＬに対応するレプリカが図5に示す処理＃１～＃４のうち、何れかの処理条件を満たすか否かを調べ、条件を満たす場合には、その処理に規定されたレプリケーション間隔をＵＲＬ別レプリケーション間隔１０８に出力する。また、レプリケーション登録削除の場合には、レプリカコンテンツＵＲＬ１０９から対応するＵＲＬを削除する。

【００７５】また、レプリケーション戦略決定部１０６は、レプリケーション戦略決定処理に先立ち、図3（ｂ）に示すレプリカ使用率（６）を計算し、当該戦略決定処理の間、これを保持する。

【００７６】さて、図5における処理＃１は、最新リクエスト発行時刻（２）が現在時刻から3時間より前であって、かつ、レプリカ使用率（６）が0．５より大きい場合には、そのＵＲＬについてのレプリケーション間隔を5時間とするものである。この条件で比較的長時間である5時間と間隔設定するのは、リクエスト頻度の割には情報中継装置１２２が保持するレプリカは高確率でそのまま使用されることから、サーバノード１１４における対応コンテンツの変更頻度が相対的に低いと予想できるからである。別のいい方をすれば、この場合はコンテンツの変更頻度に比べてリクエスト頻度が相対的に高いということになる。

【００７７】図5における処理＃２は、最新リクエスト発行時刻（２）が現在時刻から3時間より前であって、かつ、レプリカ使用率（６）が0．５以下の場合には、そのＵＲＬについてのレプリケーション間隔を2時間とするものである。この条件で比較的短い時間である2時間と間隔設定するのは、リクエスト頻度の割には情報中継装置１２２が保持するレプリカの使用率は低く、サーバノード１１４における対応コンテンツの変更頻度が相対的に高いと予想できるからである。別のいい方をすれば、この場合はコンテンツの変更頻度に比べてリクエスト頻度が相対的に低いということになる。

【００７８】図5における処理＃３は、単位時間あたりのリクエスト発生頻度（４）が5より大きく、かつ、レプリカ使用率（６）が0．８より小さい場合には、そのＵＲＬについてのレプリケーション間隔を頻度計測単位時間の１／３とするものである。これは、レプリケーション間隔を単なる時間で設定するのではなくリクエスト発生頻度やレプリカ使用率といった概念に対応させて規

定するものである。また、この処理＃３の場合は、リクエスト要求が高くかつサーバ側におけるコンテンツ変更頻度が高い場合に対応している。

【００７９】図５における処理＃４は、現在時刻から３日以上リクエストがない場合には、レプリケーションを終了させるものである。この場合は、レプリケーション登録削除の場合であり、レプリケーション戦略決定部１０６はレプリカコンテンツＵＲＬ１０９，ＵＲＬ別レプリケーション間隔１０８及びレプリカコンテンツデータ１１０からそのＵＲＬについての関連情報を削除する。

【００８０】なお、図５に示すレプリケーション戦略知識１０７は、種々考えられる戦略知識の例示であって、その他の戦略知識を適用させることもできる。例えば処理＃４にＡＮＤ条件で”固定でないコンテンツであるか否か”という条件を加え、これらの両条件が成立したときのみ”レプリケーション終了”とさせてもよい。この場合には、３日リクエストされずかつクライアントが固定的にリクエストするコンテンツでない場合にのみ、レプリケーションが登録削除されることになる。

【００８１】ＵＲＬ別レプリケーション間隔１０８は、レプリケーション戦略決定部１０６で決定された，ＵＲＬ毎のレプリケーション間隔のデータが保持されたものである。例えば図６に示す形態でＵＲＬ毎のレプリケーション間隔の値を保持する。

【００８２】図６はＵＲＬ別レプリケーション間隔の内容例を示す図である。

【００８３】レプリカコンテンツＵＲＬ１０９は、レプリケーション戦略決定部１０６で決定された，レプリケーション対象となるコンテンツのＵＲＬリストが保持されているものである。例えば図７に示すような形態でレプリケーション対象コンテンツのＵＲＬを保持する。

【００８４】図７はレプリカコンテンツＵＲＬの一例を示す図である。

【００８５】レプリカコンテンツデータ１１０は、レプリカコンテンツＵＲＬ１０９にリストアップされているＵＲＬに対応するコンテンツのレプリカ実体が保持されたものである。例えば図８に示す形態でレプリカコンテンツ実体を保持する。

【００８６】図８はレプリカコンテンツデータの一例を示す図である。

【００８７】レプリカ更新部１１１は、ＵＲＬ別レプリケーション間隔１０８に記述されている間隔で各ＵＲＬについてのレプリカコンテンツデータ１１０を更新するように、リクエスト／コンテンツ転送部１１３を介してサーバノードにコンテンツを要求する。

【００８８】レプリカ利用判定部１１２は、リクエストデータ１１７に含まれる時刻と、レプリカコンテンツデータ１１０中のリクエストと対応するコンテンツ実体の有効期限もしくは更新時刻とを比較し、クライアントノード１０１に対してレプリカを返すかサーバノード１１４から新たに取得してデータを返すかを判定する。また、レプリカをクライアントノード１０１に返すように判断した場合には、対応するＵＲＬについて、入力情報統計データ１０５におけるレプリカ使用回数をインクリメントする。

【００８９】リクエスト／コンテンツ転送部１１３は、レプリカ利用判定部１１２の判定結果に基づいて、サーバノード１１４にコンテンツ取得リクエスト１１８を送出し、サーバノード１１４から返されるコンテンツデータをクライアントノード１０１に返す。レプリカ利用判定部１１２にてレプリカを返すように判断されたときには、クライアントノード１０１にレプリカを返す。

【００９０】また、リクエスト／コンテンツ転送部１１３は、サーバノード１１４から取得したコンテンツデータをレプリカコンテンツデータ１１０及びレプリカコンテンツＵＲＬ１０９に格納する。したがって、リクエスト／コンテンツ転送部１１３は、レプリカ更新のみならず、新規にリクエストされたコンテンツの格納及びＵＲＬ保持も行う。

【００９１】なお、請求項におけるレプリケーション手段は、例えばレプリカ更新部１１１，ＵＲＬ別レプリケーション間隔１０８，レプリカコンテンツデータ１１０，レプリカコンテンツＵＲＬ１０９及びリクエスト／コンテンツ転送部１１３等が対応し、複製返却手段は、レプリカ利用判定部１１２及びリクエスト／コンテンツ転送部１１３等が対応する。

【００９２】次に、以上のように構成された本実施形態における情報中継装置の動作について、図９，図１０及び図１１を用いて説明する。

【００９３】図９は本実施形態におけるリクエスト中継処理を説明する流れ図である。

【００９４】図１０は本実施形態におけるレプリケーション戦略決定処理を説明する流れ図である。

【００９５】図１１は本実施形態におけるレプリカ更新処理を説明する流れ図である。

【００９６】これら各処理のうち、リクエスト中継処理及びレプリケーション戦略決定処理と、レプリカ更新処理とは独立に進む非同期な動作となる。

【００９７】まずリクエスト中継処理について説明する。

【００９８】このリクエスト中継処理は、図９に示すように、クライアントノード１０１からリクエストデータ１１７が発行された場合に主に情報中継装置１２２にて行われる処理である。

【００９９】まず、コンテンツ表示部１０２に対して利用者がＵＲＬを指定することにより、コンテンツ表示要求がクライアントノード１０１から出力される（Ｓ１）。

【０１００】利用者から出された上記表示要求は、リクエストデータ１１７の形態でコンテンツ表示部１０２か

ら情報中継装置１２２の入力解析部１０４へ送信される（Ｓ２）。

【０１０１】リクエストデータ１１７の内容は入力解析部１０４により解析され、リクエストを受け取った時刻の情報を元に、入力情報統計データ１０５の内容（１）～（４）が更新される（Ｓ３）。入力情報統計データ更新後は（Ｓ３）、後述するレプリケーション戦略決定処理へ進む。

【０１０２】一方、ステップＳ２の処理を受けて、入力解析部１０４を介して受信した要求内容に基づき、レプリカコンテンツデータ１１０に格納されている当該ＵＲＬのレプリカコンテンツの有効期限がレプリカ利用判定部１１２によって算出される（Ｓ４）。

【０１０３】ここで、有効期限の算出方法は種々の方法が利用可能である。例えばサーバノード１１４からコンテンツが送信される際、有効期限時刻が添付されるか、最終変更時刻が添付されるため、その値から算出する方法が採用される。

【０１０４】次に、リクエストに対応するレプリカコンテンツが有効期限内であった場合（Ｓ５）、対応するレプリカコンテンツがレプリカコンテンツデータ１１３より読み出される。この読出コンテンツは、リクエスト／コンテンツ転送部１１３からクライアントノード１０１に返される（Ｓ６）。

【０１０５】さらに、レプリカ利用判定部１１２によって入力情報統計データ１０６におけるレプリカ使用回数（５）が”１”増やされ（Ｓ７）、レプリケーション戦略決定処理となる。

【０１０６】また、リクエストに対応するレプリカコンテンツが有効期限を過ぎていた場合、又はレプリケーションされていないコンテンツに対するリクエストである場合（Ｓ５）、リクエストデータ１１７に含まれるサーバノード名に基づいて、リクエスト／コンテンツ転送部１１３からサーバノード１１４にリクエストデータ１１８が転送される。サーバノード１１４からはリクエストデータ１１８で指定されたコンテンツが情報中継装置１０３に返される（Ｓ８）。

【０１０７】サーバノード１１４から返されたコンテンツは、情報中継装置１２２のリクエスト／コンテンツ転送部１１３からクライアントノード１０１に転送されるとともに（Ｓ９）、リクエスト／コンテンツ転送部１１３の処理により、レプリカコンテンツデータ１１０の内容が同コンテンツで更新される（Ｓ１０）。なお、レプリケーションされていないコンテンツの場合には、新たなレプリケーション対象としてデータ（コンテンツ、ＵＲＬ）保持され、以降レプリケーションされることになる。

【０１０８】なお、レプリカコンテンツデータ１１０の内容が更新された後は（Ｓ１０）、レプリケーション戦略決定へと処理が進む。

【０１０９】次に、レプリケーション戦略決定処理の流れについて説明する。レプリケーション戦略決定処理はリクエスト中継処理の図９；Ｓ３若しくはＳ７，Ｓ１０の処理を受けて開始する。

【０１１０】まず、図9のステップＳ３若しくはＳ７，Ｓ１０の後に、入力情報統計データ１０５及びレプリケーション戦略知識１０７をもとに、レプリケーション戦略決定部１０６によってＵＲＬ別レプリケーション間隔１０８が生成される（ｔ１）。

【０１１１】具体的には、例えば図４のような入力情報統計データと図５のようなレプリケーション戦略知識の場合には以下のようにレプリケーション間隔が決定される。

【０１１２】まず、リクエストデータ１１７で指定されるＵＲＬの入力情報統計データが取り出される。例えばリクエストデータでｈｔｔｐ：／／ｗｗｗ／ｆｏｏ．ｈｔｍｌが指定された場合、図４の１行目の情報が取り出される。

【０１１３】次に、レプリケーション戦略決定部１０６によってレプリカ使用率（６）が計算されるとともに、取り出した入力情報統計データにマッチする条件を持つ知識がレプリケーション戦略知識１０７から検索される。例えば現在時刻が１９９８／０９／０７／１０：００であった場合、図４の１行目のデータについて検索すると、図５の１行目の知識がマッチする。

【０１１４】次に、見つかった知識に記されているレプリケーション間隔を当該ＵＲＬのレプリケーション間隔とし、ＵＲＬ別レプリケーション間隔１０８がレプリケーション戦略決定部１０６によって更新される。

【０１１５】以上が新たなレプリケーション間隔を設定する場合である。なお、他の処理に該当する場合については上記したとおりである。

【０１１６】これに対して、見つかった知識に記されているレプリケーション間隔がレプリケーションの終了を示している場合には、レプリケーション戦略決定部１０６によって、当該ＵＲＬ及び対応するレプリカコンテンツデータがＵＲＬ別レプリケーション間隔１０８，レプリカコンテンツＵＲＬ１０９，レプリカコンテンツデータ１１０の各データから削除される（ｔ２）。

【０１１７】また、レプリケーションを終了させる他の方法として、レプリカコンテンツデータ１１０が定められた大きさよりも大きくなった場合には、コンテンツの優先度情報（図示せず）を参照し、必要性の低いコンテンツをレプリケーション対象から除外するようにしてもよい。この優先度情報としては、例えば最新リクエスト発行時刻が用いられる。また、使用者が別途優先度を設定するようにしてもよい。さらに、この場合には、優先度の低いレプリカを削除する，プロキシサーバノード１０３のレプリカ削除機能を利用し、レプリカコンテンツ等を削除するようにしても良い。

【0118】なお、本実施形態ではルールベースによるレプリケーション間隔の決定方法を説明したが、入力情報統計データとレプリケーション戦略知識の形態はこれに限るものではなく、入力情報統計データの多変量解析によるレプリケーション間隔値の算出等も考えられる。

【0119】次に、レプリカ更新処理の流れについて説明する。レプリカ更新処理はリクエスト中継処理及びレプリケーション戦略決定処理とは非同期に動作するものである。

【0120】まず、レプリカコンテンツURL109に格納されている最終レプリカ作成時刻と、URL別レプリケーション間隔108に格納されているレプリケーション間隔とがレプリカ更新部111により比較される。この結果、現在時刻が最終レプリカ作成時刻からレプリケーション間隔の時間以上経過しているURLがあれば、そのコンテンツをサーバノード114からダウンロードするように、レプリカ更新部111からリクエスト/コンテンツ転送部113に要求される。

【0121】リクエスト/コンテンツ転送部113によってコンテンツがダウンロードされ、レプリカコンテンツデータ110がダウンロードデータで置き換えられ、レプリカが更新される（u1）。

【0122】レプリカ更新後、レプリカ更新部111は一定時間停止し、その後、ステップu1の処理が繰り返される（u2）。

【0123】上述したように、本発明の実施の形態に係る情報中継装置は、レプリカ更新部111を設け、リクエスト中継処理と非同期にレプリケーション処理を実行して、予めレプリカコンテンツを更新しておくようにしたので、情報中継装置内のレプリカコンテンツデータが最新のものに保たれている確率を高くすることができ、クライアントリクエストに対するヒット率を向上させることができる。

【0124】また、レプリケーション戦略決定部106を設け、リクエストの頻度に応じてレプリカ対象コンテンツを増減させるようにしているので、限られた容量のレプリカ記憶領域に対し、クライアントリクエスト頻度の高いコンテンツがレプリケーションされるようになり、クライアントからの不特定なコンテンツ取得要求に対するヒット率を向上させることができる。

【0125】また、今までのPushプラットフォーム（Castanet等）では、あらかじめ設定したコンテンツだけがPushの対象となり、クライアント側の要求の変化に柔軟に対応できないが、本発明では、レプリカコンテンツデータ110に入っていなかったコンテンツは、以降自動的にPush対象になるため、柔軟なキャッシング処理（レプリケーション）を実現させることができる。

【0126】さらに、今までのPushプラットフォームでは、キャッシュエリアが足りなくならないように、必要なくなったコンテンツを全て手作業でPush対象から外す必要があった。これに対して、本発明では、コンテンツ毎に設定される優先度に基づいて自動的にPush対象から外すようにしたので、キャッシュエリア（レプリカコンテンツデータ110）が溢れることがない。

（発明の第2の実施の形態）第1の実施形態では、レプリカ利用判定部112にてレプリカが有効期限を過ぎていると判定された場合には、リクエスト117を無条件にサーバノード114へリクエスト118として転送していた。

【0127】これに対し、本実施形態では、レプリカコンテンツがサーバノード上のオリジナルコンテンツと同一であるかどうかを確認することにより、サーバノード114からの無駄なコンテンツのダウンロードを無くすようにしたものである。

【0128】本実施形態の情報中継装置は、リクエスト/コンテンツ転送部113の処理が修正される他、第1の実施形態と同様に構成されている。

【0129】リクエスト/コンテンツ転送部113は、第1の実施形態と同様に構成される他、サーバノード114からコンテンツをダウンロードする際、まず、コンテンツ属性情報のみを取得し、当該コンテンツ属性情報に基づきレプリカコンテンツが最新でない場合にのみコンテンツの全体を取得するようになっている。

【0130】このためのリクエストデータ118の内容として、図12，図13に示すように2種類が用意されている。

【0131】図12は本発明の第2の実施形態にて使用されるコンテンツ属性情報だけを取得するリクエスト例を示す図である。

【0132】同図のリクエストでは、リクエストのタイプが「属性情報のみ」であって、そのURLが「http://www.aaa.bbb/foo.html」であることを示している。

【0133】ここで、コンテンツの属性情報としては、少なくとも「コンテンツの最終変更時刻（新規コンテンツの場合は作成時刻）」が含まれている。

【0134】図13はコンテンツ全体を取得するリクエスト例を示す図である。

【0135】同図のリクエストでは、リクエストのタイプが「コンテンツ全体」であって、そのURLが「http://www.aaa.bbb/foo.html」であることを示している。

【0136】また、リクエスト/コンテンツ転送部113は、入力情報統計データ105にオリジナルコンテンツの変更頻度情報を追加する。この情報は例えば以下の式によって求められる。

【0137】変更頻度情報＝コンテンツの全体取得リクエスト回数÷コンテンツの属性取得リクエスト回数

レプリケーション戦略知識１０７は、オリジナルコンテンツの変更頻度を条件に含むことができる。例えばオリジナルコンテンツの変更頻度が所定値範囲の条件であれば、レプリケーション間隔をある値に設定する等の処理である。

【０１３８】次に、以上のように構成された本実施形態における情報中継装置の動作について、図１４を用いて説明する。

【０１３９】図１４は本実施形態におけるリクエスト中継処理を説明する流れ図である。

【０１４０】本実施形態の動作においては第１の実施形態と比較してリクエスト中継処理が変更される。

【０１４１】まず、レプリカコンテンツが有効期限内である場合には、第１の実施形態と同様な処理が実行される（ｖ１～ｖ７）。すなわち図９に示すステップＳ１～Ｓ７と、ステップｖ１～ｖ７とは同様であるため、その説明は省略する。

【０１４２】次に、レプリカが有効期限を過ぎていると判定された場合（ｖ５）、リクエスト／コンテンツ転送部１１８によりサーバノード１１４にコンテンツ属性取得リクエスト１１８が送信され、当該コンテンツの属性情報が取得される（ｖ８）。

【０１４３】取得した属性情報に含まれる最終変更時刻と、対応するレプリカの最終レプリカ作成時刻とがリクエスト／コンテンツ転送部１１３にて比較され、オリジナルコンテンツがレプリカより新しいかが判定される（ｖ９）。

【０１４４】オリジナルコンテンツがレプリカより新しいと判定された場合（ｖ９）、サーバからコンテンツ全体が取得され（ｖ１０）、レプリカコンテンツデータ１１０が更新され（ｖ１１）、さらに、当該ＵＲＬに関する入力情報統計データが変更される。

【０１４５】また、コンテンツ全体が取得された後（ｖ１０）、当該コンテンツがクライアントノードに返される（ｖ１２）。

【０１４６】一方、ステップｖ９において、最終レプリカ作成時刻がオリジナルコンテンツの最終変更時刻より遅い場合、レプリカは最新のオリジナルコンテンツと同一であると判定され、レプリカコンテンツがクライアントノード１０１へ返される（ｖ１３）。その後、レプリカ使用回数がインクリメントされる（ｖ１４）。

【０１４７】上述したように、本発明の実施の形態に係る情報中継装置は、レプリカコンテンツがサーバノード上のオリジナルコンテンツと同一であるかどうかを確認するようにしたので、サーバノード１１４からの無駄なコンテンツのダウンロードを無くすことができ、有効期限を過ぎても変化が無いコンテンツに対するレスポンス時間の短縮が期待できる。

【０１４８】また、オリジナルコンテンツの更新頻度に基づきレプリケーション間隔を調整することが可能であるので、有効期限が明示的に設定されていないコンテンツのレプリカ更新間隔を確率的な意味で適切に設定することができ、リクエスト中継処理中にコンテンツ全体を取得しなければならない状況が起きにくくなる。

【０１４９】なお、本実施形態では属性情報の事前要求をクライアントノード１０１からリクエスト１１７があった場合についてのみ説明したが、この属性情報の事前要求は、リクエスト中継処理のみならず、レプリカ更新処理の場合に適用しても良い。この場合、レプリカ更新部１１１がレプリカ更新すべきと判断したときに、属性情報の事前要求が行われ、コンテンツが変更しているときのみダウンロードされることになる。

（発明の第３の実施の形態）第１，第２の実施形態は、いわゆるインテリジェントプルと呼ばれる技術を応用したものであるが、本実施形態ではプッシュ技術を利用する。このプッシュ技術利用と関連し、リクエスト／コンテンツ転送部とコンテンツ送信部の間の通信路にマルチキャスト技術が利用されており、これによりサーバノードから複数の情報中継装置に対し能動的にデータを送信することができるようになっている。

【０１５０】図１５は本発明の第３の実施形態に係る情報中継装置を適用したプロキシサーバを含むネットワークシステムの構成例を示すブロック図である。なお、同図に示す情報中継装置２０３はプロキシサーバに含まれるものであるが、両者の関係は第１の実施形態の場合と同様であるので、ここではプロキシサーバの表示を省略している。

【０１５１】本実施形態に用いられるネットワーク自体や、クライアントノード２０１、プロキシサーバノード及びサーバノード２１１間の関係、さらにはこれら各部の基本的な機能は、第１の実施形態の各ノード１０１，１０３及び１１４の場合と同様であるのでここでは詳細説明を省略する。

【０１５２】まず、クライアントノード２０１はクライアントノード１０１と同一の構成である。また、クライアントノードから送られるリクエストデータ２０８もリクエストデータ１１７と同一である。

【０１５３】情報中継装置２０３は、レプリケーション対象ＵＲＬ２０６，レプリカコンテンツデータ２０７，レプリケーション戦略知識２２１及び入力情報統計データ２２２の各データを図示しない記憶手段に保持する。また、これらの各データ及びリクエストデータ２０８に基づき、所定の処理を実行するレプリカ利用判定部２０４，リクエスト／コンテンツ転送部２０５及び登録削除判断部２２３を備えている。

【０１５４】ここでまず、レプリカ利用判定部２０４は、リクエストデータ２０８に含まれるＵＲＬのコンテンツがレプリケーション対象ＵＲＬ２０６に存在すればレプリカコンテンツデータ２０７から当該コンテンツをクライアントノードに返し、存在しなければレプリケー

ション対象ＵＲＬ２０６に当該ＵＲＬを追加し、サーバノード２１１に新規レプリケーション対象コンテンツとして登録するリクエスト２０９を送る。

【０１５５】また、レプリカ利用判定部２０４は、リクエストデータ２０８に基づき、そのＵＲＬ別に、最新リクエスト発行時刻を入力情報統計データ２２２として保持させる。

【０１５６】リクエスト／コンテンツ転送部２０５は、サーバノード２１１から送られて来たコンテンツデータ２１０のうち、レプリケーション対象ＵＲＬ２０６に登録されているＵＲＬのコンテンツのみをレプリカコンテンツデータ２０７に記録する。

【０１５７】レプリケーション対象ＵＲＬ２０６は、情報中継装置２０３がレプリケーション対象とするコンテンツのＵＲＬを記録するデータエリアである。例えば図１６の形態のデータ構造を持つ。

【０１５８】図１６は本実施形態におけるレプリケーション対象ＵＲＬのデータ構造例を示す図である。

【０１５９】レプリカコンテンツデータ２０７は、レプリカコンテンツを記録するデータエリアである。例えば図１７の形態のデータ構造を持つ。

【０１６０】図１７は本実施形態におけるレプリカコンテンツデータのデータ構造例を示す図である。

【０１６１】レプリケーション戦略知識２２１には、レプリカコンテンツデータ２０７内のレプリカコンテンツを削除する条件を示すデータである。この条件は、「最新のリクエスト発生が現在時刻の３日前」や「最新のリクエスト発生が現在時刻の３日前 ＡＮＤ 当該ＵＲＬが固定コンテンツでない」等である。

【０１６２】登録削除判断部２２３は、入力情報統計データ２２２の最新リクエスト発行時刻及びレプリケーション戦略知識２２１の登録削除条件から登録削除すべきＵＲＬを判断する。同判断部２２３は、あるレプリカコンテンツを登録削除すべきと判断したときには、レプリケーション対象ＵＲＬ２０６及びレプリカコンテンツデータ２０７から対応するデータを削除するとともに、サーバノード２１１に登録削除データを送信する。

【０１６３】一方、サーバノード２１１は、コンテンツデータ２１４，レプリケーション対象ＵＲＬ２１６及びレプリケーション配送先装置名２１７の各データを図示しない記憶手段に保持するとともに、これらのデータに関連して一定の処理を行うコンテンツ送信部２１２，更新検出部２１３及びレプリケーション対象ＵＲＬ登録部２１５を備えている。

【０１６４】レプリケーション対象ＵＲＬ登録部２１５は、リクエストデータ２０９に含まれるＵＲＬをレプリケーション対象ＵＲＬ２１６に登録するとともに、リクエストデータ２０９の送信元の情報中継装置名をレプリケーション配送先装置名２１７に登録する。

【０１６５】また、レプリケーション対象ＵＲＬ登録部２１５は、情報中継装置２０３の登録削除判断部２２３から削除要求データ２２４を受けると、当該データ２２４に含まれるＵＲＬをレプリケーション対象ＵＲＬ２１６から削除し、対応するデータをレプリケーション配送先装置名２１７から削除する。

【０１６６】レプリケーション対象ＵＲＬ２１６は、サーバノード２１１から情報中継装置２０３にレプリケーションのために送信するコンテンツのＵＲＬリストである。複数の情報中継装置２０３からリクエストデータ２０９を受けている場合、各情報中継装置を区別せず記録する。例えば情報中継装置のレプリケーション対象ＵＲＬ２０６と同様な図１６の形態を持つ。

【０１６７】コンテンツデータ２１４は、サーバノード２１１がオリジナルデータを持つコンテンツデータの集合である。

【０１６８】更新検出部２１３は、コンテンツデータ２１４の変化を検知し、それがレプリケーション対象ＵＲＬ２１６に含まれていれば、ＵＲＬとコンテンツデータ実体をコンテンツ送信部２１２へ送る。

【０１６９】更新検出部２１３におけるコンテンツデータの変化を検知する方法としては、例えば以下のような何種類かの方法が考えられる。

【０１７０】Ａ．一定時間毎に全てのコンテンツの最終更新時刻を確認し、前回の確認時刻よりも後に更新が起きたコンテンツを見つける。

【０１７１】Ｂ．コンテンツを変更する時に使用するツールから、変更後のコンテンツをコンテンツデータ２１４に記録する際に更新検出部２１３に知らせる。

【０１７２】Ｃ．ＯＳやハードウェアで、記憶装置上でデータの変化があったことを検出する機能が備わっている場合、データ変化を検出した時点で更新検出部２１３に知らせる。

【０１７３】コンテンツ送信部２１２は，更新検出部２１３から送られたＵＲＬとコンテンツの組を、レプリケーション配送先装置名２１７に登録されている全ての情報中継装置２０３に向けて送信する。

【０１７４】次に、以上のように構成された本実施形態における情報中継装置の動作について、図１８、図１９、図２０及び図２１を用いて説明する。

【０１７５】図１８は本実施形態におけるリクエスト中継処理を説明する流れ図である。

【０１７６】図１９は本実施形態におけるレプリカ対象登録処理を説明する流れ図である。

【０１７７】図２０は本実施形態におけるレプリカ配信処理を説明する流れ図である。

【０１７８】図２１は本実施形態における登録削除処理を説明する流れ図である。

【０１７９】ここで、図１８及び図１９の処理は一連の流れとして処理が進むが、図２０及び図２１は独立した処理の流れとなる。

【０１８０】まず、図１８、図１９の動作の流れを説明する。

【０１８１】ステップｗ１は図9のステップＳ１と同一の処理になる。

【０１８２】次に、クライアントノード２０１からのリクエストデータ２０８は、レプリカ利用判定部２０４にて受信され（ｗ２）、リクエストに含まれるＵＲＬがレプリケーション対象ＵＲＬ２０６に登録済みかが調べられる（ｗ３）。

【０１８３】既に登録済みであった場合には（ｗ３）、レプリカ利用判定部２０４によってレプリカコンテンツデータ２０７のレプリカがクライアントノード２０１に返され（ｗ４）、終了する。

【０１８４】一方、登録済みでなかった場合（ｗ３）、レプリケーション対象ＵＲＬ２０６に、リクエストに含まれるＵＲＬが追加される（ｗ５）。さらに、サーバノード２１１に対し、レプリケーション対象ＵＲＬ登録及びコンテンツ取得のリクエスト２０９が送信される（ｗ６）。

【０１８５】サーバノード２１１のコンテンツ送信部２１２によって、リクエスト２０９に含まれるＵＲＬのコンテンツが情報中継装置２０３に返され、さらに情報中継装置２０３によりクライアントノード２０１に転送される。（ｗ７）このリクエスト中継処理に連動してレプリカ対象登録処理が図１９に示すようにして実行される。

【０１８６】まず、リクエスト２０９に含まれるＵＲＬはレプリケーション対象ＵＲＬ登録部２１５に引き渡され、このＵＲＬがサーバノード２１１のレプリケーション対象ＵＲＬに追加される（ｘ１）。さらに、リクエスト２０９の送信元装置の識別名がレプリケーション対象ＵＲＬ登録部２１５によりレプリケーション配信先装置名２１７に追加される（ｘ２）次にレプリカ配信処理について説明する。

【０１８７】まず、コンテンツデータ２１４内のコンテンツの内容変更もしくは新規作成が更新検出部２１３で検知される（ｙ１）。

【０１８８】変化を検知したコンテンツがレプリケーション対象ＵＲＬ２１６に含まれるコンテンツか否か更新検出部２１３により判断される（ｙ２）。

【０１８９】ここで、レプリケーション対象であった場合には、コンテンツ送信部２１２を通じてレプリケーション配送先装置名２１７に登録されている装置にコンテンツ２１０が送信される（ｙ３）。この送信の際には、マルチキャスト技術が利用され、これによりサーバノードから複数の情報中継装置２０３に対し能動的にデータ送信が行われる。図１５に示すのはこの複数の情報中継装置２０３のうちの一つである。

【０１９０】情報中継装置２０３においては、サーバノード２１１から送られて来たコンテンツ２１０のＵＲＬが、レプリケーション対象ＵＲＬ２０６に含まれるかどうかがリクエスト／コンテンツ転送部２０５によって判定される（ｙ４）。レプリケーション対象ＵＲＬに含まれる場合には、レプリカコンテンツデータ２０７はコンテンツ２１０によって更新される（ｙ５）。

【０１９１】このように、レプリカ対象登録処理によって、レプリカ対象がプッシュ技術を利用したサーバノード２１１に登録され、さらに、その登録ＵＲＬについてレプリカ配信処理によって情報中継装置２０３に配布される。

【０１９２】ここで、サーバノード２１１に登録されるレプリケーション対象ＵＲＬが増えすぎないようにするために、情報中継装置２０３によって登録削除処理が実行される。

【０１９３】図２１に示す登録削除処理では、まず、登録削除判断部２２３によって登録削除判断が開始され、そのために、入力情報統計データ２２２の最新リクエスト発行時刻及びレプリケーション戦略知識２２１の登録削除条件が読み出される（ｚ１）。

【０１９４】つづいて、最新リクエスト発行時刻に基づき、各ＵＲＬについて、登録削除条件を満たしているか否かが判断される（ｚ２）。

【０１９５】その結果、登録削除条件を満たすＵＲＬがあれば、そのＵＲＬに関連したレプリケーション対象ＵＲＬ２０６及びレプリカコンテンツデータ２０７が削除され（ｚ３）、サーバノード２１１に対して削除要求データ２２４が出力される（ｚ４）。

【０１９６】サーバノード２１１においては、削除要求データ２２４を受け取ったレプリケーション対象ＵＲＬ登録部２１５により、同データ２２４に含まれるＵＲＬについてのレプリケーション対象ＵＲＬ２１６及びレプリケーション配送先装置名２１７についての情報が削除される（ｚ５）。

【０１９７】上述したように、本発明の実施の形態に係る情報中継装置は、サーバノード２１１におけるオリジナルコンテンツデータの変更と連動してレプリケーション処理が起きるようになっているので、情報中継装置中のレプリカコンテンツデータは常に最新状態に保たれ、クライアントノードからのリクエストに迅速に対応することができる。

【０１９８】すなわち今までのＰｒｏｘｙサーバは一度取得したコンテンツはそのまま保持するだけなので、オリジナルが更新されたら、次回のブラウザからのアクセス時にもう一度サーバから転送し直さなければならなかった。しかし本発明では、常にＰｒｏｘｙの持つコンテンツが最新であるため、ブラウザから見た平均レスポンス時間の向上を見込むことができる。

【０１９９】なお、本実施形態では、サーバノード２１１上でコンテンツデータ２１４の変更が起きた時点で変更されたコンテンツ自体を情報中継装置２０３に送信す

るようにしたが、本発明はこのような形態に限られるものではない。例えば第２の実施形態と組み合わせ、コンテンツデータ２１４の変更時にはコンテンツ自体でなく、その属性情報のみをリクエスト／コンテンツ転送部２０５に送信する。そして、同転送部２０５にてレプリカコンテンツが最新のものであるか否かを判断した上で、レプリカが最新でない場合にのみ、リクエスト／コンテンツ転送部２０５から同コンテンツのリクエスト１１８を発行し、レプリカを更新するようにしてもよい。

（発明の第４の実施の形態）第１，第２及び第３の実施形態では、コンテンツのＵＲＬ及び実体のみについてのレプリケーションについて説明しているが、本実施形態では、コンテンツ毎に設定されているアクセスコントロール情報をレプリカコンテンツと共に保存する場合を説明する。

【０２００】本実施形態の情報中継装置は、アクセスコントロール判断部が設けられ、レプリカコンテンツデータ１１０，２０７にアクセスコントロール情報が保持されるようになっている他、第１～第３の実施形態と同様に構成されている。

【０２０１】ここで、アクセスコントロール情報とは、「Ａというユーザはこのコンテンツを見ることができる」といった内容の情報であり、これによりクライアントノードの利用者毎にアクセスできるコンテンツを制限することができる。

【０２０２】アクセスコントロール判断部は、このアクセスコントロール情報に基づいて、コンテンツアクセス制限を実行する。

【０２０３】このように構成された本実施形態の情報中継装置の動作としては、まず、クライアントからのリクエストデータにユーザ識別名が加わる。

【０２０４】情報中継装置内のレプリカコンテンツデータに登録されたアクセスコントロール情報と、クライアントユーザ識別名とがアクセスコントロール判断部により比較される。その結果、アクセスが許されたユーザにのみレプリカコンテンツが返される。

【０２０５】上述したように、本発明の実施の形態に係る情報中継装置は、コンテンツと共にアクセスコントロール情報を付加して配布するようにしたので、アクセスコントロールが必要なコンテンツに対しても、クライアントから見た時のレスポンスタイムを短縮することができる。

【０２０６】なお、同様な場合、第１～第３の実施形態では、ユーザ毎のアクセスコントロール情報を得るためにはサーバノードに問い合わせる必要がある。

（発明の第５の実施の形態）上記第１～第４の実施形態は、情報中継装置をインターネットのプロキシサーバに適用する例で説明したが、本実施形態ではファイルサーバシステムに適用する場合を説明する。

【０２０７】図２２は本発明の第５の実施形態に係る情報中継装置を適用するファイルサーバシステムの全体構成例を示す図である。

【０２０８】このシステムは、本社３０１に大規模ファイルサーバ３０２が設置され、これが第１～第４の実施形態のサーバノード１１４，２１１に対応する。この大規模ファイルサーバ３０２は、比較的低速なＬＡＮを介して本社３０１内の各部門に設けられた小規模ファイルサーバ３０３，３０４に接続され、また公衆回線を介して各支社の小規模ファイルサーバ３０５，３０６に接続されている。

【０２０９】これらの小規模ファイルサーバ３０３～３０６に情報中継装置１２２，２０３が設けられる。

【０２１０】各小規模ファイルサーバ３０３～３０６は、比較的小規模の容量のファイルサーバであり、高速ＬＡＮでその部門若しくは支社内のクライアントにファイル情報を提供できるようになっている。また、自己が有しない情報を要求された場合には、同情報を大規模ファイルサーバ３０２に請求する。この情報が第１～第４実施形態のコンテンツに相当する。また、ファイル検索情報がＵＲＬに相当する。

【０２１１】また、大規模ファイルサーバ３０２は、全ての情報を格納するものであり、小規模ファイルサーバ３０３～３０６からの要求に応じてデータを送信するようになっている。

【０２１２】このように構成されたファイルサーバシステムでは、クライアント～小規模ファイル～大規模ファイルサーバ間が、第１～第４の実施形態におけるクライアントノード～プロキシサーバノード～サーバノード間と同様な関係となる。

【０２１３】したがって、その部門や支社においてある程度以上の頻度で使用される情報は、容量の少ない小規模データベースに格納され、使用しない情報は小規模データベースから排除されていくことになる。

【０２１４】上述したように、本発明の実施の形態に係る情報中継装置は、第１～第４の実施形態と同様な構成をファイルサーバシステムに設けたので、元のファイルサーバに、セクション毎に設けられた小ファイルサーバが問合せに行くような場合でも、第１～第４の実施形態と同様な効果が得られる。

【０２１５】また、本発明の適用範囲は、インターネットやファイルサーバシステムに限られるものでなく、実施形態に示した状況と類似する状況が生じる計算機・通信システムに対しては種々適用することが可能である。例えばＦＴＰ等にも適用可能である。

【０２１６】さらに、実施形態に説明した装置は、記憶媒体に格納したプログラムをコンピュータに読み込ませることで実現させることができる。

【０２１７】ここで本発明における記憶媒体としては、磁気ディスク、フロッピーディスク、ハードディスク、光ディスク（ＣＤ－ＲＯＭ、ＣＤ－Ｒ、ＤＶＤ等）、光

磁気ディスク（ＭＯ等）、半導体メモリ等、プログラムを記憶でき、かつコンピュータが読み取り可能な記憶媒体であれば、その記憶形式は何れの形態であってもよい。

【０２１８】また、記憶媒体からコンピュータにインストールされたプログラムの指示に基づきコンピュータ上で稼働しているＯＳ（オペレーティングシステム）や、データベース管理ソフト、ネットワークソフト等のＭＷ（ミドルウェア）等が本実施形態を実現するための各処理の一部を実行してもよい。

【０２１９】さらに、本発明における記憶媒体は、コンピュータと独立した媒体に限らず、ＬＡＮやインターネット等により伝送されたプログラムをダウンロードして記憶又は一時記憶した記憶媒体も含まれる。

【０２２０】また、記憶媒体は１つに限らず、複数の媒体から本実施形態における処理が実行される場合も本発明における記憶媒体に含まれ、媒体構成は何らの構成であってもよい。

【０２２１】なお、本発明におけるコンピュータは、記憶媒体に記憶されたプログラムに基づき、本実施形態における各処理を実行するものであって、パソコン等の１つからなる装置、複数の装置がネットワーク接続されたシステム等の何れの構成であってもよい。

【０２２２】また、本発明におけるコンピュータとは、パソコンに限らず、情報処理機器に含まれる演算処理装置、マイコン等も含み、プログラムによって本発明の機能を実現することが可能な機器、装置を総称している。

【０２２３】

【発明の効果】以上詳記したように本発明によれば、オリジナルコンテンツの更新頻度が高く、さらにクライアントから不特定多数のサーバへの情報提供要求が出力される場合において、その平均レスポンスタイムを向上させることができる情報中継装置及び記憶媒体を提供することができる。

【図面の簡単な説明】

【図１】本発明の第１の実施形態に係る情報中継装置を適用したプロキシサーバを含むネットワークシステムの構成例を示すブロック図。

【図２】ＵＲＬと送信元のＩＤの一例を示す図。

【図３】入力情報統計データ及びレプリケーション戦略決定部で使用されるデータの内容例を示す図。

【図４】入力情報統計データの保存形態の一例を示す図。

【図５】レプリケーション戦略知識の内容例を示す図。

【図６】ＵＲＬ別レプリケーション間隔の内容例を示す図。

【図７】レプリカコンテンツＵＲＬの一例を示す図。

【図８】レプリカコンテンツデータの一例を示す図。

【図９】同実施形態におけるリクエスト中継処理を説明する流れ図。

【図１０】同実施形態におけるレプリケーション戦略決定処理を説明する流れ図。

【図１１】同実施形態におけるレプリカ更新処理を説明する流れ図。

【図１２】本発明の第２の実施形態にて使用されるコンテンツ属性情報だけを取得するリクエスト例を示す図。

【図１３】コンテンツ全体を取得するリクエスト例を示す図。

【図１４】同実施形態におけるリクエスト中継処理を説明する流れ図。

【図１５】本発明の第３の実施形態に係る情報中継装置を適用したプロキシサーバを含むネットワークシステムの構成例を示すブロック図。

【図１６】同実施形態におけるレプリケーション対象ＵＲＬのデータ構造例を示す図。

【図１７】同実施形態におけるレプリカコンテンツデータのデータ構造例を示す図。

【図１８】同実施形態におけるリクエスト中継処理を説明する流れ図。

【図１９】同実施形態におけるレプリカ対象登録処理を説明する流れ図。

【図２０】同実施形態におけるレプリカ配信処理を説明する流れ図。

【図２１】同実施形態における登録削除処理を説明する流れ図。

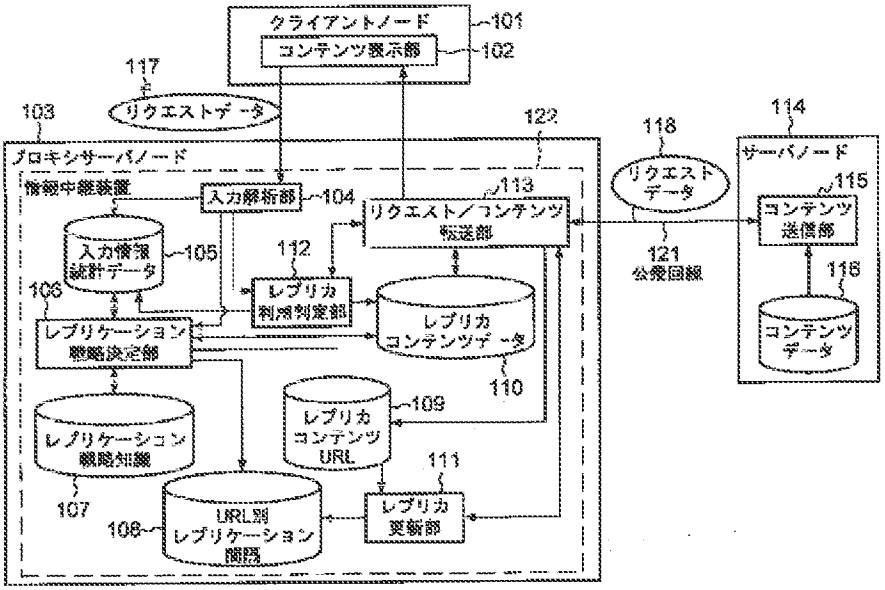
【図２２】本発明の第５の実施形態に係る情報中継装置を適用するファイルサーバシステムの全体構成例を示す図。

【符号の説明】

１０１…クライアントノード
１０３…プロキシサーバノード
１０４…入力解析部
１０５…入力情報統計データ
１０６…レプリケーション戦略決定部
１０７…レプリケーション戦略知識
１０８…ＵＲＬ別レプリケーション間隔
１０９…レプリカコンテンツＵＲＬ
１１０…レプリカコンテンツデータ
１１１…レプリカ更新部
１１２…レプリカ利用判定部
１１３…リクエスト／コンテンツ転送部
１１４…サーバノード
１１５…コンテンツ送信部
１１６…コンテンツデータ
１１７，１１８…コンテンツ取得リクエスト
１２１…公衆回線
１２２…情報中継装置
２０１…クライアントノード
２０２…コンテンツ表示部
２０３…情報中継装置

２０４…レプリカ利用判定部
２０５…リクエスト／コンテンツ転送部
２０６…レプリケーション対象ＵＲＬ
２０７…レプリカコンテンツデータ
２０８…リクエストデータ
２０９…リクエストデータ
２１０…コンテンツデータ
２１１…サーバノード
２１２…コンテンツ送信部
２１３…更新検出部
２１４…コンテンツデータ
２１５…レプリケーション対象ＵＲＬ登録部
２１６…レプリケーション対象ＵＲＬ
２１７…レプリケーション配送先装置名
２２１…レプリケーション戦略知識
２２２…入力情報統計データ
２２３…登録削除判断部
３０１…本社
３０２…大規模ファイルサーバ
３０３，３０４，３０５，３０６…小規模ファイルサーバ

【図１】



【図１６】

URL
http://www/foo.html
http://www2/bar.gif

【図２】

【図３】

URL	http://www.toshiba.co.jp/foo/bar.html
送信元	client1.toshiba.co.jp

【図４】

(1)	(2)	(3)	(4)	(5)
http://www/foo.html	1998/08/07/09:12	35	3	22
http://www2/bar.gif	1998/09/07/08:00	16	7	12

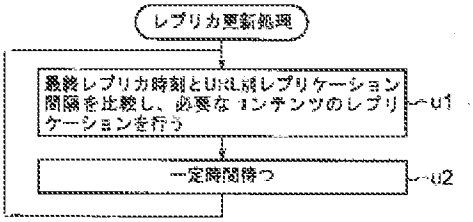
【図１１】

(a) 入力情報統計データ

項目番号	項　目　名	項目の意味
(1)	URL	コンテンツを特定するURL
(2)	最新リクエスト発行時刻	最も最近に当該URLについて発行されたリクエストの発行時刻
(3)	総リクエスト回数	システム管理者が定めた時点から現在までの、当該URLに関する総リクエスト数
(4)	リクエスト発生頻度	単位時間当たりのリクエスト発生回数
(5)	レプリカ使用回数	レプリカが選ばれた数

(b) レプリケーション戦略決定部での計算データ

(6)	レプリカ使用率	リクエスト数に対し、レプリカが選ばれた数の割合 (5)/(3)



【図１２】

項目	内　容
リクエストタイプ	属性情報のみ
URL	http://www.aaa.bbb/foo.html

【図5】

処理	条件	レプリケーション間隔
#1	(最新リクエスト発行時刻（2）>現在時刻の3時間) AND (レプリカ使用率（6）>0.5)	5時間
#2	(最新リクエスト発行時刻（2）>現在時刻の3時間) AND (レプリカ使用率（6）=<0.5)	2時間
#3	(リクエスト発生頻度（4）>5) AND (レプリカ使用率（6）<0.8)	頻度計測単位時間/3
#4	最新リクエスト発行時刻（2）>現在時刻の3日前	レプリケーション終了

【図6】

URL	レプリケーション間隔
http://www/foo.html	5時間
http://www2/bar.gif	1時間

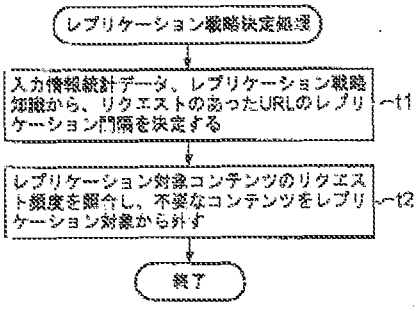
【図7】

URL	最終レプリカ作成時刻
http://www/foo.html	1998/09/07/09:00
http://www2/bar.gif	1998/09/07/09:00

【図8】

URL	レプリカ実体	有効期限
http://www/foo.html	foo.htmlを構成するデータ	1998/09/08/08:10
http://www2/bar.gif	bar.gifを構成するデータ	1998/09/08/09:35

【図10】



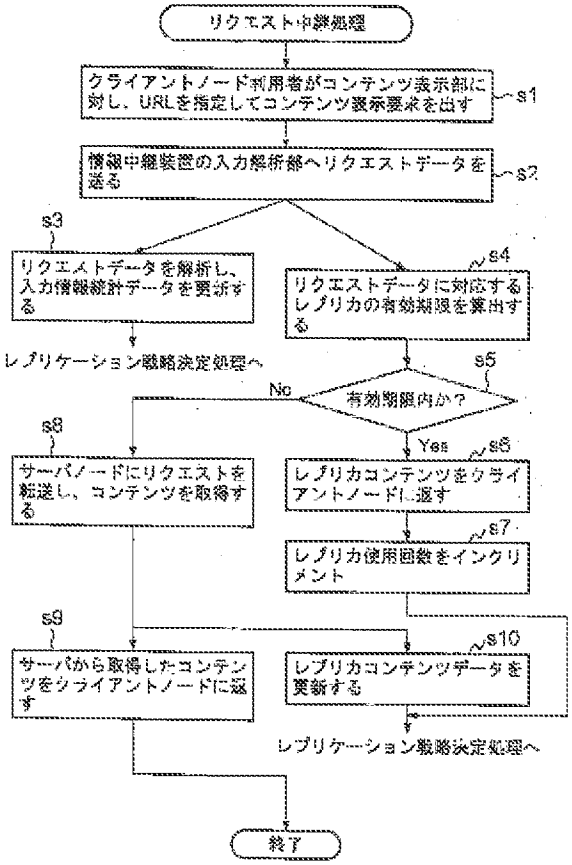
【図13】

項目	内容
リクエストタイプ	全体
URL	http://www.aaa.bbb/foo.html

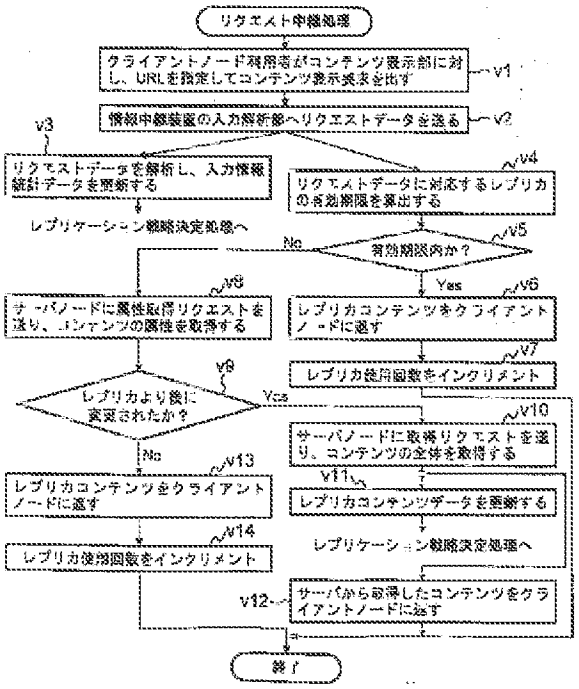
【図17】

URI	レプリカ実体
http://www/foo.html	foo.htmlを構成するデータ
http://www2/bar.gif	bar.gifを構成するデータ

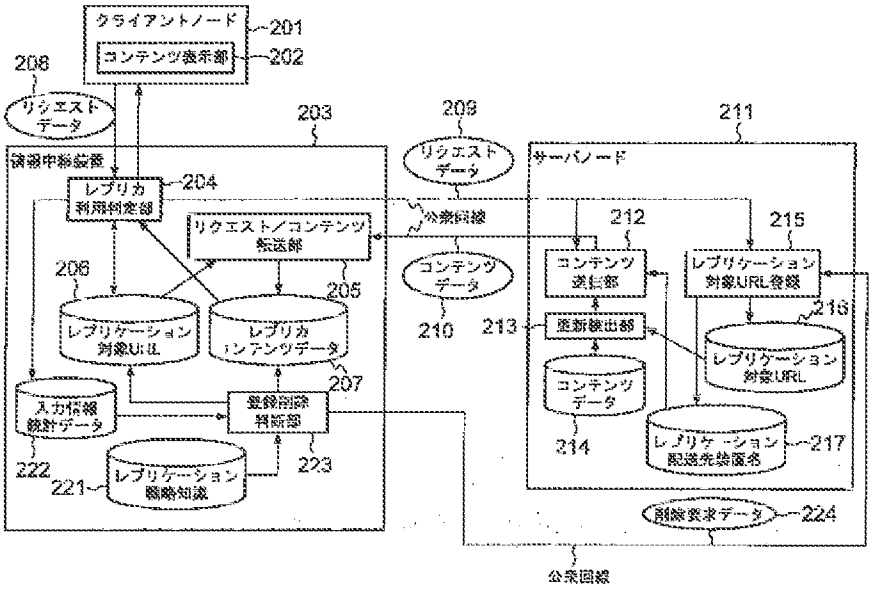
【図９】


リクエスト中継処理
クライアントノード利用者がコンテンツ表示部に対し、URLを指定してコンテンツ表示要求を出す
s1
情報中継装置の入力解析部へリクエストデータを送る
s2
s3
リクエストデータを解析し、入力情報統計データを更新する
s4
リクエストデータに対応するレプリカの有効期限を算出する
レプリケーション戦略決定処理へ
s5
No
有効期限内か？
Yes
s8
サーバノードにリクエストを転送し、コンテンツを取得する
s6
レプリカコンテンツをクライアントノードに返す
s7
レプリカ使用回数をインクリメント
s9
サーバから取得したコンテンツをクライアントノードに返す
s10
レプリカコンテンツデータを更新する
レプリケーション戦略決定処理へ
終了

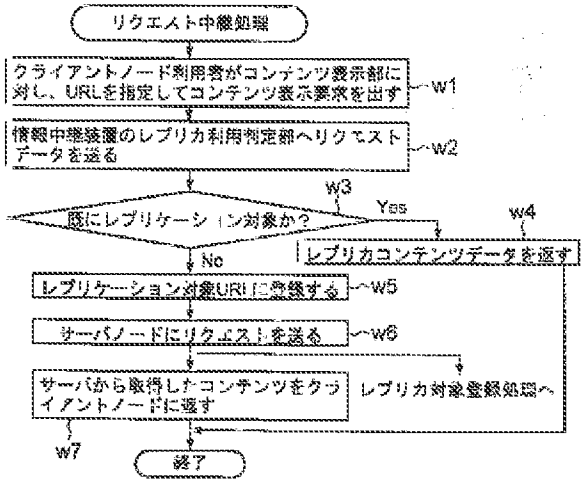
【図１４】


リクエスト中継処理
クライアントノード利用者がコンテンツ表示部に対し、URLを指定してコンテンツ表示要求を出す
V1
情報中継装置の入力解析部へリクエストデータを送る
V2
V3
リクエストデータを解析し、入力情報統計データを更新する
V4
リクエストデータに対応するレプリカの有効期限を算出する
レプリケーション戦略決定処理へ
No
有効期限内か？
V5
Yes
V8
サーバノードに属性取得リクエストを送り、コンテンツの属性を取得する
V6
レプリカコンテンツをクライアントノードに返す
V7
レプリカ使用回数をインクリメント
V9
レプリカより後に変更されたか？
Yes
V10
サーバノードに取得リクエストを送り、コンテンツの全体を取得する
No
V13
レプリカコンテンツをクライアントノードに返す
V11
レプリカコンテンツデータを更新する
レプリケーション戦略決定処理へ
V14
レプリカ使用回数をインクリメント
V12
サーバから取得したコンテンツをクライアントノードに返す
終了

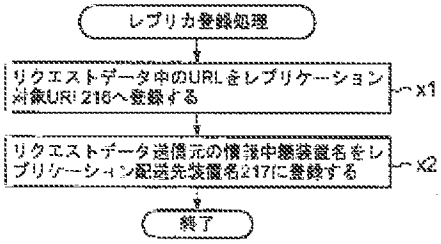
【図１５】


クライアントノード
201
コンテンツ表示部
202
208
リクエストデータ
203
情報中継装置
209
リクエストデータ
211
サーバノード
レプリカ利用判定部
204
公衆回線
212
215
リクエスト/コンテンツ転送部
206
205
コンテンツデータ
210
213
コンテンツ送信部
レプリケーション対象URL登録
レプリケーション対象URL
レプリカコンテンツデータ
207
差分検出部
216
レプリケーション対象URL
入力情報統計データ
登録削除判断部
コンテンツデータ
214
222
221
レプリケーション戦略知識
223
レプリケーション配送先装置名
217
削除要求データ
224
公衆回線

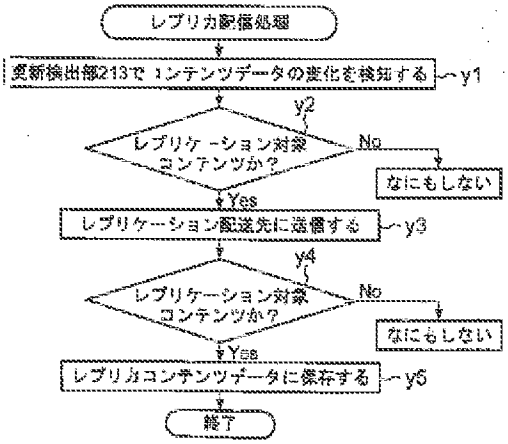
【図18】



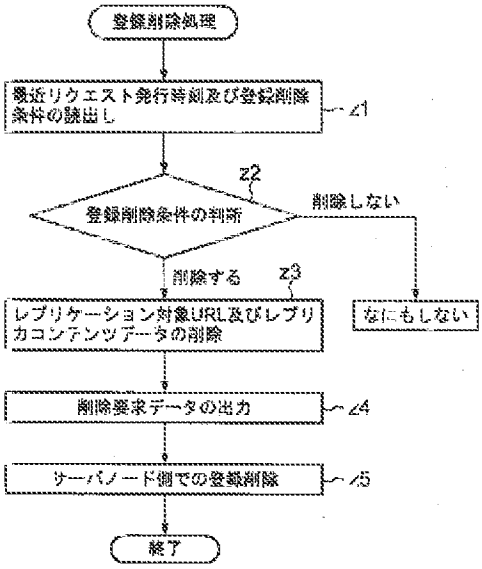
【図19】



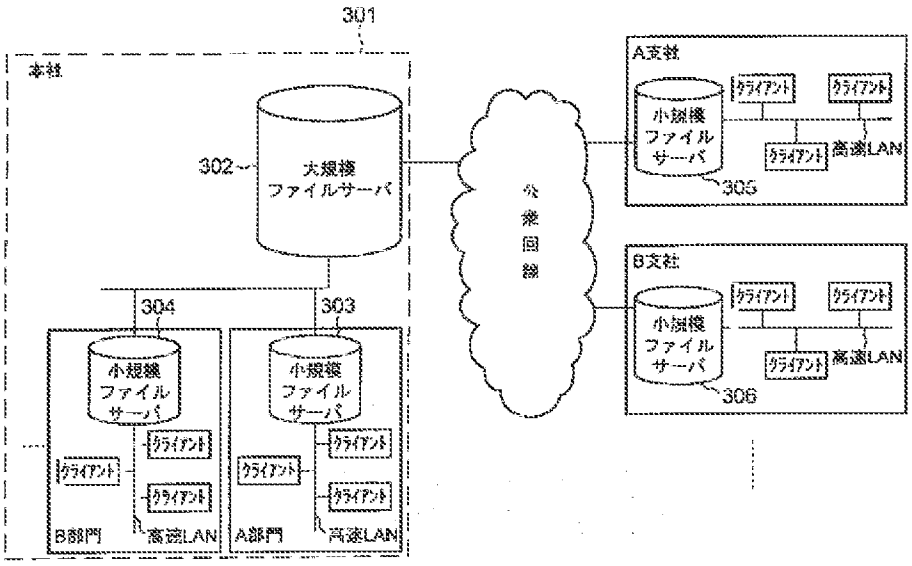
【図20】



【図21】



【図22】



フロントページの続き

Fターム(参考) 5B089 GA19 GA21 HA01 JA22 JB15
KA05 KB06 KD04
5K030 GA03 HA04 HC01 HD01 KA07
LD17 LD20
9A001 JJ04 JJ25 JJ27

JP2000181843A INFORMATION REPEATER AND STORAGE MEDIUM

The EPO does not accept responsibility for the accuracy of data originating from authorities other than the EPO, nor does it guarantee that such data is complete, up-to-date or fit for specific purposes.

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[0001] BACKGROUND OF THE INVENTION 1. Field of the Invention The present invention relates to an information relay device and a storage medium, and more specifically, information generated by a server computer on a network and relaying information exchange between the client computer that refers to the information. The present invention relates to a relay device and a storage medium.

[0002] 2. Description of the Related Art In a distributed computer system represented by WWW (World Wide Web) and FTP (File Transfer Protocol) services, a unique identification character string for specifying a lump of information (hereinafter referred to as content) is in the form of URL. Are associated with each content. Content can be extracted from a server system (hereinafter referred to as a server) by specifying a URL from a client system (hereinafter referred to as a client).

[0003] When using such a system, an information relay device called a proxy server may be interposed between the client and the server. A proxy server has several functions, one of which is a caching function.

[0004] By using this caching function, the content once referred by the client is stored in the cache area when passing through the proxy server. With this data cache, when the client requests to view the contents again, the network data transfer between the proxy server and the server can be omitted to return the data in the cache, and the client's request can be answered at high speed. be able to.

[0005] The operation of a general caching proxy server currently implemented is as follows. Here, an example of WWW is shown.

[0006] 1. In response to a display request from the client, the cache area is examined.

[0007] 2. If there is a copy of the content requested by the client in the cache area, it is returned if the copy is within the expiration date. The expiration date is sent together when the content is acquired from the server.

[0008] 3. When the expiration date has passed, in order to check whether it is the latest one, the last update date and time of the content is inquired to the WWW server where the original is placed.

[0009] 4). If the original last update date matches the update date of the copy, the contents in the cache are returned to the client.

[0010] 5). If the original last update date is newer than the cache, the original content is downloaded again, returned to the client, and the cache is updated.

[0011] Hereinafter, the situation 2 or 4 is expressed as "cache hit".

[0012] Here, the conditions for hitting the cache in response to the information provision request from the client are summarized as follows.

[0013] The content of the requested URL exists in the cache (hereinafter referred to as existence).

[0014] The content in the cache is the same as the server (hereinafter referred to as the latest).

[0015] Due to the nature of these conditions, the cache hits only when both existence and freshness conditions are satisfied in the replicated data on the cache.

[0016] On the other hand, in a database replication system or technology called push technology, changes are notified to the client that has a copy of the previously set content when the content on the server is updated. Changed to

[0017] By using the push technology for the cache management of the proxy server, the contents of the URL set in advance are always held in the cache area. For this reason, the cache hit probability with respect to the request from the client is higher than that of a general proxy server, and the average response time viewed from the client is shortened. This effect becomes significant when content on the server is updated frequently.

[0018] Strictly speaking, it cannot be said to be a push technique, but there is a technique called an intelligent pull in what is generally called a push technique. While the push technology described above actively sends content from the server side, this intelligent pull tries to achieve the same state as when using the push technology apparently by acquiring content periodically from the client side. To do.

[0019] As an example of applying this intelligent pull technology to a proxy server, there is Castanet of Marimba, USA.

[0020] Marimba's Castanet consists of a transmitter with a server function and a tuner with a client function. The tuner periodically checks whether the content of the URL set in advance on the tuner has been updated on the transmitter, downloads the updated content, and updates the duplicate file on the tuner.

[0021] When there is a content reference request from the user, the duplicate content on the tuner is displayed. Therefore, when the tuner is used as a proxy server for a WWW browser, a high-speed response can be realized. In this case, if the reference request from the WWW browser is a content cached on the tuner, a copy is returned. Otherwise, the content is downloaded from the original server.

[0022] Since the content cached in the tuner is regularly updated to the latest state, the probability that the cache is up-to-date is higher than when a general proxy server is used.

[0023] In Japanese Patent Laid-Open No. 10-21134, two proxy processes are prepared, the first proxy process has a normal proxy function, and the second proxy is the first proxy. A technique is described in which URLs described in an access log to be generated are sequentially read from an original in a Web server and stored in a cache. In other words, if the target content that the client is trying to acquire is not found in the proxy cache, or if it is found and the expiration date has expired, the original can be read and the target content can be found within the expiration date. If it does, return it to the client as it is.

[0024] However, when the caching function of the above-described caching proxy server is used, the caching function of the caching proxy server is effective when the content update frequency of the original content placed on the server is low. work. However, when the update frequency of the original content is high, there is a problem that the probability that the cache is up-to-date becomes low, so that the cache hit rate is lowered and the proxy server is less effective for caching.

[0025] In addition, when the above push technology or intelligent pull technology is used, only a preset content can be copied. Accordingly, there is a problem that the probability that the existence of the cache is established is lowered in a system where the original content is unspecified such as WWW, and the hit rate is lowered. If the presence is improved by setting a sufficiently large amount of content in advance as a push target, a problem arises that the required cache size becomes too large, which is not realistic.

[0026] Further, in the technology described in Japanese Patent Laid-Open No. 10-21134, the content is cached based on the access log when the first proxy access log increases, so unless there is a request from the client, the cache is cached. In some cases, the client cannot obtain new content even if the original content is changed within the expiration date.

[0027] The present invention has been made in consideration of such circumstances, and when the update frequency of the original content is high, and when an information provision request is output from a client to an unspecified number of servers, the average response time is calculated. An object of the present invention is to provide an information relay device and a storage medium that can be improved.

[0028] In order to solve the above problems, the invention corresponding to claim 1 is arranged on a network connecting a server computer as an information provider and a client computer as an information user. This is an information relay apparatus having a relay function for transferring a data provision request from a client computer to a server computer and transferring provided data from the server computer to the client computer.

[0029] In this information relay apparatus, the requested data is replicated and held by the replication means asynchronously with the data provision request for the data on the server computer that has been requested to provide data in the past by the client computer.

[0030] Further, when a data provision request is made from the client computer, the duplicate data held by the replication means is returned to the client computer by the duplicate return means.

[0031] In the present invention, since the replication update is performed asynchronously with the data provision request as described above, even when the update frequency of the original content is high, it is possible to appropriately return the copy and is requested in the past. Since the data is copied, the average response time can be improved when an information provision request is output from a client to an unspecified number of servers.

[0032] Next, in the invention corresponding to claim 2, in the invention corresponding to claim 1, the replication means updates the replicated data to the latest state at a set time interval.

[0033] Therefore, the duplicated data can be returned more efficiently.

[0034] Next, an invention corresponding to claim 3 is the invention corresponding to claim 2, further comprising a replication interval determining means, wherein each update time interval for a plurality of replicated data is set to each data by the interval determining means. Is changed based on the frequency of data provision requests from client computers.

[0035] Therefore, appropriate replication update can be performed according to the data request frequency.

[0036] Next, in the invention corresponding to claim 4, in the invention corresponding to claim 2 or 3, the update interval determination means determines that each update time interval for a plurality of replicated data is on the server computer for each data. Changed based on data change frequency.

[0037] Therefore, it is possible to perform replication update considering not only the client request but also the situation on the server side.

[0038] Next, in the invention corresponding to claim 5, in the invention corresponding to claims 1 to 4, when the replica use determining means receives a data provision request, the replicated data held by the replication means is within the expiration date. Whether it is a thing or not is judged.

[0039] If the replica usage determining means determines that the replicated data is out of the valid period, the replication means inquires the server computer about the attribute information of the data corresponding to the replicated data. When it is determined that the data has been updated on the computer, the data is acquired again from the server computer and the acquired data is delivered to the relay function.

[0040] Therefore, when data on the server side is not actually changed, it is possible to prevent redundant data transmission between the server and the relay device, and efficient data transfer can be performed.

[0041] Next, in the invention corresponding to claim 6, in the invention corresponding to claim 1, when a change occurs in the data to be provided, the server computer provides the data provided by registering the data provided and registered This is applied to the information relay apparatus when the updated data is transmitted to the target. The server computer uses, for example, push technology.

[0042] In this case, when receiving a data provision request for data that does not hold replicated data from the client computer, the replication means registers the requested data in the server computer to provide the data.

[0043] Therefore, the same effect as that of the first aspect of the invention can be achieved by encouraging the server computer using the push technology or the like to register the push target data from the information relay apparatus.

[0044] Next, in the invention corresponding to claim 7, in the invention corresponding to claim 1, access restriction information for the duplicate data is acquired and held by the replication means together with the duplicate data.

[0045] Further, the duplicate return means returns the duplicate data only to the data provision request from the client permitted to access based on the access restriction information.

[0046] Therefore, it is possible to return data only to clients having access authority.

[0047] Next, an invention corresponding to claim 8 is a recording medium on which a program for causing a computer to realize the invention corresponding to claim 1 is recorded.

[0048] The computer controlled by the program read from the recording medium functions as the information relay device of claim 1.

[0049] Next, an invention corresponding to claim 9 is a recording medium on which a program for causing a computer to realize the invention corresponding to claim 2 is recorded.

[0050] The computer controlled by the program read from the recording medium functions as the information relay device according to claim 2.

[0051] Next, an invention corresponding to claim 10 is a recording medium on which a program for causing a computer to realize the invention corresponding to claim 6 is recorded.

[0052] A computer controlled by the program read from the recording medium functions as an information relay apparatus according to claim 6.

[0053] DESCRIPTION OF THE PREFERRED EMBODIMENTS Embodiments of the present invention will be described below. (First Embodiment of the Invention) FIG. 1 is a block diagram showing a configuration example of a network system including a proxy server to which an information relay apparatus according to a first embodiment of the present invention is applied.

[0054] This network system is the Internet in which a large number of server nodes 114 and client nodes 101 are connected via a public line 121. Further, the client node 101 is connected to the public line 121 via the proxy server node 103, and makes a content request for the server node 114 to the proxy server 103. The proxy server node 103 incorporates the information relay device 122 of this embodiment.

[0055] In the present embodiment, the case where the nodes 101, 103, and 114 are connected will be described. However, the presence of a network is not an essential requirement of the invention. For example, the client node 101 and the information relay apparatus are in the same computer. It can also exist as a software process.

[0056] Although only one node 101, 103, 114 is shown in FIG. 1, the client node 101 and the server node 114 may include a plurality of devices having the same configuration. Further, each of the nodes 101, 103, 114 comprises a computer system having a communication function, and constitutes various function realizing means shown in FIG. 1 from its hardware resources such as CPU and memory and software resources such as a control program. To do. In FIG. 1, various data necessary for realizing the functions are shown, but these are stored in a storage means (not shown) such as a memory or a hard disk in each computer (not shown).

[0057] The configuration of each element will be described below.

[0058] The client node 101 is provided with a content display unit 102 having an information display function such as a WWW browser. The content display unit 102 outputs a content acquisition request 117 from the client to the server, and displays the content sent from the server.

[0059] Next, the server node 114 includes a content transmission unit 115 and content data 116 having an information transmission function such as a WWW server.

[0060] The content transmission unit 115 receives the request 117 or 118 from the client or the proxy server 103 and transmits the corresponding content.

[0061] The content data 116 is a set of content transmitted from the content transmission unit 115 in response to a request 117 or 118 from a client or an information relay device, and is stored in a storage unit (not shown). In addition, one content is expressed by a set of an ID for identifying individual content (URL in the case of

WWW) and a content content entity. In the following description, a case where the ID is a URL will be described.

[0062] FIG. 2 is a diagram illustrating an example of a URL and a transmission source ID.

[0063] The information shown in the figure is an example of the identification information included in the request data 117 and 118 for specifying the content that the client node 101 wants to acquire.

[0064] Next, the proxy server node 103 is a server that performs communication with the Internet as a proxy for the client node 101. In the present embodiment, the information relay device 122 is provided therein.

[0065] The information relay device 122 holds the input information statistical data 105, the replication strategy knowledge 107, the replica content URL 109, the URL-specific replication interval 108, and the replica content data 110. Further, based on these data and request data 117, an input analysis unit 104, a replication strategy determination unit 107, a replica usage determination unit 112, a request / content transfer unit 113, and a replica update unit 111 that execute predetermined processing are provided. Yes.

[0066] First, the input analysis unit 104 analyzes the request 117 sent from the client and creates the input information statistical data 105. Further, all the request information is sent to the replica use determination unit 112.

[0067] The input information statistical data 105 is obtained by storing past request analysis information or the like in a storage unit (not shown). For example, the statistical information of the request is held in the form shown in FIG. 4 for the item of FIG.

[0068] FIG. 3 is a diagram showing an example of contents of input information statistical data and data used in the replication strategy determination unit.

[0069] FIG. 4 is a diagram showing an example of a storage form of input information statistical data.

[0070] Of the items shown in FIG. 3A, the input analysis unit 104 received URL (1), latest request issue time (2), total request count (3), and request occurrence frequency (4). Based on the request 117, it is analyzed or calculated and updated. The replica usage count (5) is incremented when the replica is used by the replica usage determining unit 112 described later.

[0071] The replication strategy determination unit 106 uses the input information statistical data 105 based on the replication strategy knowledge 107 to determine which content is to be replicated and at what interval the replica is updated to the latest state. The result is output to the URL-specific replication interval 108. Here, the replication strategy knowledge 107 is knowledge data used by the replication strategy determination unit 106, and holds knowledge in the form shown in FIG. 5, for example.

[0072] FIG. 5 is a diagram showing an example of the contents of the replication strategy knowledge.

[0073] Corresponding to each example of the replication strategy knowledge 107 shown in the figure, what kind of replication interval determination the replication strategy determination unit 106 determines is as follows.

[0074] The replication strategy determination unit 106 checks whether or not the replica corresponding to each URL satisfies any of the processing conditions # 1 to # 4 shown in FIG. The specified replication interval is output to the URL-specific replication interval 108. In the case of replication registration deletion, the corresponding URL is deleted from the replica content URL 109.

[0075] Further, prior to the replication strategy determination process, the replication strategy determination unit 106 calculates the replica usage rate (6) shown in FIG. 3B, and holds this during the strategy determination process.

[0076] Now, in the process # 1 in FIG. 5, when the latest request issue time (2) is before 3 hours from the current time and the replica usage rate (6) is larger than 0.5, the URL The replication interval is set to 5 hours. The reason for setting the interval of 5 hours, which is a relatively long time under this condition, is that the replica held by the information relay device 122 is used as it is with a high probability for the request frequency.

This is because the change frequency can be expected to be relatively low. In other words, in this case, the request frequency is relatively higher than the content change frequency.

[0077] In the process # 2 in FIG. 5, when the latest request issue time (2) is before 3 hours from the current time and the replica usage rate (6) is 0.5 or less, replication for the URL is performed. The interval is 2 hours. The reason for setting the interval as 2 hours, which is a relatively short time under this condition, is that the usage rate of the replica held by the information relay device 122 is low for the request frequency, and the frequency of change of the corresponding content in the server node 114 is relative This is because it can be expected to be very high. In other words, in this case, the request frequency is relatively low compared to the content change frequency.

[0078] In process # 3 in FIG. 5, when the request occurrence frequency (4) per unit time is larger than 5 and the replica usage rate (6) is smaller than 0.8, the replication interval for the URL is frequency-measured. One third of the unit time. In this method, the replication interval is not set by mere time, but is defined in correspondence with concepts such as request occurrence frequency and replica usage rate. Further, the case of the process # 3 corresponds to the case where the request request is high and the content change frequency on the server side is high.

[0079] Process # 4 in FIG. 5 ends replication when there is no request for three days or more from the current time. In this case, replication registration deletion is performed, and the replication strategy determination unit 106 deletes the relevant information about the URL from the replica content URL 109, the URL-specific replication interval 108, and the replica content data 110.

[0080] The replication strategy knowledge 107 shown in FIG. 5 is an example of various possible strategy knowledge, and other strategy knowledge can be applied. For example, a condition "whether or not the content is not fixed" is added to the process # 4, and "replication end" may be set only when both of these conditions are satisfied. In this case, the replication is registered and deleted only when the content is not requested for 3 days and the content is not a request that the client requests in a fixed manner.

[0081] The URL-by-URL replication interval 108 holds the replication interval data for each URL determined by the replication strategy determination unit 106. For example, the replication interval value for each URL is held in the form shown in FIG.

[0082] FIG. 6 is a diagram showing an example of the content of the URL-specific replication interval.

[0083] The replica content URL 109 holds a URL list of content to be replicated determined by the replication strategy determination unit 106. For example, the URL of the content to be replicated is held in the form as shown in FIG.

[0084] FIG. 7 is a diagram showing an example of the replica content URL.

[0085] The replica content data 110 holds the replica entity of the content corresponding to the URL listed in the replica content URL 109. For example, the replica content entity is held in the form shown in FIG.

[0086] FIG. 8 shows an example of replica content data.

[0087] The replica update unit 111 requests content from the server node via the request / content transfer unit 113 so as to update the replica content data 110 for each URL at the interval described in the URL-by-URL replication interval 108.

[0088] The replica usage determining unit 112 compares the time included in the request data 117 with the expiration date or update time of the content entity corresponding to the request in the replica content data 110, and returns a replica to the client node 101 or a server It is determined whether data is newly acquired from the node 114 and returned. If it is determined to return the replica to the client node 101, the replica usage count in the input information statistical data 105 is incremented for the corresponding URL.

[0089] The request / content transfer unit 113 sends a content acquisition request 118 to the server node 114 based on the determination result of the replica use determination unit 112 and returns the content data returned from the server node 114 to the client node 101. When the replica usage determining unit 112 determines to return the replica, the replica is returned to the client node 101.

[0090] Further, the request / content transfer unit 113 stores the content data acquired from the server node 114 in the replica content data 110 and the replica content URL 109. Therefore, the request / content transfer unit 113 not only updates the replica but also stores the newly requested content and holds the URL.

[0091] The replication means in the claims corresponds to, for example, the replica update unit 111, the replication interval by URL 108, the replica content data 110, the replica content URL 109, the request / content transfer unit 113, etc. 112, the request / content transfer unit 113, and the like.

[0092] Next, the operation of the information relay apparatus according to this embodiment configured as described above will be described with reference to FIGS.

[0093] FIG. 9 is a flowchart for explaining request relay processing in the present embodiment.

[0094] FIG. 10 is a flowchart for explaining the replication strategy determination processing in this embodiment.

[0095] FIG. 11 is a flowchart for explaining replica update processing in this embodiment.

[0096] Among these processes, the request relay process, the replication strategy determination process, and the replica update process are asynchronous operations that proceed independently.

[0097] First, the request relay process will be described.

[0098] As shown in FIG. 9, this request relay process is a process mainly performed in the information relay apparatus 122 when the request data 117 is issued from the client node 101.

[0099] First, when a user designates a URL for the content display unit 102, a content display request is output from the client node 101 (S1).

[0100] The display request issued from the user is transmitted from the content display unit 102 to the input analysis unit 104 of the information relay device 122 in the form of request data 117 (S2).

[0101] The contents of the request data 117 are analyzed by the input analysis unit 104, and the contents (1) to (4) of the input information statistical data 105 are updated based on the information on the time when the request is received (S3). After updating the input information statistical data (S3), the process proceeds to a replication strategy determination process described later.

[0102] On the other hand, the replica usage determination unit 112 calculates the expiration date of the replica content of the URL stored in the replica content data 110 based on the request received via the input analysis unit 104 in response to the process of step S2. (S4).

[0103] Here, various methods can be used as the expiration date calculation method. For example, when content is transmitted from the server node 114, an expiration time is attached or a last modification time is attached, so a method of calculating from the value is adopted.

[0104] Next, when the replica content corresponding to the request is within the expiration date (S5), the corresponding replica content is read from the replica content data 113. This read content is returned from the request / content transfer unit 113 to the client node 101 (S6).

[0105] Further, the replica usage determination unit 112 increments the replica usage count (5) in the input information statistical data 106 by "1" (S7), and the replication strategy determination process is performed.

[0106] If the replica content corresponding to the request has expired, or if the request is for a content that has not been replicated (S5), the request / content transfer unit is based on the server node name included in the request data 117. The request data 118 is transferred from the server 113 to the server node 114. The server node 114 returns the content specified by the request data 118 to the information relay apparatus 103 (S8).

[0107] The content returned from the server node 114 is transferred from the request / content transfer unit 113 of the information relay apparatus 122 to the client node 101 (S9), and the contents of the replica content data

110 are processed by the request / content transfer unit 113. Is updated with the same content (S10). In the case of content that has not been replicated, data (content, URL) is retained as a new replication target, and is subsequently replicated.

[0108] Note that after the content of the replica content data 110 is updated (S10), the process proceeds to the replication strategy determination.

[0109] Next, the flow of replication strategy determination processing will be described. The replication strategy determination process starts in response to the request relay process shown in FIG. 9; S3, S7, or S10.

[0110] First, after step S3 or S7, S10 of FIG. 9, the replication strategy determination unit 106 generates a URL-based replication interval 108 based on the input information statistical data 105 and the replication strategy knowledge 107 (t1).

[0111] Specifically, for example, in the case of input information statistical data as shown in FIG. 4 and replication strategy knowledge as shown in FIG. 5, the replication interval is determined as follows.

[0112] First, the input information statistical data of the URL specified by the request data 117 is extracted. For example, the request data is http: // www / foo. When html is designated, the information on the first line in FIG. 4 is extracted.

[0113] Next, the replica usage rate (6) is calculated by the replication strategy determination unit 106, and knowledge having a condition matching the extracted input information statistical data is searched from the replication strategy knowledge 107. For example, if the current time is 1998/09/07/10: 00: 00, searching for the data on the first line in FIG. 4 matches the knowledge on the first line in FIG.

[0114] Next, the replication interval described in the found knowledge is set as the replication interval of the URL, and the replication interval 108 for each URL is updated by the replication strategy determination unit 106.

[0115] The above is the case where a new replication interval is set. The cases corresponding to other processes are as described above.

[0116] On the other hand, when the replication interval described in the found knowledge indicates the end of replication, the replication strategy determination unit 106 determines that the URL and the corresponding replica content data are the URL-specific replication interval 108, replica It is deleted from each data of the content URL 109 and the replica content data 110 (t2).

[0117] As another method for ending replication, when the replica content data 110 becomes larger than a predetermined size, the content priority information (not shown) is referred to and the content with low necessity is replicated. You may make it exclude from object. For example, the latest request issue time is used as the priority information. Also, the user may set the priority separately. Further, in this case, replica content or the like may be deleted by using a replica deletion function of the proxy server node 103 that deletes a replica having a low priority.

[0118] In this embodiment, the rule-based replication interval determination method has been described. However, the form of the input information statistical data and the replication strategy knowledge is not limited to this, and the replication interval value obtained by multivariate analysis of the input information statistical data. Calculation etc. can also be considered.

[0119] Next, the flow of replica update processing will be described. The replica update process operates asynchronously with the request relay process and the replication strategy determination process.

[0120] First, the replica update unit 111 compares the last replica creation time stored in the replica content URL 109 with the replication interval stored in the replication interval by URL 108. As a result, if there is a URL whose current time is more than the replication interval from the last replica creation time, the replica update unit 111 requests the request / content transfer unit 113 to download the content from the server node 114. Is done.

[0121] The content is downloaded by the request / content transfer unit 113, the replica content data 110 is replaced with the download data, and the replica is updated (u1).

[0122] After replica update, the replica update unit 111 stops for a certain period of time, and then the process of step u1 is repeated (u2).

[0123] As described above, the information relay apparatus according to the embodiment of the present invention includes the replica update unit 111, and executes the replication process asynchronously with the request relay process to update the replica content in advance. The probability that the replica content data in the information relay apparatus is kept up-to-date can be increased, and the hit rate for the client request can be improved.

[0124] In addition, since the replication strategy determining unit 106 is provided to increase or decrease the content to be replicated according to the frequency of requests, the content with high client request frequency can be replicated to the replica storage area with a limited capacity. Thus, the hit rate for an unspecified content acquisition request from the client can be improved.

[0125] Further, in the conventional Push platform (Castanet, etc.), only the preset content is subject to Push, and it is not possible to flexibly cope with changes in requests on the client side, but in the present invention, it was not included in the replica content data 110 Since the content is automatically Pushed thereafter, flexible caching processing (replication) can be realized.

[0126] Further, with the conventional Push platform, it is necessary to manually remove all unnecessary contents from the Push target so that the cache area is not insufficient. On the other hand, in the present invention, the cache area (replica content data 110) does not overflow because it is automatically excluded from Push based on the priority set for each content. (Second Embodiment of the Invention) In the first embodiment, when the replica usage determining unit 112 determines that the replica has expired, the request 117 is unconditionally sent to the server node 114. It was transferred as request 118.

[0127] On the other hand, in the present embodiment, by checking whether or not the replica content is the same as the original content on the server node, useless content download from the server node 114 is eliminated.

[0128] The information relay apparatus of this embodiment is configured in the same manner as in the first embodiment except that the processing of the request / content transfer unit 113 is modified.

[0129] The request / content transfer unit 113 is configured in the same manner as in the first embodiment. When downloading content from the server node 114, the request / content transfer unit 113 first acquires only the content attribute information, The entire content is acquired only when it is not up-to-date.

[0130] As the contents of the request data 118 for this purpose, two types are prepared as shown in FIG8.

[0131] FIG. 12 is a diagram showing an example of a request for acquiring only the content attribute information used in the second embodiment of the present invention.

[0132] The request in FIG. 6 indicates that the request type is "attribute information only" and the URL is "http: //www.aaa.bbb/foo.html".

[0133] Here, at least "content last modification time (creation time in the case of new content)" is included as content attribute information.

[0134] FIG. 13 is a diagram illustrating an example of a request for acquiring the entire content.

[0135] The request in FIG. 6 indicates that the request type is "whole content" and the URL is "http: //www.aaa.bbb/foo.html".

[0136] Further, the request / content transfer unit 113 adds the original content change frequency information to the input information statistical data 105. This information is obtained by the following equation, for example.

[0137] Change frequency information = total content acquisition request count ÷ content attribute acquisition request count replication strategy knowledge 107 can include the change frequency of the original content as a

condition. For example, if the change frequency of the original content is within a predetermined value range, the replication interval is set to a certain value.

[0138] Next, the operation of the information relay apparatus according to this embodiment configured as described above will be described with reference to FIG.

[0139] FIG. 14 is a flowchart for explaining request relay processing in this embodiment.

[0140] In the operation of the present embodiment, the request relay process is changed as compared with the first embodiment.

[0141] First, when the replica content is within the expiration date, processing similar to that in the first embodiment is executed (v1 to v7). That is, since steps S1 to S7 and steps v1 to v7 shown in FIG. 9 are the same, description thereof is omitted.

[0142] Next, when it is determined that the replica has expired (v5), the request / content transfer unit 118 transmits a content attribute acquisition request 118 to the server node 114 to acquire attribute information of the content (v8).

[0143] The request / content transfer unit 113 compares the last modification time included in the acquired attribute information with the last replica creation time of the corresponding replica, and determines whether the original content is newer than the replica (v9).

[0144] When it is determined that the original content is newer than the replica (v9), the entire content is acquired from the server (v10), the replica content data 110 is updated (v11), and the input information statistical data regarding the URL is changed. .

[0145] Further, after the entire content is acquired (v10), the content is returned to the client node (v12).

[0146] On the other hand, if the last replica creation time is later than the last modification time of the original content in step v9, it is determined that the replica is the same as the latest original content, and the replica content is returned to the client node 101 (v13). Thereafter, the number of times the replica is used is incremented (v14).

[0147] As described above, the information relay apparatus according to the embodiment of the present invention checks whether or not the replica content is the same as the original content on the server node. Downloads can be eliminated, and the response time for content that does not change even after the expiration date can be shortened.

[0148] In addition, since it is possible to adjust the replication interval based on the update frequency of the original content, it is possible to appropriately set the replica update interval of the content for which the expiration date is not explicitly set in a probabilistic sense, A situation in which the entire content must be acquired during the request relay process is less likely to occur.

[0149] In this embodiment, the attribute information advance request has been described only when the request 117 is received from the client node 101. However, this attribute information advance request is applicable not only to request relay processing but also to replica update processing. You may do it. In this case, when the replica update unit 111 determines that the replica should be updated, a prior request for attribute information is made and the content is downloaded only when the content is changed. (Third Embodiment of the Invention) In the first and second embodiments, a technique called an intelligent pull is applied. In this embodiment, a push technique is used. In connection with the use of this push technology, a multicast technology is used in the communication path between the request / content transfer unit and the content transmission unit, thereby actively transmitting data from the server node to a plurality of information relay apparatuses. Be able to.

[0150] FIG. 15 is a block diagram showing a configuration example of a network system including a proxy server to which the information relay apparatus according to the third embodiment of the present invention is applied. Note that the information relay apparatus 203 shown in the figure is included in the proxy server, but since the relationship between them is the same as in the first embodiment, the display of the proxy server is omitted here.

[0151] The network itself used in the present embodiment, the relationship between the client node 201, the proxy server node, and the server node 211, and the basic functions of these units are the same as those of the nodes 101, 103, and 114 of the first embodiment. Since it is the same as the case, detailed description is omitted here.

[0152] First, the client node 201 has the same configuration as the client node 101. Request data 208 sent from the client node is also the same as request data 117.

[0153] The information relay device 203 holds the replication target URL 206, replica content data 207, replication strategy knowledge 221 and input information statistical data 222 in storage means (not shown). In addition, a replica use determination unit 204, a request / content transfer unit 205, and a registration deletion determination unit 223 that execute predetermined processing based on these data and request data 208 are provided.

[0154] First, the replica usage determining unit 204 returns the content from the replica content data 207 to the client node if the content of the URL included in the request data 208 exists in the replication target URL 206, and returns the content to the replication target URL 206 otherwise. The URL is added, and a request 209 for registering as new replication target content is sent to the server node 211.

[0155] Further, the replica usage determining unit 204 holds the latest request issue time as the input information statistical data 222 for each URL based on the request data 208.

[0156] The request / content transfer unit 205 records, in the replica content data 207, only the content of the URL registered in the replication target URL 206 among the content data 210 sent from the server node 211.

[0157] The replication target URL 206 is a data area for recording the URL of content to be replicated by the information relay apparatus 203. For example, it has a data structure shown in FIG.

[0158] FIG. 16 is a diagram showing an example of the data structure of the replicaton target URL in this embodiment.

[0159] The replica content data 207 is a data area for recording replica content. For example, it has a data structure shown in FIG.

[0160] FIG. 17 is a diagram showing an example of the data structure of replica content data in this embodiment.

[0161] The replication strategy knowledge 221 is data indicating conditions for deleting the replica content in the replica content data 207. This condition is "the latest request is generated 3 days before the current time", "the latest request is generated 3 days before the current time AND the URL is not fixed content", or the like.

[0162] The registration deletion determination unit 223 determines the URL to be registered and deleted from the latest request issue time of the input information statistical data 222 and the registration deletion condition of the replication strategy knowledge 221. When it is determined that a certain replica content should be registered and deleted, the determination unit 223 deletes the corresponding data from the replication target URL 206 and the replica content data 207 and transmits the registration deletion data to the server node 211.

[0163] On the other hand, the server node 211 holds the content data 214, the replication target URL 216, and the replication delivery destination device name 217 in a storage unit (not shown), and performs a certain process related to these data. , An update detection unit 213 and a replication target URL registration unit 215.

[0164] The replication target URL registration unit 215 registers the URL included in the request data 209 in the replication target URL 216 and registers the information relay apparatus name of the transmission source of the request data 209 in the replication delivery destination apparatus name 217.

[0165] When the replication target URL registration unit 215 receives the deletion request data 224 from the registration deletion determination unit 223 of the information relay apparatus 203, the replication target URL registration unit 215 deletes the URL included in the data 224 from the replication target URL 216, and replicates the corresponding data. Delete from the destination device name 217.

[0166] The replication target URL 216 is a URL list of contents transmitted from the server node 211 to the information relay apparatus 203 for replication. When request data 209 is received from a plurality of information relay apparatuses 203, each information relay apparatus is recorded without distinction. For example, it has the form of FIG. 16 similar to the replication target URL 206 of the information relay apparatus.

[0167] The content data 214 is a set of content data that the server node 211 has original data.

[0168] The update detection unit 213 detects a change in the content data 214, and if the change is included in the replication target URL 216, sends the URL and the content data entity to the content transmission unit 212.

[0169] As a method for detecting a change in content data in the update detection unit 213, for example, the following several methods are conceivable.

[0170] A. The last update time of all contents is confirmed every fixed time, and the content that has been updated after the last confirmation time is found.

[0171] B. The update detection unit 213 is notified from the tool used when changing the content when the changed content is recorded in the content data 214.

[0172] C. When the OS or hardware has a function of detecting a data change on the storage device, the update detection unit 213 is notified when the data change is detected.

[0173] The content transmission unit 212 transmits the URL and content pair sent from the update detection unit 213 to all the information relay devices 203 registered in the replication delivery destination device name 217.

[0174] Next, the operation of the information relay apparatus according to the present embodiment configured as described above will be described with reference to FIGS. 18, 19, 20 and 21. FIG.

[0175] FIG. 18 is a flowchart for explaining request relay processing in this embodiment.

[0176] FIG. 19 is a flowchart for explaining replica target registration processing in the present embodiment.

[0177] FIG. 20 is a flowchart for explaining replica distribution processing in this embodiment.

[0178] FIG. 21 is a flowchart for explaining the registration deletion process in this embodiment.

[0179] Here, the processing of FIGS. 18 and 19 proceeds as a series of flows, but FIGS. 20 and 21 are independent processing flows.

[0180] First, the flow of operations in FIGS. 18 and 19 will be described.

[0181] Step w1 is the same as step S1 in FIG.

[0182] Next, the request data 208 from the client node 201 is received by the replica usage determining unit 204 (w2), and it is checked whether the URL included in the request has been registered in the replication target URL 206 (w3).

[0183] If it has already been registered (w3), the replica usage determining unit 204 returns a replica of the replica content data 207 to the client node 201 (w4), and the process ends.

[0184] On the other hand, if not registered (w3), the URL included in the request is added to the replication target URL 206 (w5). Further, a replication target URL registration and content acquisition request 209 is transmitted to the server node 211 (w6).

[0185] The content of the URL included in the request 209 is returned to the information relay device 203 by the content transmission unit 212 of the server node 211, and further transferred to the client node 201 by the information relay device 203. (W7) In synchronization with the request relay process, the replica target registration process is executed as shown in FIG.

[0186] First, the URL included in the request 209 is delivered to the replication target URL registration unit 215, and this URL is added to the replication target URL of the server node 211 (x1). Further, the identification name of the transmission source device of the request 209 is added to the replication distribution destination device name 217 by the replication target URL registration unit 215 (x2). Next, the replica distribution processing will be described.

[0187] First, a change or new creation of content in the content data 214 is detected by the update detection unit 213 (y1).

[0188] The update detection unit 213 determines whether the content whose change has been detected is content included in the replication target URL 216 (y2).

[0189] Here, if it is a replication target, the content 210 is transmitted to the device registered in the replication delivery destination device name 217 through the content transmission unit 212 (y3). In this transmission, a multicast technique is used, whereby data transmission is actively performed from the server node to the plurality of information relay apparatuses 203. FIG. 15 shows one of the plurality of information relay apparatuses 203.

[0190] In the information relay apparatus 203, the request / content transfer unit 205 determines whether the URL of the content 210 sent from the server node 211 is included in the replication target URL 206 (y4). If it is included in the replication target URL, the replica content data 207 is updated by the content 210 (y5).

[0191] As described above, the replica object is registered in the server node 211 using the push technology by the replica object registration process, and the registration URL is distributed to the information relay apparatus 203 by the replica distribution process.

[0192] Here, in order to prevent the replication target URLs registered in the server node 211 from increasing excessively, the information relay apparatus 203 executes a registration deletion process.

[0193] In the registration deletion process shown in FIG. 21, first, registration deletion determination is started by the registration deletion determination unit 223, and for this purpose, the latest request issue time of the input information statistical data 222 and the registration deletion condition of the replication strategy knowledge 221 are read (z1).

[0194] Subsequently, based on the latest request issue time, it is determined whether or not the registration deletion condition is satisfied for each URL (z2).

[0195] As a result, if there is a URL satisfying the registration deletion condition, the replication target URL 206 and the replica content data 207 related to the URL are deleted (z3), and the deletion request data 224 is output to the server node 211 (z4). .

[0196] In the server node 211, the replication target URL registration unit 215 that has received the deletion request data 224 deletes the information about the replication target URL 216 and the replication delivery destination device name 217 for the URL included in the data 224 (z5). .

[0197] As described above, the information relay apparatus according to the embodiment of the present invention is configured such that the replication process occurs in conjunction with the change of the original content data in the server node 211. Therefore, the replica content data in the information relay apparatus is always up to date and can respond quickly to requests from client nodes.

[0198] In other words, since the proxy server so far only holds the content once acquired, once the original is updated, it has to be transferred again from the server when accessed from the next browser. However, in the present invention, since the content of Proxy is always the latest, it is possible to expect an improvement in average response time as viewed from the browser.

[0199] In the present embodiment, the changed content itself is transmitted to the information relay apparatus 203 when the content data 214 is changed on the server node 211. However, the present invention is limited to such a form. It is not a thing. For example, in combination with the second embodiment, when the content data 214 is changed, only the attribute information, not the content itself, is transmitted to the request / content transfer unit 205. Then, after determining whether or not the replica content is the latest in the transfer unit 205,

the request / content transfer unit 205 issues the request 118 of the content only when the replica is not the latest, and the replica May be updated. (Fourth Embodiment of the Invention) In the first, second and third embodiments, only the URL and content of the content have been described. In this embodiment, the replication is set for each content. A case where the existing access control information is stored together with the replica content will be described.

[0200] The information relay apparatus of this embodiment is configured in the same manner as in the first to third embodiments except that an access control determination unit is provided and access control information is held in the replica content data 110 and 207. Has been.

[0201] Here, the access control information is information such as "a user named A can see this content", and thus the content that can be accessed for each user of the client node can be limited.

[0202] The access control determination unit executes content access restriction based on the access control information.

[0203] As an operation of the information relay apparatus of this embodiment configured as described above, first, a user identification name is added to request data from a client.

[0204] The access control determination unit compares the access control information registered in the replica content data in the information relay apparatus with the client user identification name. As a result, replica contents are returned only to users who are allowed access.

[0205] As described above, the information relay apparatus according to the embodiment of the present invention distributes the access control information together with the content, so that the content requiring access control is also viewed from the client. Response time can be shortened.

[0206] In the same case, in the first to third embodiments, it is necessary to make an inquiry to the server node in order to obtain access control information for each user. (Fifth Embodiment of the Invention) In the first to fourth embodiments, the information relay apparatus is applied to an Internet proxy server. However, in this embodiment, the information relay apparatus is applied to a file server system. explain.

[0207] FIG. 22 is a diagram showing an example of the overall configuration of a file server system to which an information relay apparatus according to the fifth embodiment of the present invention is applied.

[0208] In this system, a large-scale file server 302 is installed in a head office 301, which corresponds to the server nodes 114 and 211 of the first to fourth embodiments. The large-scale file server 302 is connected to small-scale file servers 303 and 304 provided in each department in the head office 301 via a relatively low-speed LAN, and small-scale file servers of each branch office via public lines. 305 and 306 are connected.

[0209] These small file servers 303 to 306 are provided with information relay apparatuses 122 and 203.

[0210] Each of the small file servers 303 to 306 is a file server having a relatively small capacity, and can provide file information to clients in the department or branch office via a high-speed LAN. Further, when information that the user does not have is requested, the information is charged to the large-scale file server 302. This information corresponds to the contents of the first to fourth embodiments. The file search information corresponds to the URL.

[0211] The large-scale file server 302 stores all information and transmits data in response to requests from the small-scale file servers 303 to 306.

[0212] In the file server system configured as described above, the relationship between the client, the small file, and the large file server is the same as the relationship between the client node, the proxy server node, and the server node in the first to fourth embodiments.

[0213] Therefore, information used at a certain frequency in the department or branch office is stored in a small-scale database with a small capacity, and unused information is excluded from the small-scale database.

[0214] As described above, since the information relay device according to the embodiment of the present invention has the same configuration as that of the first to fourth embodiments in the file server system, the

information relay device is provided for each section in the original file server. Even when the small file server goes to make an inquiry, the same effect as in the first to fourth embodiments can be obtained.

[0215] The scope of application of the present invention is not limited to the Internet or a file server system, but can be variously applied to a computer / communication system in which a situation similar to the situation shown in the embodiment occurs. For example, it can be applied to FTP.

[0216] Furthermore, the apparatus described in the embodiment can be realized by causing a computer to read a program stored in a storage medium.

[0217] Here, the storage medium in the present invention can store programs such as a magnetic disk, floppy disk, hard disk, optical disk (CD-ROM, CD-R, DVD, etc.), magneto-optical disk (MO, etc.), semiconductor memory, etc. As long as it is a computer-readable storage medium, the storage format may be any form.

[0218] In addition, an OS (operating system) operating on the computer based on an instruction of a program installed in the computer from the storage medium, MW (middleware) such as database management software, network software, and the like implement the present embodiment. A part of each process may be executed.

[0219] Furthermore, the storage medium in the present invention is not limited to a medium independent of a computer, but also includes a storage medium in which a program transmitted via a LAN or the Internet is downloaded and stored or temporarily stored.

[0220] Also, the number of storage media is not limited to one, and the case where the processing in the present embodiment is executed from a plurality of media is also included in the storage media in the present invention, and the media configuration may be any configuration.

[0221] The computer according to the present invention executes each process according to the present embodiment based on a program stored in a storage medium, and includes a single device such as a personal computer or a system in which a plurality of devices are connected to a network. Any configuration may be used.

[0222] In addition, the computer in the present invention is not limited to a personal computer, but includes an arithmetic processing device, a microcomputer, and the like included in an information processing device, and is a generic term for devices and devices that can realize the functions of the present invention by a program. .

[0223] As described in detail above, according to the present invention, when the update frequency of the original content is high and a request for providing information to an unspecified number of servers is output from the client, the average response time is set. An information relay device and a storage medium that can be improved can be provided.

Electronic Acknowledgement Receipt

EFS ID:	38000967
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	11-DEC-2019
Filing Date:	08-MAY-2017
Time Stamp:	16:05:09
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	Transmittal Letter	492USC1_IDS.pdf	37030 8b1b775ac23fee31d1c7d472e44ee686eeffb134	no	5
Warnings:					96

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	492USC1_sb08.pdf	29633 7d67428656f24a983aac47526a660fef453cfd8d	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	JP2000181843A.pdf	2311800 dc67039eb43eec1440827fbeae88edc55516bb37	no	34
Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	JP_2017530734_ExRpt_28Oct19_0492JP01.pdf	64206 4c21cf6ea7d0a044a119ae85b1289b0ec3b4e3c9	no	5
Warnings:					
Information:					
		Total Files Size (in bytes):	2442669		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/588,935	Confirmation No.	:	2851
First Applicant	:	NEWTON, et al.	Art Unit	:	2458
Filed	:	May 8, 2017	Examiner	:	Khanh Q. Dinh
Title	:	CACHING IN A CONTENT DELIVERY FRAMEWORK			
Docket No.	:	0492-US-C1			

Submitted Via EFS-Web

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT PURSUANT TO 37 C.F.R. §§ 1.56, 1.97, AND 1.98

Sir:

The Examiner is respectfully requested to consider the patents, patent applications, publications, or other information cataloged on the enclosed Form (e.g., PTO-1449, PTO-892, PTO/SB/08, etc.) during examination of the above-identified patent application. The order of presentation of the references should not be construed as an indication of importance. These references are submitted for the Examiner's consideration and are submitted pursuant to an Applicant's duty of disclosure under 37 C.F.R. § 1.56.

Copies of all of the cited documents:

☐ are enclosed unless otherwise indicated on the enclosed Form PTO/SB/08a.

☐ have been previously furnished to the Office in prior application No. __, filed ___, which the present application relies upon for an earlier effective filing date under 35 U.S.C. § 120. Therefore, no copies of the cited documents are included herewith pursuant to 37 C.F.R. § 1.98(d); MPEP § 609(III)(A)(2).

☒ are enclosed unless they are U.S. patents or U.S. patent application publications pursuant to 37 C.F.R. § 1.98(a).

I
BASIS

This information disclosure statement is filed pursuant to

☒ 37 C.F.R. § 1.97(b).
This information disclosure statement is filed either (1) within three months of the filing date of a national application other than a continued prosecution application under 37 C.F.R. § 1.53(d); (2) within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application; (3) before the mailing date of a first Office action on the merits; (4) concurrently with the filing of a request for continued examination under 37 C.F.R. § 1.114; or (5) before the mailing of a first Office action after the filing of a request for continued examination under 37 C.F.R. § 1.114, whichever event occurs last.

Accordingly, this information disclosure statement requires no fee and no certification.

☐ 37 C.F.R. § 1.97(c).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing date of any of (1) a final action under 37 C.F.R. § 1.113; (2) a notice of allowance under 37 C.F.R. § 1.311; or (3) an action that otherwise closes prosecution in the application.

Accordingly, this information disclosure statement requires either the fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c), or a statement under 37 C.F.R. § 1.97(e).

☐ 37 C.F.R. § 1.97(d).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(c) since a:

☐ final action under 37 C.F.R. § 1.113

☐ notice of allowance under 37 C.F.R. § 1.311

was mailed to the Applicant on ___.

Accordingly, this information disclosure statement requires the fee set forth in 37 C.F.R. § 1.17(p) to consider an information disclosure statement under 37 C.F.R. § 1.97(d), and a statement under 37 C.F.R. § 1.97(e).

If this statement crosses in the mail with an Office action, or is otherwise not in the indicated category of 37 C.F.R. § 1.97, it is respectfully requested that this statement be treated in the next appropriate category and made of record. To the extent required, please treat this paper as a conditional petition for acceptance of the information disclosure statement.

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $240 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

☐ Please charge the required fee to Deposit Account No. 505063.

☒ The Commissioner is hereby authorized to charge any additional required fees or credit any overpayments associated with this information disclosure statement to the account.

III

CERTIFICATION

Pursuant to 37 C.F.R. § 1.97(e), I state as follows:

☒ No statement is necessary.

☐ Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(1).

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to my knowledge after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(2).

Pursuant to 37 C.F.R. § 1.704(d), I state as follows:

☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of this information disclosure statement.

IV
FOREIGN LANGUAGE REFERENCES

Pursuant to 37 C.F.R. § 1.98(a)(3)(i), any information disclosure statement filed under 37 C.F.R. § 1.97 shall include a concise explanation of the relevance, as it is presently understood by the individual designated in § 1.56(c) most knowledgeable about the content of the information, of each patent, publication, or other information listed that is not in the English language. The concise explanation may be either separate from the specification or incorporated therein. In compliance with the rules, the Applicant states as follows:

☐ No concise explanation is required since all cited references are in English.

☐ A concise explanation of the relevance of one or more foreign language references is attached.

☐ According to the procedural policy adopted by the PTO with regard to disclosure requirements, the Applicant is satisfying the disclosure requirement pursuant to MPEP § 609.04(a)(III) by submitting herewith the following:

- ☐ English language versions of any non-English language documents.
- ☐ English language versions of one or more search reports or other actions by one or more foreign patent offices in one or more counterpart foreign applications, which indicate the degree of relevance found by the foreign office(s).
- ☐ Pursuant to 37 C.F.R. § 1.98(a)(3)(ii), a copy of a translation is not submitted herewith because a written English-language translation of a non-English-language document, or portion thereof, is not within the possession, custody, or control of, or is readily available to any individual designated in § 1.56(c).

The Applicant has not analyzed these documents and, therefore, declines to comment on their relevance at this time.

☐ One or more English language abstracts for the non-English language references are also enclosed.

V
REMARKS

It is respectfully requested that:

(1) The Examiner sign the enclosed Form to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application; and

(2) The citations for the cited information be printed on any patent that issues from this application.

The submission of this information disclosure statement by the Applicant shall not be construed as a representation that a search has been performed or that no other material information under 37 C.F.R. § 1.56 exists. See 37 C.F.R. § 1.97(g).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, material to the patentability of one or more of the pending claims in this application pursuant to 37 C.F.R. § 1.56(b), unless specifically designated by the Applicant as such. See 37 C.F.R. § 1.97(h).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, or even qualifies as "prior art" under 35 U.S.C. § 102 with respect to this invention, unless specifically designated by the Applicant as such.

Notwithstanding any statements by the Applicant, the Examiner is urged to form his or her own conclusion regarding the relevance of the cited information.

VI
CONCLUSION

The Examiner is encouraged to contact the undersigned attorney to discuss any questions concerning this information disclosure statement or any of the information cited or referred to herein.

Respectfully submitted,

Date: December 11, 2019

/DDW/

David D. Wier, Reg. No. 48,229
USPTO Customer No. 83579
Level 3 Communications, LLC
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Broomfield, Colorado 80021
Tel: 720-888-3539

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. 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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15588935	Filing Date	2017-05-08	Docket Number (if applicable)	0492-US-C1	Art Unit	2458
First Named Inventor	Christopher Newton			Examiner Name	Khanh Q. Dinh		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 505063

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. 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.

Signature of Registered U.S. Patent Practitioner			
Signature	/Gregory D. Leibold/	Date (YYYY-MM-DD)	2019-12-06
Name	Gregory D. Leibold	Registration Number	36408

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	15588935
Filing Date:	08-May-2017
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Filer:	Gregory D. Leibold/Michele Scocchera
Attorney Docket Number:	0492-US-C1

Filed as Large 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($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	1900	1900
		Total in USD ($)		**2100**

Electronic Acknowledgement Receipt

EFS ID:	37957881
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	Gregory D. Leibold/Michele Scocchera
Filer Authorized By:	Gregory D. Leibold
Attorney Docket Number:	0492-US-C1
Receipt Date:	06-DEC-2019
Filing Date:	08-MAY-2017
Time Stamp:	16:17:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2100
RAM confirmation Number	E2019B6G18229415
Deposit Account	132725
Authorized User	Michele Scocchera

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Amendment_and_Response.pdf	147671 1dec558a4edcb44802d4c7680d2b9e3ab3ff0c40	yes	14

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment Submitted/Entered with Filing of CPA/RCE	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	14

Warnings:					
Information:					
2	Extension of Time	EOT.PDF	159072 d1a175cb3ed436852da4b2d39e04c466ec9e10ba	no	2
Warnings:					
Information:					
3	Request for Continued Examination (RCE)	RCE.PDF	1349937 04c98bd8ecf6ee62291fdd44db7b1b497da361fe	no	3
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	32635 566526d40564ea01f11de06f9c199cd353129f93	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1689315		

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Inventor:	Christopher Newton	Examiner:	Dinh, Khanh Q.
Serial No.:	15/588,935	Group Art Unit:	2458
Filed:	05/08/2017	Docket No.:	0492-US-C1
Title:	CACHING IN A CONTENT DELIVERY FRAMEWORK		

AMENDMENT & RESPONSE TO FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents:

In response to the Advisory Action mailed December 5, 2019, and the Final Office Action mailed August 8, 2019, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1. (Currently Amended) A computer-implemented method, operable with a content delivery network (CDN), the method comprising:

(A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally at the node;

(B) when it is determined by the node that said content is cached locally, then, after determining that the content is cached locally:

(B)(1) determining, by the node, a current cache policy associated with the content, wherein determining the current cache policy comprises determining a time period for expiration of content in the cache; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

2. (Original) The method as recited in claim 1 further comprising:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

3. (Original) The method as recited in claim 1 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

4. (Original) The method as recited in claim 1 wherein the current cache policy is determined from a location distinct from the node.

5. (Original) The method as recited in claim 4 wherein the location is a database.

6. (Original) The method as recited in claim 1 wherein the cache policy relates to caching content within the CDN.

7. (Original) The method as recited in claim 6 wherein the cache policy also relates to caching content outside the CDN.

8. (Currently Amended) A computer program product having computer readable instructions stored on non-transitory computer readable media, the computer readable instructions including instructions for implementing a computer-implemented method, said method operable on a device comprising hardware including memory and at least one processor and running a service on said hardware, said method operable in a content delivery service (CDN), said method comprising:

(A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally at the node;

(B) when it is determined that said content is cached locally, then, after determining that the content is cached locally:

(B)(1) determining, by the node, a current cache policy associated with the content, wherein determining the current cache policy comprises determining a time period for expiration of content in the cache; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

9. (Original) The computer program product as recited in claim 8 wherein the method further comprises:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

10. (Original) The computer program product as recited in claim 8 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

11. (Original) The computer program product as recited in claim 8 wherein the current cache policy is determined from a location distinct from the node.

12. (Original) The computer program product as recited in claim 11 wherein the location is a database.

13. (Original) The computer program product as recited in claim 8 wherein the cache policy relates to caching content within the CDN.

14. (Original) The computer program product as recited in claim 13 wherein the cache policy also relates to caching content outside the CDN.

REMARKS/ARGUMENTS

This Amendment and the following remarks are intended to fully respond to the Final Office Action dated August 8, 2019, hereinafter "Office Action." In that Office Action, claims 1-14 were examined and all claims were rejected. Claims 1-14 were rejected under 35 U.S.C. § 102(a)(2) and 103 as allegedly being unpatentable over Graham-Cumming (U.S. Patent No. 9,984,166; hereinafter "Graham-Cumming") in view of Araujo (U.S. Publication No. 2015/0347248; hereinafter "Araujo").

Reconsideration of these rejections, as they might apply to the original and amended claims in view of these remarks, is respectfully requested. In this Amendment, claims 1 and 8 have been amended, and no claims have been canceled or added. Applicants submit that claim amendments are supported throughout the specification, and in the claims as originally filed, and do not introduce new matter.

Double Patenting Rejection

Claims 1 and 8 were rejected on the ground of obviousness-type double patenting as being unpatentable over claims 1 and 9 of U.S. Patent No. 9,648,127. Without conceding the correctness of the rejection, Applicants have filed a terminal disclaimer to overcome the double patenting rejection.

Claim Rejections Under § 103(a)

Claims 1-14 were rejected under 35 U.S.C. § 103[1] as allegedly being unpatentable over Graham-Cumming in view of Araujo.

Applicants respectfully traverse the § 103(a) rejections because the Examiner failed to state a *prima facie* case of obviousness. In addition, even if the Examiner had stated a *prima facie* case of obviousness, the current amendments to the claims now render the Examiner's arguments moot. To establish a *prima facie* case of obviousness, the references must teach or

[1] The Office Action actually states in paragraph 6 that the claims are rejected "under 35 U.S.C. § 102(a)(2)" over Graham-Cumming and Araujo; however, Applicants assume this is a typographical error and treat the rejection as being pursuant to Section 103, as two references are used in combination.

suggest each and every one of the claim elements to one of ordinary skill in the art at the time the invention was made. *See* MPEP §§ 2142, 2143.03; *In re Wilson*, 424 F.2d 1382, 1385 (C.C. P.A. 1970). In addition, *KSR International Company v. Teleflex, Inc.*, 127 S. Ct. 1727, 1741 (2007), requires that there "must be some *articulated reasoning with some rational underpinning* to support the legal conclusion of obviousness." (Emphasis added.) Further, "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co.*, 127 S. Ct. at 1741. Specifically, the references fail to teach or suggest all of the claim elements.

In nonexclusive, nonlimiting examples, the presently disclosed system permits late binding of caching policies in a content delivery network ("CDN"). In examples, when a node of the CDN receives a request for a resource, it determines whether the resource is stored locally at the node. If it is stored locally at the node, the node then, after determining that the resource is stored locally, determines if a current caching policy permits the node to serve the requested resource. For example, the caching policy may comprise a time period for expiration of content in the cache. If the current caching policy permits serving the resource that is cached locally, the node serves the resource. If not, the node requests a new version of the resource, and it serves the new version.

By contrast, Graham-Cumming is a system for minimizing data that must be sent across a CDN. In particular, a "near end network optimizer" receives a request for a resource. That request might only be received by the near end network optimizer, e.g., if a proxy server failed to serve the request because the resource has been set as "no-cache" by an origin server. The near end network optimizer then checks whether the resource is available locally. If it is not available locally, it requests the resource from a "far-end network optimizer," which may then retrieve it from the origin server. If it is available locally, the near-end network optimizer still does not serve the resource – rather, it includes the version number of its locally stored version of the resource in the request to the far end network optimizer. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end

network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client.

Turning specifically to the claims, Graham-Cumming does not disclose at least the following elements of claim 1 (emphasis added):

> 1. A computer-implemented method, operable with a content delivery network (CDN), the method comprising:
>
> (A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally at the node;
>
> (B) **when it is determined by the node that said content is cached locally, then, after determining that the content is cached locally**:
>
> (B)(1) **determining, by the node, a current cache policy associated with the content, wherein determining the current cache policy comprises determining a time period for expiration of content in the cache; and then**
>
> (B)(2) **determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally**;
>
> (B)(3) based on said determining in (B)(2),
>
> (i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and
>
> (ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

Applicants initially note that claim 1 requires the claimed limitations to be performed by "a node," not an entire CDN. Further, it is not entirely clear from the Office Action what "node" the Office Action alleges performs all of the claimed limitations; however, it appears the Office Action is asserting that certain of the claimed method limitations are performed by the near end network optimizer and other limitations are performed by the far end network optimizer. Applicants respectfully disagree that the near end network optimizer and the far end network

optimizer, even in combination, are disclosed to perform the claimed limitations and, even if they did, claim 1 requires that all of the limitations be performed by the same node.

Near End Optimizer of Graham-Cumming

First, the near end network optimizer does not "determin[e] that the content is stored locally at the node" and "then, after determining that the content is cached locally, determin[e] a current cache policy associated with the content, wherein determining the current cache policy comprises determining a time period for expiration of content in the cache," as claimed. There is no such late binding of a current cache policy. The Office Action cites solely to Col. 5, l. 17 through Col. 6, l. 62 of Graham-Cumming. The only reference in those sections of Graham-Cumming to a cache policy of any kind is that the resource may be been marked with a "no-cache directive." (See, e.g., Col. 5, ll. 25-26, ll. 54-55, ll. 56-64.) However, the near end network optimizer does not, after determining that it has a copy of the requested resource at the near end network optimizer, determine a current cache policy. In fact, it does not care what the cache policy is. Moreover, a "no-cache directive" is not "a time period for expiration of content in the cache."

Rather, Graham-Cumming indicates that the near end network optimizer may only receive the request in the first place if the proxy server is unable to serve the request due to a no-cache directive. (See, e.g., Col. 5, ll. 22-26 ("The request may be received at the request module 122 as a result of a cache mechanism of the proxy server determining that the requested resource cannot be returned to the requesting client device (e.g., the resource has been set as 'no cache' . . . .).")

Second, the actions of the near end network optimizer do not depend on a determination by the near end network optimizer of the current cache policy. Rather, if the near end network optimizer does not have a copy of the resource at all, it simply requests it from the far end network optimizer. If it does have a copy of the resource, it still makes a request to the far end network optimizer, but this time it includes the version number of the resource copy that it stores locally. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end

network optimizer, and the most-current version is reconstructed and served to the requesting client. (See Graham-Cumming, Col. 6, ll. 4-62.)

Indeed, the actions of the near end network optimizer are not dependent on the current cache policy. Either way, the near end network optimizer will seek the newest version from the far end network optimizer (either the complete version or the delta). In addition, the near end network optimizer stores what it gets back from the far end network optimizer regardless of whether the resource is tagged as "no-cache." This is so that the near end network optimizer can request the delta (instead of the whole resource) upon the next request for the resource from a client. (See, e.g., Col. 5, ll. 56-64.) As such, the near end network optimizer also does not "determin[e], based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed.

As such, the near end optimizer of Graham-Cumming does not disclose "determining that the content is stored locally at the node" and "then, after determining that the content is cached locally, determining a current cache policy associated with the content, wherein determining the current cache policy comprises determining a time period for expiration of content in the cache," or "determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed.

Far End Optimizer of Graham-Cumming

The far end optimizer disclosed in Graham-Cumming is equally deficient in meeting all of the elements of claim 1. As discussed with respect to the near end optimizer, the far end optimizer receives a request for content from the near end optimizer when the near end optimizer either (a) fails to have a copy of the content; or (b) has a copy of the content but is checking the version identifier of the copy stored at the near end optimizer. The far end optimizer sends either a full copy of the content (if the near end optimizer does not have a copy) or the delta between the version the near end optimizer already has and the latest version received from the origin server.

The Office Action continues to fail entirely to identify what it considers the "current cache policy" that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally at the node and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, no such policy is identified in the Office Action. Nor, as currently claimed, does Graham-Cumming disclose any cache policy that comprises "a time period for expiration of content in the cache." Rather, the Office Action simply states in relation to element (B)(1) of claim 1: "determining if the data request is locally available, see abstract col. 5, lines 17-55." (Office Action at p. 4.) **This ignores entirely the claim element of (B)(1), which requires, after determining that the content is cached locally, "determining, by the node, a current cache policy associated with the content, wherein determining the current cache policy comprises determining a time period for expiration of content in the cache."** This late-binding of a current cache policy appears nowhere in Graham-Cumming. Nor does the Office Action point specifically to any such policy.

At most, the cited sections of Graham-Cumming state that the far end optimizer determines if it has requested content stored locally; however, the cited language still fails to identify any current cache policy that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, the only cache-related policy discussed in the cited sections of Graham-Cumming is whether the content is subject to a no-cache directive. That "policy," however, would affect whether the near end optimizer and/or far end optimizer would cache the content in the first place. Such a no-cache directive of Graham-Cumming would not be determined by a node **after** it is determined that the node stores the content locally. Further, the no-cache directive would not be used to determine whether already-stored content could be served pursuant to the content request. Still further, such no-cache directive of Graham-Cumming does not comprise a time period for expiration of content in the cache," as currently claimed.

As such, neither the near end optimizer nor the far end optimizer of Graham-Cumming, alone or in combination, discloses or suggests all of the elements of claim 1. For at least these reasons, claim 1 is allowable over Graham-Cumming.

Further, Araujo is equally deficient. It is unclear exactly how the Office Action is relying on Araujo. The Office Action (p. 5) simply states: "Graham-Cumming does not specifically disclose determination by a node in a CDN. However such teaching is discloses (sic) by Ara Jo (sic) (for example, using the content delivery networks that typically have one or more content nodes (CNs), or cache nodes, distributed across a large geographic region to provide faster and lower latency local access to the content for the end users, see abstract, fig. 1, [0020] to [0024])." It appears, then that the Office Action is relying on Araujo simply for the proposition that cache nodes in content delivery networks can be used to deliver content. Without conceding the correctness of the Office Action's characterizations of Araujo, such disclosure falls far short of making up for the considerable deficiencies of Graham-Cumming discussed above.

For example, Araujo discloses a content delivery network comprised of content nodes and a control node. The control node helps accommodate load balancing and failovers between content nodes. Nothing in the cited sections of Araujo, however, discloses any current cache policy that a node of Araujo (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. As such, Araujo fails to disclose at least the above-recited elements of claim 1 shown to be deficient in Graham-Cumming.

Similarly, claim 8 requires, *inter alia*:

> (A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally at the node;
>
> (B) when it is determined that said content is cached locally, then, after determining that the content is cached locally:
>
> (B)(1) determining, by the node, a current cache policy associated with the content, wherein determining the current cache policy comprises determining a time period for expiration of content in the cache; and then
>
> (B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;
>
> (B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

For at least similar reasons as stated above, claim 8 is allowable over the cited references. All other claims depend from one of claims 1 and 8 and are allowable for at least similar reasons. Allowance of all claims is respectfully requested.

CONCLUSION

This Amendment fully responds to the Office Action mailed on August 8, 2019. Still, that Office Action may contain arguments and rejections that are not directly addressed by this Amendment due to the fact that they are rendered moot in light of the preceding arguments in favor of patentability. Hence, the failure, if any, of this Amendment and Response to directly address an argument and/or comment raised in the Office Action should not be taken as an indication that the Applicant believes the argument and/or comment has merit. Additionally, the failure, if any, to address statements and/or comments made in the Office Action does not mean that the Applicants acquiesce to such statements and/or comments. Furthermore, the claims of the present application may include other elements, not discussed in this Amendment and Response, which are not shown, taught, or otherwise suggested by the art of record. Accordingly, the preceding arguments in favor of patentability are advanced without prejudice to other bases of patentability.

It is believed that no further fees are due with this Response. However, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment with respect to this patent application to deposit account number 50-5063.

In light of the above remarks and amendments, it is believed that the application is now in condition for allowance and such action is respectfully requested. Should any additional issues need to be resolved, the Examiner is requested to telephone David Wier at (720.888.3539), attorney-of-record, to attempt to resolve those issues.

Respectfully submitted,

Date: December 6, 2019

/Gregory D. Leibold/

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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 0492-US-C1

Application Number: 15/588,935

Filed: 05/08/2017

For: CACHING IN A CONTENT DELIVERY FRAMEWORK

Art Unit: 2458

Examiner: Khanh Q. Dinh

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☑ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 200.00
☐ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☐ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

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

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

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I am the

☐ applicant.

☑ attorney or agent of record. Registration number 36,408.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Gregory D. Leibold/ — Signature

December 6, 2019 — Date

Gregory D. Leibold — Typed or printed name

303-357-1642 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
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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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/588,935	Filing Date 05/08/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	12/06/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

83579 7590 12/05/2019

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DINH, KHANH Q	

ART UNIT	PAPER NUMBER
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Advisory Action Before the Filing of an Appeal Brief	Application No. 15/588,935	Applicant(s) Newton et al.	
	Examiner KHANH Q DINH	Art Unit 2458	AIA (FITF) Status Yes

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

THE REPLY FILED 01 November 2019 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☑ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☑ The period for reply expires 3 months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection.The current period for reply expires ____ months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☑ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☑ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: See Continuation Sheet (See 37CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicants reply has overcome the following rejection(s): _____
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☑ For purposes of appeal, the proposed amendment(s):(a) ☑ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☑ Other: Interview Summary, PTO-2323.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed:_____.
    Claim(s) objected to:_____.
    Claim(s) rejected:1-14.
    Claim(s) withdrawn from consideration:_____.

/KHANH Q DINH/ Primary Examiner, Art Unit 2458	

Continuation of 3. NOTE: The new limitation "...after determining that the content is cached locally...' would require further consideration and/or searches.

Examiner-Initiated Interview Summary	**Application No.** 15/588,935	**Applicant(s)** Newton et al.	
	Examiner KHANH Q DINH	**Art Unit** 2458	**AIA (FITF) Status** Yes

All participants (applicant, applicant's representative, PTO personnel):

(1) KHANH Q. DINH. (3) _____.

(2) Gregory D. Leibold (Reg. No.36,408). (4) _____.

Date of Interview: 02 December 2019.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐ 101 ☐ 112 ☐ 102 ☐ 103 ☐ Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1.

Identification of prior art discussed: US 8, 984,166.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/KHANH Q DINH/ Primary Examiner, Art Unit 2458	

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments:
The examiner and applicant representative discussed the current rejection. The new limitations presented in the AFCP2.0 filed on 11/1/2019 appears NOT to overcome the cited prior art. The applicant was also informed of the cited reference (Graham-Cumming, US 8,984,166) still appears to teach the proposed claim amendments. No agreement was reached.

AFCP 2.0 Decision	Application No.	Applicant(s)	
	15/588,935	Newton et al.	
	Examiner	Art Unit	AIA (FITF) Status
	KHANH Q DINH	2458	Yes

This is in response to the After Final Consideration Pilot request filed 01 November 2019.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

   ☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.

   ☐ A non-broadening amendment to at least one independent claim was not submitted.

   ☐ The request is not the first proper AFCP 2.0 request submitted in response to the most recent final rejection.

   ☐ Other: _____

2. **Proper Request**

   A. After final amendment submitted with the request will not be treated under AFCP 2.0.
   The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.

   ☐ The after final amendment will be treated under pre-pilot procedure.

   B. Updated search and/or completed additional consideration.
   The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

   ☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.

   ☑ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action . See attached interview summary for further details.

   ☐ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.

   ☐ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.

   ☐ 5. Other: _____

   Examiner Note: Please attach an interview summary when necessary as described above.

DO NOT ENTER: /K.Q.D/

S/N 15/588,935 PATENT

Conf. No. 2851

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Christopher Newton	Examiner:	Dinh, Khanh Q.
Serial No.:	15/588,935	Group Art Unit:	2458
Filed:	05/08/2017	Docket No.:	0492-US-C1
Title:	CACHING IN A CONTENT DELIVERY FRAMEWORK		

AMENDMENT & RESPONSE TO FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents:

In response to the Final Office Action mailed August 8, 2019, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	15588935
Filing Date	08-May-2017
First Named Inventor	Christopher Newton
Attorney Docket Number	0492-US-C1
Title of Invention	CACHING IN A CONTENT DELIVERY FRAMEWORK

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
LEVEL 3 COMMUNICATIONS, LLC	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

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as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.
Applicant claims the following fee status: ○ Small Entity ○ Micro Entity ◉ Regular Undiscounted I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 36408 ○ A sole inventor ○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ○ A joint inventor; all of whom are signing this request

Signature	/Gregory Leibold/
Name	Gregory Leibold

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	15588935
Filing Date:	08-May-2017
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Filer:	Gregory D. Leibold/Michele Scocchera
Attorney Docket Number:	0492-US-C1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 15588935

Filing Date: 08-May-2017

Applicant/Patent under Reexamination: Newton

Electronic Terminal Disclaimer filed on November 1, 2019

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt

EFS ID:	37637695
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	Gregory D. Leibold/Michele Scocchera
Filer Authorized By:	Gregory D. Leibold
Attorney Docket Number:	0492-US-C1
Receipt Date:	01-NOV-2019
Filing Date:	08-MAY-2017
Time Stamp:	18:04:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$160
RAM confirmation Number	E2019A1I04542031
Deposit Account	132725
Authorized User	Michele Scocchera

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33566 26f0fc549b9f082a448f6e45f56f65cfd150a4a6	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30653 37df5239fa1708d4dc56688f33f50d59119a7110	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	64219		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Christopher Newton	Examiner:	Dinh, Khanh Q.
Serial No.:	15/588,935	Group Art Unit:	2458
Filed:	05/08/2017	Docket No.:	0492-US-C1
Title:	CACHING IN A CONTENT DELIVERY FRAMEWORK		

AMENDMENT & RESPONSE TO FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents:

In response to the Final Office Action mailed August 8, 2019, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1. (Currently Amended) A computer-implemented method, operable with a content delivery network (CDN), the method comprising:

(A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally at the node;

(B) when it is determined by the node that said content is cached locally, then, after determining that the content is cached locally:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

2. (Original) The method as recited in claim 1 further comprising:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

3. (Original) The method as recited in claim 1 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

4. (Original) The method as recited in claim 1 wherein the current cache policy is determined from a location distinct from the node.

5. (Original) The method as recited in claim 4 wherein the location is a database.

6. (Original) The method as recited in claim 1 wherein the cache policy relates to caching content within the CDN.

7. (Original) The method as recited in claim 6 wherein the cache policy also relates to caching content outside the CDN.

8. (Currently Amended) A computer program product having computer readable instructions stored on non-transitory computer readable media, the computer readable instructions including instructions for implementing a computer-implemented method, said method operable on a device comprising hardware including memory and at least one processor and running a service on said hardware, said method operable in a content delivery service (CDN), said method comprising:

(A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally at the node;

(B) when it is determined that said content is cached locally, then, after determining that the content is cached locally:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

9. (Original) The computer program product as recited in claim 8 wherein the method further comprises:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

10. (Original) The computer program product as recited in claim 8 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

11. (Original) The computer program product as recited in claim 8 wherein the current cache policy is determined from a location distinct from the node.

12. (Original) The computer program product as recited in claim 11 wherein the location is a database.

13. (Original) The computer program product as recited in claim 8 wherein the cache policy relates to caching content within the CDN.

14. (Original) The computer program product as recited in claim 13 wherein the cache policy also relates to caching content outside the CDN.

REMARKS/ARGUMENTS

This Amendment and the following remarks are intended to fully respond to the Final Office Action dated August 8, 2019, hereinafter "Office Action." In that Office Action, claims 1-14 were examined and all claims were rejected. Claims 1-14 were rejected under 35 U.S.C. § 102(a)(2) and 103 as allegedly being unpatentable over Graham-Cumming (U.S. Patent No. 9,984,166; hereinafter "Graham-Cumming") in view of Araujo (U.S. Publication No. 2015/0347248; hereinafter "Araujo").

Reconsideration of these rejections, as they might apply to the original and amended claims in view of these remarks, is respectfully requested. In this Amendment, claims 1 and 8 have been amended, and no claims have been canceled or added. Applicants submit that claim amendments are supported throughout the specification, and in the claims as originally filed, and do not introduce new matter.

Double Patenting Rejection

Claims 1 and 8 were rejected on the ground of obviousness-type double patenting as being unpatentable over claims 1 and 9 of U.S. Patent No. 9,648,127. Without conceding the correctness of the rejection, Applicants have filed herewith a terminal disclaimer to overcome the double patenting rejection.

Claim Rejections Under § 103(a)

Claims 1-14 were rejected under 35 U.S.C. § 103[1] as allegedly being unpatentable over Graham-Cumming in view of Araujo.

Applicants respectfully traverse the § 103(a) rejections because the Examiner failed to state a *prima facie* case of obviousness. In addition, even if the Examiner had stated a *prima facie* case of obviousness, the current amendments to the claims now render the Examiner's arguments moot. To establish a *prima facie* case of obviousness, the references must teach or

[1] The Office Action actually states in paragraph 6 that the claims are rejected "under 35 U.S.C. § 102(a)(2)" over Graham-Cumming and Araujo; however, Applicants assume this is a typographical error and treat the rejection as being pursuant to Section 103, as two references are used in combination.

suggest each and every one of the claim elements to one of ordinary skill in the art at the time the invention was made. *See* MPEP §§ 2142, 2143.03; *In re Wilson*, 424 F.2d 1382, 1385 (C.C. P.A. 1970). In addition, *KSR International Company v. Teleflex, Inc.*, 127 S. Ct. 1727, 1741 (2007), requires that there "must be some *articulated reasoning with some rational underpinning* to support the legal conclusion of obviousness." (Emphasis added.) Further, "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co.*, 127 S. Ct. at 1741. Specifically, the references fail to teach or suggest all of the claim elements.

In nonexclusive, nonlimiting examples, the presently disclosed system permits late binding of caching policies in a content delivery network ("CDN"). In examples, when a node of the CDN receives a request for a resource, it determines whether the resource is stored locally at the node. If it is stored locally at the node, the node then, after determining that the resource is stored locally, determines if a current caching policy permits the node to serve the requested resource. If the current caching policy permits serving the resource that is cached locally, the node serves the resource. If not, the node requests a new version of the resource, and it serves the new version.

By contrast, Graham-Cumming is a system for minimizing data that must be sent across a CDN. In particular, a "near end network optimizer" receives a request for a resource. That request might only be received by the near end network optimizer, e.g., if a proxy server failed to serve the request because the resource has been set as "no-cache" by an origin server. The near end network optimizer then checks whether the resource is available locally. If it is not available locally, it requests the resource from a "far-end network optimizer," which may then retrieve it from the origin server. If it is available locally, the near-end network optimizer still does not serve the resource – rather, it includes the version number of its locally stored version of the resource in the request to the far end network optimizer. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client.

Turning specifically to the claims, Graham-Cumming does not disclose at least the following elements of claim 1 (emphasis added):

> 1. A computer-implemented method, operable with a content delivery network (CDN), the method comprising:
>
> (A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally at the node;
>
> (B) **when it is determined by the node that said content is cached locally, then, after determining that the content is cached locally**:
>
> (B)(1) **determining, by the node, a current cache policy associated with the content; and then**
>
> (B)(2) **determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally**;
>
> (B)(3) based on said determining in (B)(2),
>
> (i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and
>
> (ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

Applicants initially note that claim 1 requires the claimed limitations to be performed by "a node," not an entire CDN. Further, it is not entirely clear from the Office Action what "node" the Office Action alleges performs all of the claimed limitations; however, it appears the Office Action is asserting that certain of the claimed method limitations are performed by the near end network optimizer and other limitations are performed by the far end network optimizer. Applicants respectfully disagree that the near end network optimizer and the far end network optimizer, even in combination, are disclosed to perform the claimed limitations and, even if they did, claim 1 requires that all of the limitations be performed by the same node.

Near End Optimizer of Graham-Cumming

First, the near end network optimizer does not "determin[e] that the content is stored locally at the node" and "then, after determining that the content is cached locally, determin[e] a current cache policy associated with the content," as claimed. There is no such late binding of a current cache policy. The Office Action cites solely to Col. 5, l. 17 through Col. 6, l. 62 of Graham-Cumming. The only reference in those sections of Graham-Cumming to a cache policy of any kind is that the resource may be been marked with a "no-cache directive." (See, e.g., Col. 5, ll. 25-26, ll. 54-55, ll. 56-64.) However, the near end network optimizer does not, after determining that it has a copy of the requested resource at the near end network optimizer, determine a current cache policy. In fact, it does not care what the cache policy is.

Rather, Graham-Cumming indicates that the near end network optimizer may only receive the request in the first place if the proxy server is unable to serve the request due to a no-cache policy. (See, e.g., Col. 5, ll. 22-26 ("The request may be received at the request module 122 as a result of a cache mechanism of the proxy server determining that the requested resource cannot be returned to the requesting client device (e.g., the resource has been set as 'no cache' . . . .).")

Second, the actions of the near end network optimizer do not depend on a determination by the near end network optimizer of the current cache policy. Rather, if the near end network optimizer does not have a copy of the resource at all, it simply requests it from the far end network optimizer. If it does have a copy of the resource, it still makes a request to the far end network optimizer, but this time it includes the version number of the resource copy that it stores locally. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client. (See Graham-Cumming, Col. 6, ll. 4-62.)

Indeed, the actions of the near end network optimizer are not dependent on the current cache policy. Either way, the near end network optimizer will seek the newest version from the far end network optimizer (either the complete version or the delta). In addition, the near end network optimizer stores what it gets back from the far end network optimizer regardless of

whether the resource is tagged as "no-cache." This is so that the near end network optimizer can request the delta (instead of the whole resource) upon the next request for the resource from a client. (See, e.g., Col. 5, ll. 56-64.) As such, the near end network optimizer also does not "determin[e], based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed.

As such, the near end optimizer of Graham-Cumming does not disclose "determining that the content is stored locally at the node" and "then, after determining that the content is cached locally, determining a current cache policy associated with the content," or "determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed.

Far End Optimizer of Graham-Cumming

The far end optimizer disclosed in Graham-Cumming is equally deficient in meeting all of the elements of claim 1. As discussed with respect to the near end optimizer, the far end optimizer receives a request for content from the near end optimizer when the near end optimizer either (a) fails to have a copy of the content; or (b) has a copy of the content but is checking the version identifier of the copy stored at the near end optimizer. The far end optimizer sends either a full copy of the content (if the near end optimizer does not have a copy) or the delta between the version the near end optimizer already has and the latest version received from the origin server.

The Office Action continues to fail entirely to identify what it considers the "current cache policy" that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally at the node and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, no such policy is identified in the Office Action. Rather, the Office Action simply states in relation to element (B)(1) of claim 1: "determining if the data request is locally available, see abstract col. 5, lines 17-55." (Office Action at p. 4.) **This ignores entirely the claim element of (B)(1), which requires, after determining that the content is cached locally, "determining, by the node, a current cache policy associated with the**

content." This late-binding of a current cache policy appears nowhere in Graham-Cumming. Nor does the Office Action point specifically to any such policy.

At most, the cited sections of Graham-Cumming state that the far end optimizer determines if it has requested content stored locally; however, the cited language still fails to identify any current cache policy that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, the only cache-related policy discussed in the cited sections of Graham-Cumming is whether the content is subject to a no-cache directive. That "policy," however, would affect whether the near end optimizer and/or far end optimizer would cache the content in the first place. Such a no-cache directive of Graham-Cumming would not be determined by a node **after** it is determined that the node stores the content locally. Further, the no-cache directive would not be used to determine whether already-stored content could be served pursuant to the content request.

As such, neither the near end optimizer nor the far end optimizer of Graham-Cumming, alone or in combination, discloses or suggests all of the elements of claim 1. For at least these reasons, claim 1 is allowable over Graham-Cumming.

Further, Araujo is equally deficient. It is unclear exactly how the Office Action is relying on Araujo. The Office Action (p. 5) simply states: "Graham-Cumming does not specifically disclose determination by a node in a CDN. However such teaching is discloses (sic) by Ara Jo (sic) (for example, using the content delivery networks that typically have one or more content nodes (CNs), or cache nodes, distributed across a large geographic region to provide faster and lower latency local access to the content for the end users, see abstract, fig. 1, [0020] to [0024])." It appears, then that the Office Action is relying on Araujo simply for the proposition that cache nodes in content delivery networks can be used to deliver content. Without conceding the correctness of the Office Action's characterizations of Araujo, such disclosure falls far short of making up for the considerable deficiencies of Graham-Cumming discussed above.

For example, Araujo discloses a content delivery network comprised of content nodes and a control node. The control node helps accommodate load balancing and failovers between

content nodes. Nothing in the cited sections of Araujo, however, discloses any current cache policy that a node of Araujo (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. As such, Araujo fails to disclose at least the above-recited elements of claim 1 shown to be deficient in Graham-Cumming.

Similarly, claim 8 requires, *inter alia*:

> (A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally at the node;
>
> (B) when it is determined that said content is cached locally, then, after determining that the content is cached locally:
>
> (B)(1) determining, by the node, a current cache policy associated with the content; and then
>
> (B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;
>
> (B)(3) based on said determining in (B)(2),
>
> (i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and
>
> (ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

For at least similar reasons as stated above, claim 8 is allowable over the cited references. All other claims depend from one of claims 1 and 8 and are allowable for at least similar reasons. Allowance of all claims is respectfully requested.

CONCLUSION

This Amendment fully responds to the Office Action mailed on August 8, 2019. Still, that Office Action may contain arguments and rejections that are not directly addressed by this Amendment due to the fact that they are rendered moot in light of the preceding arguments in favor of patentability. Hence, the failure, if any, of this Amendment and Response to directly address an argument and/or comment raised in the Office Action should not be taken as an indication that the Applicant believes the argument and/or comment has merit. Additionally, the failure, if any, to address statements and/or comments made in the Office Action does not mean that the Applicants acquiesce to such statements and/or comments. Furthermore, the claims of the present application may include other elements, not discussed in this Amendment and Response, which are not shown, taught, or otherwise suggested by the art of record. Accordingly, the preceding arguments in favor of patentability are advanced without prejudice to other bases of patentability.

It is believed that no further fees are due with this Response. However, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment with respect to this patent application to deposit account number 50-5063.

In light of the above remarks and amendments, it is believed that the application is now in condition for allowance and such action is respectfully requested. Should any additional issues need to be resolved, the Examiner is requested to telephone David Wier at (720.888.3539), attorney-of-record, to attempt to resolve those issues.

Respectfully submitted,

Date: November 1, 2019

/Gregory D. Leibold/

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83579
PATENT TRADEMARK OFFICE

Doc Code: A.NE.AFCP
Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (05-13)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

Practitioner Docket No.:	Application No.:	Filing Date:
0492-US-C1	15/588,935	05/08/2017
First Named Inventor:	**Title:**	
Christopher Newton	CACHING IN A CONTENT DELIVERY FRAMEWORK	

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.

1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (*e.g.*, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).
2. The above-identified application contains an outstanding final rejection.
3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.
4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.
5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.
6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web).
7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]
8. By filing this certification and request, applicant acknowledges the following:
    - Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.
    - The examiner will verify that the AFCP 2.0 submission is compliant, *i.e.*, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:
        - The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, by mailing an advisory action.
        - If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.
            - The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.
            - If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.

Signature	Date
/Gregory D. Leibold/	November 1, 2019
Name (Print/Typed)	**Practitioner Registration No.**
Gregory D. Leibold	36,408

***Note**: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.*

[✓] * Total of 1 forms are submitted.

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 Acknowledgement Receipt

EFS ID:	37637659
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	Gregory D. Leibold/Michele Scocchera
Filer Authorized By:	Gregory D. Leibold
Attorney Docket Number:	0492-US-C1
Receipt Date:	01-NOV-2019
Filing Date:	08-MAY-2017
Time Stamp:	18:01:16
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		Amendment_and_Response.pdf	145520 41a22e63cca27205da5a438721232f8d8def9886	yes	13

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	13

Warnings:					
Information:					
2	After Final Consideration Program Request	AFCP_Form.PDF	226752 36f6f476b3e8026a00b85ca01c59509599c4bf4f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	372272		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/588,935	Filing Date 05/08/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	11/01/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

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

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

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

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

83579 7590 08/08/2019

LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

EXAMINER	
DINH, KHANH Q	

ART UNIT	PAPER NUMBER
2458	

NOTIFICATION DATE	DELIVERY MODE
08/08/2019	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No. 15/588,935	Applicant(s) Newton et al.	
	Examiner KHANH Q DINH	Art Unit 2458	AIA (FITF) Status Yes

-- 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 4/25/19.

☐ 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) 1-14 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) 1-14 is/are rejected.

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

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

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

Application Papers

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

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

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

1. This is in response to the Remarks filed on 4/25/2019. Claims 1 -14 are presented for examination.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321 (c) or 1.321 (d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321 (b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon

submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

3. Claims 1 and 8 of the instant application are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over some claims of U.S. Patent No. 9,648,127.

Regarding claims 1 and 8, claims 1' and 9 of U.S. Patent No. 9,648,127 contain every element of claims 1 and 8 of the instant application and as such anticipate claims 1 and 8 of the instant application.

The patent 9,648,127 does not specifically disclose determination by a node in a CDN. However, such teaching is discloses by Ara Jo (for example, using the content delivery networks that typically have one or more content nodes (CNs), or cache nodes, distributed across a large geographic region to provide faster and lower latency local access to the content for the end users, see abstract, fig.l, [0020] to [0024]). It would have been obvious to one of the ordinary skill in the art at the time the invention was made to implement Ara Jo's teachings into the computer system of Graham-Cumming to monitor data delivery because it would have enabled the content delivery network to act as a proxy to cache content delivery between origin servers and the end user devices.

Claim Rejections - 35 USC §103

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim(s) 1-14 are rejected under 35 U.S.C. 102(a)(2) as being unpatentable over Graham-Cumming, US pat. No.9,984,166 in view of Ara Jo, US Pub. No.20150347248.

As to claim 1, Graham-Cumming discloses a computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN:

(A) in response to a request for content, determining if the content is cached locally, when it is determined that said content is cached locally, then: (B)(1) determining a current cache policy associated with the content (determining if the data request is locally available, see abstract, col.5 lines 17-55); and then

(B) (2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally, (B)(3) based on said determining in (B)(2), when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and when it is acceptable to serve the content that is cached locally, serving the content that is cached locally (determining and processing a new data version upon request, see col.5 line 56 to col.6 line 62).

Graham-Cumming does not specifically disclose determination by a node in a CDN. However, such teaching is discloses by Ara Jo (for example, using the content delivery networks that typically have one or more content nodes (CNs), or cache nodes, distributed across a large geographic region to provide faster and lower latency local access to the content for the end users, see abstract, fig.l, [0020] to [0024]). It would have been obvious to one of the ordinary skill in the art at the time the invention was made to implement Ara Jo's teachings into the computer system of Graham-Cumming to monitor data delivery because it would have enabled the content delivery network to act as a proxy to cache content delivery between origin servers and the end user devices.

As to claim 2, Graham-Cumming discloses (C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1) (see col.6 lines 4-55).

As to claim 3, Graham-Cumming discloses the request comprises an HTTP request and wherein the content comprises one or more resources (see col.3 lines 17-26).

As to claim 4, Graham-Cumming discloses the current cache policy is determined from a location distinct from the node (see col.5 line 27 to col.6 line 34).

As to claim 5, Graham-Cumming discloses the location is a database (see col.5 lines 17-55).

As to claim 6, Graham-Cumming discloses the cache policy relates to caching content within the CDN (see col. 1 lines 12-31 and col.5 lines 17-55).

As to claim 7, Graham-Cumming discloses the cache policy also relates to caching content outside the CDN (see col. 1 lines 12-31 and col.5 lines 17-55).

Claims 8-14 are rejected for the same reasons set forth in claims 1-7 respectively.

Response to Arguments

7. Applicant's arguments filed 4/25/2019 have been fully considered but they are not persuasive.

- Applicant asserts that the cited reference does not disclose determining if the content is cached locally, when it is determined that said content is cached locally, then: determining a current cache policy associated with the content and then determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally.

Examiner respectfully disagree. Examiner respectfully point out that Graham-Cumming determining if the content is cached locally, when it is determined that said content is cached locally, then determining a current cache policy (latest version identifier) associated with the content (determining if the data request is locally available, see abstract, col.5 lines 17-55) and then determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally (determining and processing a new data version or the latest version identified by the version identifier of the resource upon request locally, see col.5 line 56 to col.6 line 62).

- Applicant asserts that there is no clear determination of a node in a CDN.

Examiner respectfully point out that Ara Jo discloses determination by a node in a CDN (for example, Ara implement the content delivery networks that typically have one or more

content nodes (CNs), or cache nodes, for distributing across a large geographic region to provide faster and lower latency local access to the content for the end users, see abstract, fig.l, [0020] to [0024] as rejected above. Ara Jo discloses using a node to distribute and provide data access to the end users as claimed.

As a result, cited prior art does disclose a computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN, as broadly claimed by the Applicants. Applicants clearly have still failed to identify specific claim limitations that would define a clearly patentable distinction over prior art.

Conclusion

8. Claims 1-14 are rejected.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Dinh whose telephone number is (571) 272-3936. The examiner can normally be reached on Monday through Friday from 8:00 A.m. to 5:00 P.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Bates, can be reached on (571) 272-3980. The fax phone number for this group 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).

Any response to this action should be mailed to:

Commissioner for patents P O Box 1450 Alexandria, VA 22313-1450

/KHANH Q DINH/
Primary Examiner, Art Unit 2458

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	Art Unit
	KHANH Q DINH	2458

CPC - Searched*		
Symbol	Date	Examiner
H04L29/08072, G06F17/30902, H04L29/06	8/7/2017	KD

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	213, 217, 218, 220	8/7/2017	KD
updated searches		2/19/2018	KD

* 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
WEST, INVENTOR SEARCHES	8/7/2017	KD
west	01/22/2019	KD
updated searches	08/05/2019	KD

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

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	Art Unit
	KHANH Q DINH	2458

✓	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	08/07/2017	02/20/2018	01/22/2019	08/05/2019					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	✓					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	✓	✓					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Christopher Newton	Examiner:	Dinh, Khanh Q.
Serial No.:	15/588,935	Group Art Unit:	2458
Filed:	05/08/2017	Docket No.:	0492-US-C1
Title:	CACHING IN A CONTENT DELIVERY FRAMEWORK		

RESPONSE TO NON-FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents:

In response to the Non-Final Office Action mailed January 25, 2019, please consider the following:

Listing of the Claims begins on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Listing of Claims:

1. (Previously Presented) A computer-implemented method, operable with a content delivery network (CDN), the method comprising:

(A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally;

(B) when it is determined by the node that said content is cached locally, then:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

2. (Original) The method as recited in claim 1 further comprising:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

3. (Original) The method as recited in claim 1 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

4. (Original) The method as recited in claim 1 wherein the current cache policy is determined from a location distinct from the node.

5. (Original) The method as recited in claim 4 wherein the location is a database.

6. (Original) The method as recited in claim 1 wherein the cache policy relates to caching content within the CDN.

7. (Original) The method as recited in claim 6 wherein the cache policy also relates to caching content outside the CDN.

8. (Previously Presented) A computer program product having computer readable instructions stored on non-transitory computer readable media, the computer readable instructions including instructions for implementing a computer-implemented method, said method operable on a device comprising hardware including memory and at least one processor and running a service on said hardware, said method operable in a content delivery service (CDN), said method comprising:

(A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

9. (Original) The computer program product as recited in claim 8 wherein the method further comprises:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

10. (Original) The computer program product as recited in claim 8 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

11. (Original) The computer program product as recited in claim 8 wherein the current cache policy is determined from a location distinct from the node.

12. (Original) The computer program product as recited in claim 11 wherein the location is a database.

13. (Original) The computer program product as recited in claim 8 wherein the cache policy relates to caching content within the CDN.

14. (Original) The computer program product as recited in claim 13 wherein the cache policy also relates to caching content outside the CDN.

REMARKS/ARGUMENTS

This Response and the following remarks are intended to fully respond to the Non-Final Office Action dated January 25, 2019, hereinafter "Office Action." In that Office Action, claims 1-14 were examined and all claims were rejected. Claims 1-14 were rejected under 35 U.S.C. § 102(a)(2) and 103 as being unpatentable over Graham-Cumming (U.S. Patent No. 8,984,166; hereinafter "Graham-Cumming") in view of Araujo (U.S. Publication No. 2015/0347248; hereinafter "Araujo").

Reconsideration of these rejections, as they might apply to claims in view of these remarks, is respectfully requested. In this Response, no claims have been amended, canceled, or added. Therefore, claims 1-14 remain present for examination.

Double Patenting Rejection

Claims 1 and 8 were rejected on the ground of obviousness-type double patenting as being unpatentable over claims 1 and 9 of U.S. Patent No. 9,648,127. Without conceding the correctness of the rejection, Applicants will address this rejection if and when the present claims are indicated as otherwise allowable. Applicants reserve the right to submit a terminal disclaimer to overcome the double patenting rejection.

Claim Rejections Under § 103(a)

Claims 1-14 were rejected under 35 U.S.C. § 102(a)(2) and 103 as being unpatentable over Graham-Cumming in view of Araujo.

Applicants respectfully traverse the § 103(a) rejections because the Examiner failed to state a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, the references must teach or suggest each and every one of the claim elements to one of ordinary skill in the art at the time the invention was made. *See* MPEP §§ 2142, 2143.03; *In re Wilson*, 424 F.2d 1382, 1385 (C.C. P.A. 1970). In addition, *KSR International Company v. Teleflex, Inc.*, 127 S. Ct. 1727, 1741 (2007), requires that there "must be some *articulated reasoning with some rational underpinning* to support the legal conclusion of obviousness." (Emphasis added.) Further, "a patent composed of several elements is not proved obvious merely by demonstrating

that each of its elements was, independently, known in the prior art." *KSR Int'l Co.*, 127 S. Ct. at 1741. Specifically, the references fail to teach or suggest all of the claim elements. Applicants submit that Graham-Cumming fails to teach or suggest all of the claimed limitations and Araujo fails to compensate for the deficiencies of Graham-Cumming.

In nonexclusive, nonlimiting examples, the presently disclosed system permits late binding of caching policies in a content delivery network ("CDN"). In examples, when a node of the CDN receives a request for a resource, it determines whether the resource is stored locally. If it is stored locally, the node then determines if a current caching policy permits the node to serve the requested resource. If the current caching policy permits serving the resource that is cached locally, the node serves the resource. If not, the node requests a new version of the resource, and it serves the new version.

By contrast, Graham-Cumming is a system for minimizing data that must be sent across a CDN. In particular, a "near end network optimizer" receives a request for a resource. That request might only be received by the near end network optimizer, e.g., if a proxy server failed to serve the request because the resource has been set as "no-cache" by an origin server. The near end network optimizer then checks whether the resource is available locally. If it is not available locally, it requests the resource from a "far-end network optimizer," which may then retrieve it from the origin server. If it is available locally, the near-end network optimizer still does not serve the resource – rather, it includes the version number of its locally stored version of the resource in the request to the far end network optimizer. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client.

Turning specifically to the claims, Graham-Cumming does not disclose at least the following elements of claim 1 (emphasis added):

> 1. A computer-implemented method, operable with a content delivery network (CDN), the method comprising:

(A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally;

(B) **when it is determined by the node that said content is cached locally, then**:

(B)(1) **determining, by the node, a current cache policy associated with the content; and then**

(B)(2) **determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally**;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

Applicants initially note that claim 1 requires the claimed limitations to be performed by "a node," not an entire CDN. Further, it is not entirely clear from the Office Action what "node" the Office Action alleges performs all of the claimed limitations; however, it appears the Office Action is asserting that certain of the claimed method limitations are performed by the near end network optimizer and other limitations are performed by the far end network optimizer. Applicants respectfully disagree that the near end network optimizer and the far end network optimizer, even in combination, are disclosed to perform the claimed limitations and, even if they did, claim 1 requires that all of the limitations be performed by the same node.

Near End Optimizer of Graham-Cumming

First, the near end network optimizer does not "determin[e] that the content is stored locally" and "<u>then</u> determin[e] a current cache policy associated with the content," as claimed. There is no such late binding of a current cache policy. The Office Action cites solely to Col. 5, l. 17 through Col. 6, l. 62 of Graham-Cumming. The only reference in those sections of Graham-Cumming to a cache policy of any kind is that the resource may be been marked with a "no-

cache directive." (See, e.g., Col. 5, ll. 25-26, ll. 54-55, ll. 56-64.) However, the near end network optimizer does not, after determining that it has a copy of the requested resource, determine a current cache policy. In fact, it does not care what the cache policy is.

Rather, Graham-Cumming indicates that the near end network optimizer may only receive the request in the first place if the proxy server is unable to serve the request due to a no-cache policy. (See, e.g., Col. 5, ll. 22-26 ("The request may be received at the request module 122 as a result of a cache mechanism of the proxy server determining that the requested resource cannot be returned to the requesting client device (e.g., the resource has been set as 'no cache' . . . .).")

Second, the actions of the near end network optimizer do not depend on a determination by the near end network optimizer of the current cache policy. Rather, if the near end network optimizer does not have a copy of the resource at all, it simply requests it from the far end network optimizer. If it does have a copy of the resource, it still makes a request to the far end network optimizer, but this time it includes the version number of the resource copy that it stores locally. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client. (See Graham-Cumming, Col. 6, ll. 4-62.)

Indeed, the actions of the near end network optimizer are not dependent on the current cache policy. Either way, the near end network optimizer will seek the newest version from the far end network optimizer (either the complete version or the delta). In addition, the near end network optimizer stores what it gets back from the far end network optimizer regardless of whether the resource is tagged as "no-cache." This is so that the near end network optimizer can request the delta (instead of the whole resource) upon the next request for the resource from a client. (See, e.g., Col. 5, ll. 56-64.) As such, the near end network optimizer also does not "determin[e], based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed.

As such, the near end optimizer of Graham-Cumming does not disclose "determining that the content is stored locally" and "then determining a current cache policy associated with the content," or "determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed.

Far End Optimizer of Graham-Cumming

The far end optimizer disclosed in Graham-Cumming is equally deficient in meeting all of the elements of claim 1. As discussed with respect to the near end optimizer, the far end optimizer receives a request for content from the near end optimizer when the near end optimizer either (a) fails to have a copy of the content; or (b) has a copy of the content but is checking the version identifier of the copy stored at the near end optimizer. The far end optimizer sends either a full copy of the content (if the near end optimizer does not have a copy) or the delta between the version the near end optimizer already has and the latest version received from the origin server.

The Office Action continues to fail entirely to identify what it considers the "current cache policy" that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, no such policy is identified in the Office Action. Rather, the Office Action simply states in relation to element (B)(1) of claim 1: "determining if the data request is locally available, see abstract col. 5, lines 17-55." (Office Action at p. 4.) **This ignores entirely the claim element of (B)(1), which requires, after determining that the content is cached locally, "determining, by the node, a current cache policy associated with the content."** This late-binding of a current cache policy appears nowhere in Graham-Cumming. Nor does the Office Action point specifically to any such policy.

At most, the cited sections of Graham-Cumming state that the far end optimizer determines if it has requested content stored locally; however, the cited language still fails to identify any current cache policy that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, the only cache-related policy discussed

in the cited sections of Graham-Cumming is whether the content is subject to a no-cache directive. That "policy," however, would affect whether the near end optimizer and/or far end optimizer would cache the content in the first place. Such a no-cache directive of Graham-Cumming would not be determined by a node **after** it is determined that the node stores the content locally. Further, the no-cache directive would not be used to determine whether already-stored content could be served pursuant to the content request.

As such, neither the near end optimizer nor the far end optimizer of Graham-Cumming, alone or in combination, discloses or suggests all of the elements of claim 1. For at least these reasons, claim 1 is allowable over Graham-Cumming.

The Office Action indicates that Applicant's previous arguments (similar to the above) regarding Graham-Cumming "are persuasive." (Office Action at p. 5.) However, the Office Action now cites to Araujo. Applicants agree that Graham-Cumming is deficient for at least the reasons stated above, but Araujo is equally deficient.

It is unclear exactly how the Office Action is relying on Araujo. The Office Action (p. 4) simply states: "Graham-Cumming does not specifically disclose determination by a node in a CDN. However such teaching is discloses (sic) by Ara Jo (sic) (for example, using the **content delivery networks** that typically have one or more content **nodes** (CNs), or **cache nodes**, distributed across a large geographic region to provide faster and lower latency local access to the content for the end users, see abstract, fig. 1, [0020] to [0024])" (emphasis in original). It appears, then that the Office Action is relying on Araujo simply for the proposition that cache nodes in content delivery networks can be used to deliver content. Without conceding the correctness of the Office Action's characterizations of Araujo, such disclosure falls far short of making up for the considerable deficiencies of Graham-Cumming discussed above.

For example, Araujo discloses a content delivery network comprised of content nodes and a control node. The control node helps accommodate load balancing and failovers between content nodes. Nothing in the cited sections of Araujo, however, discloses any current cache policy that a node of Araujo (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is

acceptable. As such, Araujo fails to disclose at least the above-recited elements of claim 1 shown to be deficient in Graham-Cumming.

Similarly, claim 8 requires, *inter alia*:

(A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

For at least similar reasons as stated above, claim 8 is allowable over the cited references. All other claims depend from one of claims 1 and 8 and are allowable for at least similar reasons. Allowance of all claims is respectfully requested.

CONCLUSION

This Response fully responds to the Office Action mailed on January 25, 2019. Still, that Office Action may contain arguments and rejections that are not directly addressed by this Response due to the fact that they are rendered moot in light of the preceding arguments in favor of patentability. Hence, the failure, if any, of this Response to directly address an argument and/or comment raised in the Office Action should not be taken as an indication that the Applicant believes the argument and/or comment has merit. Additionally, the failure, if any, to address statements and/or comments made in the Office Action does not mean that the Applicants acquiesce to such statements and/or comments. Furthermore, the claims of the present application may include other elements, not discussed in this Response, which are not shown, taught, or otherwise suggested by the art of record. Accordingly, the preceding arguments in favor of patentability are advanced without prejudice to other bases of patentability.

It is believed that no further fees are due with this Response. However, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment with respect to this patent application to deposit account number 50-5063.

In light of the above remarks, it is believed that the application is now in condition for allowance and such action is respectfully requested.

Should any additional issues need to be resolved, the Examiner is requested to telephone David Wier at (720.888.3539), attorney-of-record, to attempt to resolve those issues.

Respectfully submitted,

Date: April 25, 2019

/Gregory D. Leibold/

Gregory D. Leibold, Reg. No. 36,408
MERCHANT & GOULD P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402-0903
(303) 357-1642

83579
PATENT TRADEMARK OFFICE

Electronic Acknowledgement Receipt

EFS ID:	35829556
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	Gregory D. Leibold/Michele Scocchera
Filer Authorized By:	Gregory D. Leibold
Attorney Docket Number:	0492-US-C1
Receipt Date:	25-APR-2019
Filing Date:	08-MAY-2017
Time Stamp:	13:07:49
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		Response.pdf	148397 672d8732e06039575b4c7217acd9fbe0c95a2269	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	12
Warnings:			
Information:			
	Total Files Size (in bytes):	148397	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/588,935	Filing Date 05/08/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/25/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

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

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

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

83579 7590 01/25/2019

LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

EXAMINER	
DINH, KHANH Q	

ART UNIT	PAPER NUMBER
2458	

NOTIFICATION DATE	DELIVERY MODE
01/25/2019	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No. 15/588,935	Applicant(s) Newton et al.	
	Examiner KHANH Q DINH	Art Unit 2458	AIA Status Yes

-- 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 7/30/18.

☐ 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) 1-14 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) 1-14 is/are rejected.

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

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

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

Application Papers

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

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

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

1. This is in response to the RCE filed on 7/30/18. Claims 1 -14 are presented for examination.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321 (c) or 1.321 (d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321 (b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon

submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

3. Claims 1 and 8 of the instant application are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over some claims of U.S. Patent No. 9,648,127.

Regarding claims 1 and 8, claims 1' and 9 of U.S. Patent No. 9,648,127 contain every element of claims 1 and 8 of the instant application and as such anticipate claims 1 and 8 of the instant application. The patent 9,648,127 does not specifically disclose determination by a node in a CDN. However, such teaching is discloses by Ara Jo (for example, using the **content delivery networks** that typically have one or more content **nodes** (CNs), or **cache nodes,** distributed across a large geographic region to provide faster and lower latency **local** access to the content for the end users, see abstract, fig.1, [0020] to [0024]). It would have been obvious to one of the ordinary skill in the art at the time the invention was made to implement Ara Jo's teachings into the computer system of Graham-Cumming to monitor data delivery because it would have enabled the content delivery network to act as a proxy to cache content delivery between origin servers and the end user devices.

Claim Rejections - 35 USC §103

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention

and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim(s) 1-14 are rejected under 35 U.S.C. 102(a)(2) as being unpatentable over Graham-Cumming, US pat. No.9,984,166 in view of Ara Jo, US Pub. No.20150347248.

As to claim 1, Graham-Cumming discloses a computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN:

(A) in response to a request for content, determining if the content is cached locally, when it is determined that said content is cached locally, then: (B)(1) determining a current cache policy associated with the content (determining if the data request is locally available, see abstract, col.5 lines 17-55); and then

(B) (2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally, (B)(3) based on said determining in (B)(2), when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and when it is acceptable to serve the content that is cached locally, serving the content that is cached locally (determining and processing a new data version upon request, see col.5 line 56 to col.6 line 62).

Graham-Cumming does not specifically disclose determination by a node in a CDN. However, such teaching is discloses by Ara Jo (for example, using the **content delivery networks** that typically have one or more content **nodes** (CNs), or **cache nodes,** distributed across a large geographic region to provide faster and lower latency **local** access to the content for the end users, see abstract, fig.1, [0020] to [0024]). It would have been obvious to one of the ordinary skill in the art at the time the invention was made to implement Ara Jo's teachings into the computer system of Graham-Cumming to monitor data delivery because it would have enabled the content delivery network to act as a proxy to cache content delivery between origin servers and the end user devices.

As to claim 2, Graham-Cumming discloses (C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1) (see col.6 lines 4-55).

As to claim 3, Graham-Cumming discloses the request comprises an HTTP request and wherein the content comprises one or more resources (see col.3 lines 17-26).

As to claim 4, Graham-Cumming discloses the current cache policy is determined from a location distinct from the node (see col.5 line 27 to col.6 line 34).

As to claim 5, Graham-Cumming discloses the location is a database (see col.5 lines 17-55).

As to claim 6, Graham-Cumming discloses the cache policy relates to caching content within the CDN (see col. 1 lines 12-31 and col.5 lines 17-55).

As to claim 7, Graham-Cumming discloses the cache policy also relates to caching content outside the CDN (see col. 1 lines 12-31 and col.5 lines 17-55).

Claims 8-14 are rejected for the same reasons set forth in claims 1-7 respectively.

Response to Arguments

6. Applicant's arguments, filed 7/30/18 with respect to the rejection(s) of claim(s) under 35 USC 102 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

However, upon further consideration, a new ground(s) of rejection is made in view of Ara Jo, US Pub. No.20150347248.

Conclusion

7. Claims 1-14 are rejected.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Dinh whose telephone number is (571) 272-3936. The examiner can normally be reached on Monday through Friday from 8:00 A.m. to 5:00 P.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Bates, can be reached on (571) 272-3980. The fax phone number for this group 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).

Any response to this action should be mailed to:

Commissioner for patents P O Box 1450 Alexandria, VA 22313-1450

/KHANH Q DINH/
Primary Examiner, Art Unit 2458

Notice of References Cited	Application/Control No. 15/588,935	Applicant(s)/Patent Under Reexamination Newton et al.	
	Examiner KHANH Q DINH	Art Unit 2458	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-20150347248-A1	12-2015	Ara jo; Joao Diogo Taveira	G06F11/2023	714/4.11
*	B	US-20150334094-A1	11-2015	Suresh; Rangan V.	H04L63/0471	713/153
*	C	US-20150333930-A1	11-2015	Aysola; Ravi S.	H04L63/0471	370/392
*	D	US-20140365683-A1	12-2014	Bergman; Artur	H04L45/34	709/238
*	E	US-20140245359-A1	08-2014	De Foy; Xavier	H04W36/0011	725/62
*	F	US-9678841-B2	06-2017	Ara jo; Joao Diogo Taveira	G06F11/2023	1/1
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	Art Unit
	KHANH Q DINH	2458

CPC - Searched*		
Symbol	Date	Examiner
H04L29/08072, G06F17/30902, H04L29/06	8/7/2017	KD

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
709	213, 217, 218, 220	8/7/2017	KD
updated searches		2/19/2018	KD

* 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
WEST, INVENTOR SEARCHES	8/7/2017	KD
west	01/22/2019	KD

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

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/588,935	Newton et al.
	Examiner	Art Unit
	KHANH Q DINH	2458

✓	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	08/07/2017	02/20/2018	01/22/2019						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	✓						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	✓						
	14	✓	✓	✓						

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2458
Examiner Name	Khanh Q. Dinh

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS					
Examiner Initial *	**Cite No**	**Document Number**	**Publication Date**	**Name of Patentee or Applicant of Cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear
		20120215779	Aug 23, 2012	Lipstone, Laurence R.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	**Cite No**	**Foreign Patent Document**	**Publication Date**	**Name of Patentee or Applicant of cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	**T[2]**

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	**Cite No [1]**	**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, page(s), volume-issue number(s), publisher, city and/or country where published.**	**T[2]**
		Extended European Search Report, dated May 3, 2018, Application No. 15870782.8, filed December 14, 2015; Dkt. No. 0492-EP-01 , 7 pgs.	

EXAMINER /KHANH Q DINH/ **DATE CONSIDERED** 01/22/2019

Substitute Disclosure Statement Form (PTO-1449)

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional) 2 Applicant is to place a check mark here if English language Translation is attached

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.Q.D/ 196

MENU

Refine Search

Search Results

Term	Documents
@AD	135948141
(25 AND (@AD < "20150215")).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS.	43
(L25 and @ad<20150215).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS.	43

Database: US Pre-Grant Publication Full-Text Database; US Patents Full-Text Database; US Patents OCR Backfile; EPO Abstracts Database; JPO Abstracts Database; Derwent World Patents Index; IBM Technical Disclosure Bulletin Database

Search Type: ⊙ Prior Art ○ Interference

Search: L26 Refine Search

Order By: ⊙ Date ○ Hits

Recall Text Clear Interrupt

Search History

DATE: Tuesday, January 22, 2019 Purge Queries Printable Copy Create Case

Order By	Set Name Side by Side	Query	Hit Count	Set Name Result Set	Set Name Grid	Set Name Classification
Prior Art Searches						
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS; PLUR=YES; OP=ADJ					
Date	L26	L25 and @ad<20150215	43	L26	L26	L26
Date	L25	(content delivery network) same server same node same cache same local$4	91	L25	L25	L25
Date	L24	L23 and @ad<20150215	199	L24	L24	L24
Date	L23	(content delivery network) same server same node same cache	331	L23	L23	L23
Date	L22	(content delivery network) same server same node	1693	L22	L22	L22
Date	L21	content delivery network	19562	L21	L21	L21
Date	L20	L19 and node	2	L20	L20	L20
Date	L19	9984166.pn.	2	L19	L19	L19
Date	L18	9648127.pn.	3	L18	L18	L18
	L17	L16 and L11	18	L17	L17	L17
	L16	L7 and (h04l29/06 or ho4l29/08072)	115	L16	L16	L16
	L15	L3 and (h04l29/06 or ho4l29/08072)	5922	L15	L15	L15
	L14	L13 and L6	4	L14	L14	L14
	L13	cache policy same check$4	193	L13	L13	L13
	L12	L11 and L6	57	L12	L12	L12
	L11	L10 and L4	57	L11	L11	L11
	L10	L6 and L3	524	L10	L10	L10
	L9	L8 and L6	0	L9	L9	L9
	L8	L7 and L5	21	L8	L8	L8
	L7	L3 and L4	365	L7	L7	L7
	L6	new version same content	7159	L6	L6	L6
	L5	cache policy	2773	L5	L5	L5
	L4	check$4 same local cache	4410	L4	L4	L4
	L3	content delivery network or cdn	31286	L3	L3	L3
	L2	L1 and http	1	L2	L2	L2
	L1	8984166.pn.	2	L1	L1	L1

END OF SEARCH HISTORY

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/588,935	Filing Date 05/08/2017	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

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

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)		
	07/30/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0	X $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
NICOLE NICHOLSON

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

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

PTO/SB/30EFS (02-18)
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15588935	Filing Date	2017-05-08	Docket Number (if applicable)	0492-US-C1	Art Unit	2458
First Named Inventor	Christopher Newton			Examiner Name	Khanh Q. Dinh		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 505063

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

X Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. 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.

Signature of Registered U.S. Patent Practitioner			
Signature	/Gregory D. Leibold/	Date (YYYY-MM-DD)	2018-07-30
Name	Gregory D. Leibold	Registration Number	36408

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	15588935
Filing Date:	08-May-2017
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Filer:	Gregory D. Leibold/Michele Scocchera
Attorney Docket Number:	0492-US-C1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1300	1300
		Total in USD ($)		**1300**

Electronic Acknowledgement Receipt

EFS ID:	33319741
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	Gregory D. Leibold/Michele Scocchera
Filer Authorized By:	Gregory D. Leibold
Attorney Docket Number:	0492-US-C1
Receipt Date:	30-JUL-2018
Filing Date:	08-MAY-2017
Time Stamp:	15:51:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1300
RAM confirmation Number	073118INTEFSW15523000
Deposit Account	132725
Authorized User	Michele Scocchera

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Amendment_and_Response.pdf	147816 afed073ebeb2de00b60de1272c61edf6b350d631	yes	13
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Response After Final Action		1	1	
	Claims		2	5	
	Applicant Arguments/Remarks Made in an Amendment		6	13	
Warnings:					
Information:					
2	Request for Continued Examination (RCE)	RCE.PDF	1349931 a06b8f840dab72506dc60924d152b934512d0761	no	3
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30502 cf58dd03aee4b1e0e1d7a51320ef2b8713c89a65	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1528249		

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Christopher Newton	Examiner:	Dinh, Khanh Q.
Serial No.:	15/588,935	Group Art Unit:	2458
Filed:	05/08/2017	Docket No.:	0492-US-C1
Title:	CACHING IN A CONTENT DELIVERY FRAMEWORK		

AMENDMENT & RESPONSE TO FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents:

In response to the Final Office Action mailed February 26, 2018, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1. (Currently Amended) A computer-implemented method, operable with a content delivery network (CDN), the method comprising~~, by a node in the CDN~~:

(A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally;

(B) when it is determined by the node that said content is cached locally, then:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

2. (Original) The method as recited in claim 1 further comprising:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

3. (Original) The method as recited in claim 1 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

4. (Original) The method as recited in claim 1 wherein the current cache policy is determined from a location distinct from the node.

5. (Original) The method as recited in claim 4 wherein the location is a database.

6. (Original) The method as recited in claim 1 wherein the cache policy relates to caching content within the CDN.

7. (Original) The method as recited in claim 6 wherein the cache policy also relates to caching content outside the CDN.

8. (Currently Amended) A computer program product having computer readable instructions stored on non-transitory computer readable media, the computer readable instructions including instructions for implementing a computer-implemented method, said method operable on a device comprising hardware including memory and at least one processor and running a service on said hardware, said method operable in a content delivery service (CDN), said method comprising:

(A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

9. (Original) The computer program product as recited in claim 8 wherein the method further comprises:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

10. (Original) The computer program product as recited in claim 8 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

11. (Original) The computer program product as recited in claim 8 wherein the current cache policy is determined from a location distinct from the node.

12. (Original) The computer program product as recited in claim 11 wherein the location is a database.

13. (Original) The computer program product as recited in claim 8 wherein the cache policy relates to caching content within the CDN.

14. (Original) The computer program product as recited in claim 13 wherein the cache policy also relates to caching content outside the CDN.

REMARKS/ARGUMENTS

This Amendment and the following remarks are intended to fully respond to the Final Office Action dated February 26, 2018, hereinafter "Office Action." In that Office Action, claims 1-14 were examined and all claims were rejected. Claims 1-14 were rejected under 35 U.S.C. § 102(a)(2) as allegedly anticipated by Graham-Cumming (U.S. Patent No. 9,984,166; hereinafter "Graham-Cumming").

Reconsideration of these rejections, as they might apply to the original and amended claims in view of these remarks, is respectfully requested. In this Amendment, claims 1 and 8 have been amended, and no claims have been added or canceled. Therefore, claims 1-14 remain present for examination.

Applicants submit that claim amendments are supported throughout the specification, and in the claims as originally filed, and do not introduce new matter. For instance, the amendments are supported by at least the following sections of the Specification: paras. 0044-45.

Double Patenting Rejection

Claims 1 and 8 were rejected on the ground of obviousness-type double patenting as being unpatentable over claims 1 and 9 of U.S. Patent No. 9,648,127. Without conceding the correctness of the rejection, Applicants will address this rejection if and when the present claims are indicated as otherwise allowable. Applicants reserve the right to submit a terminal disclaimer to overcome the double patenting rejection.

Claim Rejections under 35 U.S.C. § 102(a)

Claims 1-14 were rejected under 35 U.S.C. § 102(a) as allegedly anticipated by Graham-Cumming. Applicants respectfully traverse this rejection because either the Examiner failed to state a *prima facie* case of anticipation or the current amendments to the claims now render the Examiner's arguments moot. "Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim." *Lindemann Mashinenfabrik GmbH v. Am. Hoist & Derrick Co.,* 730 F.2d 1452, 1458 (Fed. Cir.

1984); *see also,* MPEP § 2131. Applicants submit that the cited reference does not disclose all of the elements of the rejected claims.

In nonexclusive, nonlimiting examples, the presently disclosed system permits late binding of caching policies in a content delivery network ("CDN"). In examples, when a node of the CDN receives a request for a resource, it determines whether the resource is stored locally. If it is stored locally, the node then determines if a current caching policy permits the node to serve the requested resource. If the current caching policy permits serving the resource that is cached locally, the node serves the resource. If not, the node requests a new version of the resource, and it serves the new version.

By contrast, Graham-Cumming is a system for minimizing data that must be sent across a CDN. In particular, a "near end network optimizer" receives a request for a resource. That request might only be received by the near end network optimizer, e.g., if a proxy server failed to serve the request because the resource has been set as "no-cache" by an origin server. The near end network optimizer then checks whether the resource is available locally. If it is not available locally, it requests the resource from a "far-end network optimizer," which may then retrieve it from the origin server. If it is available locally, the near-end network optimizer still does not serve the resource – rather, it includes the version number of its locally stored version of the resource in the request to the far end network optimizer. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client.

Turning specifically to the claims, Graham-Cumming does not disclose at least the following elements of claim 1 (emphasis added):

> 1. A computer-implemented method, operable with a content delivery network (CDN), the method comprising:
>
> (A) in response to a request for content, determining, by a node in the CDN, if the content is cached locally;

(B) **when it is determined by the node that said content is cached locally, then**:

(B)(1) **determining, by the node, a current cache policy associated with the content; and then**

(B)(2) **determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally**;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

Applicants initially note that claim 1 requires the claimed limitations to be performed by "a node," not an entire CDN. Further, it is not entirely clear from the Office Action what "node" the Office Action alleges performs all of the claimed limitations; however, it appears the Office Action is asserting that certain of the claimed method limitations are performed by the near end network optimizer and other limitations are performed by the far end network optimizer. Applicants respectfully disagree that the near end network optimizer and the far end network optimizer, even in combination, are disclosed to perform the claimed limitations and, even if they did, amended claim 1 requires that all of the limitations be performed by the same node of the CDN.

Near End Optimizer of Graham-Cumming

First, the near end network optimizer does not "determin[e] that the content is stored locally" and "then determin[e] a current cache policy associated with the content," as claimed. There is no such late binding of a current cache policy. The Office Action cites solely to Col. 5, l. 17 through Col. 6, l. 62 of Graham-Cumming. The only reference in those sections of Graham-Cumming to a cache policy of any kind is that the resource may be been marked with a "no-cache directive." (See, e.g., Col. 5, ll. 25-26, ll. 54-55, ll. 56-64.) However, the near end network

optimizer does not, after determining that it has a copy of the requested resource, determine a current cache policy. In fact, it does not care what the cache policy is.

Rather, Graham-Cumming indicates that the near end network optimizer may only receive the request in the first place if the proxy server is unable to serve the request due to a no-cache policy. (See, e.g., Col. 5, ll. 22-26 ("The request may be received at the request module 122 as a result of a cache mechanism of the proxy server determining that the requested resource cannot be returned to the requesting client device (e.g., the resource has been set as 'no cache' . . . .).")

Further, the actions of the near end network optimizer do not depend on a determination by the near end network optimizer of the current cache policy. Rather, if the near end network optimizer does not have a copy of the resource at all, it simply requests it from the far end network optimizer. If it does have a copy of the resource, it still makes a request to the far end network optimizer, but this time it includes the version number of the resource copy that it stores locally. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client. (See Graham-Cumming, Col. 6, ll. 4-62.)

Indeed, the actions of the near end network optimizer are not dependent on the current cache policy. Either way, the near end network optimizer will seek the newest version from the far end network optimizer (either the complete version or the delta). In addition, the near end network optimizer stores what it gets back from the far end network optimizer regardless of whether the resource is tagged as "no-cache." This is so that the near end network optimizer can request the delta (instead of the whole resource) upon the next request for the resource from a client. (See, e.g., Col. 5, ll. 56-64.) As such, the near end network optimizer also does not "determin[e], based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed.

Far End Optimizer of Graham-Cumming

The far end optimizer disclosed in Graham-Cumming is equally deficient in meeting all of the elements of claim 1. As discussed with respect to the near end optimizer, the far end optimizer receives a request for content from the near end optimizer when the near end optimizer either (a) fails to have a copy of the content; or (b) has a copy of the content but is checking the version identifier of the copy stored at the near end optimizer. The far end optimizer sends either a full copy of the content (if the near end optimizer does not have a copy) or the delta between the version the near end optimizer already has and the latest version received from the origin server.

The Office Action continues to fail entirely to identify what it considers the "current cache policy" that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, no such policy is identified in the Office Action. Rather, the Office Action simply states in relation to element (B)(1) of claim 1: "determining if the data request is locally available, see abstract col. 5, lines 17-55." (Office Action at p. 4.) This ignores entirely the claim element of (B)(1), which requires, after determining that the content is cached locally, "determining, by the node, a current cache policy associated with the content." This late-binding of a current cache policy appears nowhere in Graham-Cumming. Nor does the Office Action point specifically to any such policy.

In the Response to Arguments section of the Office Action, the Office Action again ignores the claim language:

> For example, Graham-Cumming discloses "in response to a request for content, determining if the content is cached locally, when it is determined that the content is cached locally, then (B)(1) determining a current cache policy associated with the content and then (B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally (i.e., the request module 142 has access to the identified resource version if that version of the resource can be reconstructed using the stored differences between versions of a resource. If the request module 142 does not have access to that version then the far end network optimizer 140 makes a request to the origin server for the requested resource, or if **locally** available, the far end network optimizer 140 accesses the **local** version), updates its dynamic dictionary 144 to include the latest version of the resource, and replies to the

near end network optimizer with the requested resource, see col. 5, lines 17-55 and col. 6 lines 3-47.

(Office Action at p. 7 (emphasis in original).)

At most, this language indicates that the far end optimizer of Graham-Cumming determines if it has requested content stored locally; however, the quoted language still fails to identify any current cache policy that a node of Graham-Cumming (a) determines after it is determined that the node has the content cached locally and (b) uses to determine whether serving the locally cached content is acceptable. Indeed, the only cache-related policy discussed in the cited sections of Graham-Cumming is whether the content is subject to a no-cache directive. That "policy," however, would affect whether the near end optimizer and/or far end optimizer would cache the content in the first place. Such a no-cache directive of Graham-Cumming would not be determined by a node after it is determined that the node stores the content locally. Further, the no-cache directive would not be used to determine whether already-stored content could be served pursuant to the content request.

As such, neither the near end optimizer nor the far end optimizer of Graham-Cumming, alone or in combination, discloses or suggests all of the elements of claim 1. For at least these reasons, claim 1 is allowable over Graham-Cumming.

Similarly, claim 8 requires, *inter alia*:

(A) in response to a request for content, determining, by a node of the CDN, if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining, by the node, a current cache policy associated with the content; and then

(B)(2) determining, by the node and based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining, by the node, a new version of the content and then serving, by the node, the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving, by the node, the content that is cached locally.

For at least similar reasons as stated above, claim 8 is allowable over Graham-Cumming. All other claims depend from one of claims 1 and 8 and are allowable for at least similar reasons. Allowance of all claims is respectfully requested.

CONCLUSION

This Amendment fully responds to the Office Action mailed on February 26, 2018. Still, that Office Action may contain arguments and rejections that are not directly addressed by this Amendment due to the fact that they are rendered moot in light of the preceding arguments in favor of patentability. Hence, the failure, if any, of this Amendment and Response to directly address an argument and/or comment raised in the Office Action should not be taken as an indication that the Applicant believes the argument and/or comment has merit. Additionally, the failure, if any, to address statements and/or comments made in the Office Action does not mean that the Applicants acquiesce to such statements and/or comments. Furthermore, the claims of the present application may include other elements, not discussed in this Amendment and Response, which are not shown, taught, or otherwise suggested by the art of record. Accordingly, the preceding arguments in favor of patentability are advanced without prejudice to other bases of patentability.

This Amendment and Response is filed with a Request for Continued Examination. It is believed that no further fees are due with this Response. However, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment with respect to this patent application to deposit account number 50-5063. In light of the above remarks and amendments, it is believed that the application is now in condition for allowance and such action is respectfully requested.

Should any additional issues need to be resolved, the Examiner is requested to telephone David Wier at (720.888.3539), attorney-of-record, to attempt to resolve those issues.

Respectfully submitted,

Date: July 30, 2018

/Gregory D. Leibold/

Gregory D. Leibold, Reg. No. 36,408
MERCHANT & GOULD P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402-0903
(303) 357-1642

83579
PATENT TRADEMARK OFFICE

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2458
Examiner Name	Khanh Q. Dinh

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS

Examiner Initial *	Cite No	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear
		20120215779	Aug 23, 2012	Lipstone, Laurence R.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Extended European Search Report, dated May 3, 2018, Application No. 15870782.8, filed December 14, 2015; Dkt. No. 0492-EP-01 , 7 pgs.	

EXAMINER **DATE CONSIDERED**

Substitute Disclosure Statement Form (PTO-1449)
* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional) [2] Applicant is to place a check mark here if English language Translation is attached

Electronic Patent Application Fee Transmittal

Application Number:	15588935
Filing Date:	08-May-2017
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Filer:	David Dewey Wier/Kathleen McInnish
Attorney Docket Number:	0492-US-C1

Filed as Large 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($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
		Total in USD ($)		**240**

Electronic Acknowledgement Receipt

EFS ID:	32739424
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	29-MAY-2018
Filing Date:	08-MAY-2017
Time Stamp:	11:54:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$240
RAM confirmation Number	052918INTEFSW11543700
Deposit Account	505063
Authorized User	Kathleen McInnish

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

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	492USC1_IDS.pdf	37623 0eac15c0f89bf156f47b1c03d09bf6b12493399f	no	5
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	492USC1_sb08.pdf	29584 8f60dfbadfb17383761a7cdf79255f6824320813	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	EP_158707828_EESR_3May18_492EP01.pdf	246490 26b3ffd667f98db5c276a70fea6602d72a905586	no	7
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30711 c30a726cf47b5a5e625be71a4d3aa3725ac0b98d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	344408		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/588,935	Confirmation No.	:	2851
First Applicant	:	NEWTON, et al.	Art Unit	:	2458
Filed	:	May 8, 2017	Examiner	:	Khanh Q. Dinh
Title	:	CACHING IN A CONTENT DELIVERY FRAMEWORK			
Docket No.	:	0492-US-C1			

Submitted Via EFS-Web

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT PURSUANT TO 37 C.F.R. §§ 1.56, 1.97, AND 1.98

Sir:

The Examiner is respectfully requested to consider the patents, patent applications, publications, or other information cataloged on the enclosed Form (e.g., PTO-1449, PTO-892, PTO/SB/08, etc.) during examination of the above-identified patent application. The order of presentation of the references should not be construed as an indication of importance. These references are submitted for the Examiner's consideration and are submitted pursuant to an Applicant's duty of disclosure under 37 C.F.R. § 1.56.

Copies of all of the cited documents:

☐ are enclosed unless otherwise indicated on the enclosed Form PTO/SB/08a.

☐ have been previously furnished to the Office in prior application No. __, filed ___, which the present application relies upon for an earlier effective filing date under 35 U.S.C. § 120. Therefore, no copies of the cited documents are included herewith pursuant to 37 C.F.R. § 1.98(d); MPEP § 609(III)(A)(2).

☒ are enclosed unless they are U.S. patents or U.S. patent application publications pursuant to 37 C.F.R. § 1.98(a).

I
BASIS

This information disclosure statement is filed pursuant to

☐ 37 C.F.R. § 1.97(b).
This information disclosure statement is filed either (1) within three months of the filing date of a national application other than a continued prosecution application under 37 C.F.R. § 1.53(d); (2) within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application; (3) before the mailing date of a first Office action on the merits; (4) concurrently with the filing of a request for continued examination under 37 C.F.R. § 1.114; or (5) before the mailing of a first Office action after the filing of a request for continued examination under 37 C.F.R. § 1.114, whichever event occurs last.

Accordingly, this information disclosure statement requires no fee and no certification.

☐ 37 C.F.R. § 1.97(c).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing date of any of (1) a final action under 37 C.F.R. § 1.113; (2) a notice of allowance under 37 C.F.R. § 1.311; or (3) an action that otherwise closes prosecution in the application.

Accordingly, this information disclosure statement requires either the fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c), or a statement under 37 C.F.R. § 1.97(e).

☒ 37 C.F.R. § 1.97(d).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(c) since a:

☒ final action under 37 C.F.R. § 1.113

☐ notice of allowance under 37 C.F.R. § 1.311

was mailed to the Applicant on February 26, 2018.

Accordingly, this information disclosure statement requires the fee set forth in 37 C.F.R. § 1.17(p) to consider an information disclosure statement under 37 C.F.R. § 1.97(d), and a statement under 37 C.F.R. § 1.97(e).

If this statement crosses in the mail with an Office action, or is otherwise not in the indicated category of 37 C.F.R. § 1.97, it is respectfully requested that this statement be treated in the next appropriate category and made of record. To the extent required, please treat this paper as a conditional petition for acceptance of the information disclosure statement.

II
FEES

Any required fee is being paid as indicated below:

☐ No fee is due.

☒ The $240 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☒ This fee is paid by credit card.

☐ Please charge the required fee to Deposit Account No. 505063.

☒ The Commissioner is hereby authorized to charge any additional required fees or credit any overpayments associated with this information disclosure statement to the account.

III

CERTIFICATION

Pursuant to 37 C.F.R. § 1.97(e), I state as follows:

☐ No statement is necessary.

☒ Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(1).

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to my knowledge after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(2).

Pursuant to 37 C.F.R. § 1.704(d), I state as follows:

☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of this information disclosure statement.

IV
FOREIGN LANGUAGE REFERENCES

Pursuant to 37 C.F.R. § 1.98(a)(3)(i), any information disclosure statement filed under 37 C.F.R. § 1.97 shall include a concise explanation of the relevance, as it is presently understood by the individual designated in § 1.56(c) most knowledgeable about the content of the information, of each patent, publication, or other information listed that is not in the English language. The concise explanation may be either separate from the specification or incorporated therein. In compliance with the rules, the Applicant states as follows:

☐ No concise explanation is required since all cited references are in English.

☐ A concise explanation of the relevance of one or more foreign language references is attached.

☐ According to the procedural policy adopted by the PTO with regard to disclosure requirements, the Applicant is satisfying the disclosure requirement pursuant to MPEP § 609.04(a)(III) by submitting herewith the following:

- ☐ English language versions of any non-English language documents.
- ☐ English language versions of one or more search reports or other actions by one or more foreign patent offices in one or more counterpart foreign applications, which indicate the degree of relevance found by the foreign office(s).
- ☐ Pursuant to 37 C.F.R. § 1.98(a)(3)(ii), a copy of a translation is not submitted herewith because a written English-language translation of a non-English-language document, or portion thereof, is not within the possession, custody, or control of, or is readily available to any individual designated in § 1.56(c).

The Applicant has not analyzed these documents and, therefore, declines to comment on their relevance at this time.

☐ One or more English language abstracts for the non-English language references are also enclosed.

V
REMARKS

It is respectfully requested that:

(1) The Examiner sign the enclosed Form to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application; and

(2) The citations for the cited information be printed on any patent that issues from this application.

The submission of this information disclosure statement by the Applicant shall not be construed as a representation that a search has been performed or that no other material information under 37 C.F.R. § 1.56 exists. See 37 C.F.R. § 1.97(g).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, material to the patentability of one or more of the pending claims in this application pursuant to 37 C.F.R. § 1.56(b), unless specifically designated by the Applicant as such. See 37 C.F.R. § 1.97(h).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, or even qualifies as "prior art" under 35 U.S.C. § 102 with respect to this invention, unless specifically designated by the Applicant as such.

Notwithstanding any statements by the Applicant, the Examiner is urged to form his or her own conclusion regarding the relevance of the cited information.

VI
CONCLUSION

The Examiner is encouraged to contact the undersigned attorney to discuss any questions concerning this information disclosure statement or any of the information cited or referred to herein.

Respectfully submitted,

Date: May 29, 2018

/JCS/

Jonathan C. Siekmann, Reg. No. 58,259
USPTO Customer No. 83579
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-2140
Fax: 720-888-5619

PTO/AIA/31 (03-14)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD

Docket Number (Optional): 0492-US-C1

I hereby certify that this correspondence is being facsimile transmitted to the USPTO, EFS-Web transmitted to the USPTO, or deposited with the United States Postal Service with sufficient postage in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, on Alexandria, VA 22313-1450" [37 CFR 1.8(a)]

on _____.

Signature _____

Typed or printed name _____

In re Application of: Christopher Newton et al.

Application Number	Filed
15/588,935	May 8, 2017

For: CACHING IN A CONTENT DELIVERY FRAMEWORK

Art Unit	Examiner
2458	Khanh Q. DINH

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 800

☐ Applicant asserts small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by 50%, and the resulting fee is: $ _____

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Therefore, the fee shown above is reduced by 75%, and the resulting fee is: $ _____
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

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

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 50-5063.

☑ Payment made via EFS-Web.

☐ A petition for an extension of time under 37 CFR 1.136(a) (PTO/AIA/22 or equivalent) is enclosed.
For extensions of time in reexamination proceedings, see 37 CFR 1.550.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant

☑ attorney or agent of record
Registration number 58,259

☐ attorney or agent acting under 37 CFR 1.34
Registration number _____

Signature /JCS/

Typed or printed name Jonathan C. Siekmann

Telephone Number 720-888-2140

Date May 29, 2018

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 41.20(b)(1) and 41.31. 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, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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:	15588935
Filing Date:	08-May-2017
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0492-US-C1

Filed as Large 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:				
NOTICE OF APPEAL	1401	1	800	800
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**800**

Electronic Acknowledgement Receipt

EFS ID:	32749884
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	29-MAY-2018
Filing Date:	08-MAY-2017
Time Stamp:	18:49:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$800
RAM confirmation Number	053018INTEFSW18492300
Deposit Account	
Authorized User	

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Notice of Appeal Filed	aia0031.pdf	248904 a3acdfdc98006f9d466ef06a5edae4f2c8517de4	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30706 b40870a20e8c2a377d00c879ea04ff9f3ea55c1a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	279610		

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New Applications Under 35 U.S.C. 111

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

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

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

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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
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

83579 7590 02/26/2018

LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

EXAMINER
DINH, KHANH Q

ART UNIT	PAPER NUMBER
2458	

NOTIFICATION DATE	DELIVERY MODE
02/26/2018	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No. 15/588,935	Applicant(s) NEWTON ET AL.	
	Examiner KHANH DINH	Art Unit 2458	AIA (First Inventor to File) Status Yes

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

Period for Reply

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

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

Status

1)☒ Responsive to communication(s) filed on *11/17/17*.

☐ 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) *1-14* 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) *1-14* is/are rejected.

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

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

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

Application Papers

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

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

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

2. This is in response to the Remarks filed on 11/17/17. Claims 1-14 are presented for examination.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

4. Claims 1 and 8 of the instant application are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over some claims of U.S. Patent No. 9,648,127.

Regarding claims 1 and 8, claims 1` and 9 of U.S. Patent No. 9,648,127 contain every element of claims 1 and 8 of the instant application and as such anticipate claims 1 and 8 of the instant application.

Claim Rejections - 35 USC § 102

5. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

7. Claim(s) 1-14 are rejected under 35 U.S.C. 102(a)(2) as being anticipated by Graham-Cumming, US pat. No.9,984,166.

As to claim 1, Graham-Cumming discloses a computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN:

(A) in response to a request for content, determining if the content is cached locally, when it is determined that said content is cached locally, then: (B)(1) determining a current cache policy associated with the content (determining if the data request is locally available, see abstract, col.5 lines 17-55); and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally, (B)(3) based on said determining in (B)(2), when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and when it is acceptable to serve the content that is cached locally, serving the content that is cached locally (determining and processing a new data version upon request, see col.5 line 56 to col.6 line 62).

As to claim 2, Graham-Cumming discloses (C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1) (see col.6 lines 4-55).

As to claim 3, Graham-Cumming discloses the request comprises an HTTP request and wherein the content comprises one or more resources (see col.3 lines 17-26).

As to claim 4, Graham-Cumming discloses the current cache policy is determined from a location distinct from the node (see col.5 line 27 to col.6 line 34).

As to claim 5, Graham-Cumming discloses the location is a database (see col.5 lines 17-55).

As to claim 6, Graham-Cumming discloses the cache policy relates to caching content within the CDN (see col.1 lines 12-31 and col.5 lines 17-55).

As to claim 7, Graham-Cumming discloses the cache policy also relates to caching content outside the CDN (see col.1 lines 12-31 and col.5 lines 17-55).

Claims 8-14 are rejected for the same reasons set forth in claims 1-7 respectively.

Response to Arguments

8. Applicant's arguments filed 11/17/18 have been fully considered but they are not persuasive.

- Applicant asserts that the cited reference does not disclose “a computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN”.

In response to applicant's arguments, the recitation "a computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN “ has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

- Applicant further asserts that the cited reference does not disclose "in response to a request for content, determining if the content is cached locally, when it is determined that said content is cached locally, then: (B)(1) determining a current cache policy associated with the content and then (B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally”.

Examiner respectfully disagree. Examiner respectfully point out that Graham-Cumming discloses the Applicant's claimed invention. For example, Graham-Cumming discloses "in response to a request for content, determining if the content is cached locally, when it is determined that said content is cached locally, then: (B)(1) determining a current cache policy associated with the content and then (B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally (i.e., the request module 142 has access to the identified resource version if that version of the resource can be reconstructed using the stored differences between versions of a resource. If the request module 142 does not have access to that version, then the far end network optimizer 140 retrieves the requested resource (e.g., the far end network optimizer 140 makes a request to the origin server for the requested resource, or if locally available, the far end network optimizer 140 accesses the local version), updates its dynamic dictionary 144 to include the latest version of the resource, and replies to the near end network optimizer 120 with the requested resource, see col.5 lines 17-55 and col.6 lines 3-47) as rejected above.

As a result, cited prior art does disclose a computer-implemented method, operable with a content delivery network (CDN), as broadly claimed by the Applicants. Applicants clearly have still failed to identify specific claim limitations that would define a clearly patentable distinction over prior art.

Therefore, the examiner asserts that cited prior art teaches or suggests the subject matter broadly recited in independent claims 1 and 8.

Claims 2-7 and 9-14 are also rejected at least by virtue of their dependency on independent claims and by other reasons set forth in the previous office action [see paper sent 8/17/17].

Conclusion

7. Claims 1-14 are rejected.

8. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Dinh whose telephone number is (571) 272-3936. The examiner can normally be reached on Monday through Friday from 8:00 A.m. to 5:00 P.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Bates, can be reached on (571) 272-3980. The fax phone number for this group 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).

Any response to this action should be mailed to:

Commissioner for patents

P O Box 1450

Alexandria, VA 22313-1450

/Khanh Dinh/
Primary Examiner, Art Unit 2458

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15588935	NEWTON ET AL.
	Examiner	**Art Unit**
	KHANH DINH	2458

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

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

CLAIM		DATE								
Final	Original	08/07/2017	02/20/2018							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15588935	NEWTON ET AL.
	Examiner	Art Unit
	KHANH DINH	2458

CPC- SEARCHED		
Symbol	Date	Examiner
H04L29/08072, G06F17/30902, H04L29/06	8/7/2017	KD

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	213, 217, 218, 220	8/7/2017	KD
updated searches		2/19/2018	KD

* 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
WEST, INVENTOR SEARCHES	8/7/2017	KD

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Christopher Newton	Examiner:	Dinh, Khanh Q.
Serial No.:	15/588,935	Group Art Unit:	2458
Filed:	05/08/2017	Docket No.:	0492-US-C1
Title:	CACHING IN A CONTENT DELIVERY FRAMEWORK		

AMENDMENT & RESPONSE TO NON-FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Attention: Commissioner for Patents:

In response to the Non-Final Office Action mailed August 17, 2017, please consider the following:

Listing of the Claims begins on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Amendments to the Claims:

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

Listing of Claims:

1. (Original) A computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN:

(A) in response to a request for content, determining if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining a current cache policy associated with the content; and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving the content that is cached locally.

2. (Original) The method as recited in claim 1 further comprising:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

3. (Original) The method as recited in claim 1 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

4. (Original) The method as recited in claim 1 wherein the current cache policy is determined from a location distinct from the node.

5. (Original) The method as recited in claim 4 wherein the location is a database.

6. (Original) The method as recited in claim 1 wherein the cache policy relates to caching content within the CDN.

7. (Original) The method as recited in claim 6 wherein the cache policy also relates to caching content outside the CDN.

8. (Original) A computer program product having computer readable instructions stored on non-transitory computer readable media, the computer readable instructions including instructions for implementing a computer-implemented method, said method operable on a device comprising hardware including memory and at least one processor and running a service on said hardware, said method operable in a content delivery service (CDN), said method comprising:

(A) in response to a request for content, determining if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining a current cache policy associated with the content; and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving the content that is cached locally.

9. (Original) The computer program product as recited in claim 8 wherein the method further comprises:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

10. (Original) The computer program product as recited in claim 8 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

11. (Original) The computer program product as recited in claim 8 wherein the current cache policy is determined from a location distinct from the node.

12. (Original) The computer program product as recited in claim 11 wherein the location is a database.

13. (Original) The computer program product as recited in claim 8 wherein the cache policy relates to caching content within the CDN.

14. (Original) The computer program product as recited in claim 13 wherein the cache policy also relates to caching content outside the CDN.

REMARKS/ARGUMENTS

This Response and the following remarks are intended to fully respond to the Non-Final Office Action dated August 17, 2017, hereinafter "Office Action." In that Office Action, claims 1-14 were examined and all claims were rejected. Claims 1-14 were rejected under 35 U.S.C. § 102(a) as allegedly anticipated by Graham-Cumming (U.S. Patent No. 8,984,166; hereinafter "Graham-Cumming").

Reconsideration of these rejections, as they might apply to the claims in view of these remarks, is respectfully requested. In this Response, no claims have been added, canceled or amended. Therefore, claims 1-14 remain present for examination.

Double Patenting Rejection

Claims 1 and 8 were rejected on the ground of obviousness-type double patenting as being unpatentable over claims 1 and 9 of U.S. Patent No. 9,648,127. Without conceding the correctness of the double patenting rejection, Applicant will address this rejection in the future, if the Office believes the double patenting rejection to still be necessary given the above (and any future) amendments. Applicant reserves the right to submit a terminal disclaimer to overcome any future double patenting rejections.

Claim Rejections under 35 U.S.C. § 102(a)

Claims 1-14 were rejected under 35 U.S.C. § 102(a) as allegedly anticipated by Graham-Cumming. Applicants respectfully traverse this rejection because either the Examiner failed to state a *prima facie* case of anticipation or the current amendments to the claims now render the Examiner's arguments moot. "Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim." *Lindemann Mashinenfabrik GmbH v. Am. Hoist & Derrick Co.,* 730 F.2d 1452, 1458 (Fed. Cir. 1984); *see also,* MPEP § 2131. Applicants submit that the cited reference does not disclose all of the elements of the rejected claims.

In nonexclusive, nonlimiting examples, the presently disclosed system permits late binding of caching policies in a content delivery network ("CDN"). In examples, when a node of the CDN receives a request for a resource, it determines whether the resource is stored locally. If it is stored locally, it then determines if a current caching policy permits the node to serve the

requested resource. If the current caching policy permits serving the resource that is cached locally, the node serves the resource. If not, the node requests a new version of the resource, and it serves the new version.

By contrast, Graham-Cumming is a system for minimizing data that must be sent across a CDN. In particular, a "near end network optimizer" receives a request for a resource. That request might only be received by the near end network optimizer, e.g., if a proxy server failed to serve the request because the resource has been set as "no-cache" by an origin server. The near end network optimizer then checks whether the resource is available locally. If it is not available locally, it requests the resource from a "far-end network optimizer," which may then retrieve it from the origin server. If it is available locally, the near-end network optimizer still does not serve the resource – rather, it includes the version number of its locally stored version of the resource in the request to the far end network optimizer. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client.

Turning specifically to the claims, Graham-Cumming does not disclose at least the following elements of claim 1 (emphasis added):

1. A computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN:

(A) in response to a request for content, determining if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining a current cache policy associated with the content; and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving the content that is cached locally.

Applicants initially note that claim 1 requires the claimed method to be performed by "a node," not an entire CDN. Further, it is not entirely clear from the Office Action what "node" the Office Action alleges performs all of the claimed limitations; however, it appears the Office Action is asserting that the near end network optimizer performs all of the claimed limitations. Applicants respectfully disagree.

First, the near end network optimizer does not "determin[e] that the content is stored locally" and "then determin[e] a current cache policy associated with the content," as claimed. There is no such late binding of a current cache policy. The Office Action cites solely to Col. 5, l. 17 through Col. 6, l. 62 of Graham-Cumming. The only reference in those sections of Graham-Cumming to a cache policy of any kind is that the resource may be been marked as "no-cache." (See, e.g., Col. 5, ll. 25-26, ll. 54-55, ll. 56-64.) However, the near end network optimizer does not, after determining that it has a copy of the requested resource, determine a current cache policy. In fact, it does not care what the cache policy is.

Rather, Graham-Cumming indicates that the near end network optimizer may only receive the request in the first place if the proxy server is unable to serve the request due to a no-cache policy. (See, e.g., Col. 5, ll. 22-26 ("The request may be received at the request module 122 as a result of a cache mechanism of the proxy server determining that the requested resource cannot be returned to the requesting client device (e.g., the resource has been set as 'no cache' . . . .).")

Further, the actions of the near end network optimizer do not depend on a determination by the near end network optimizer of the current cache policy. Rather, if the near end network optimizer does not have a copy of the resource at all, it simply requests it from the far end network optimizer. If it does have a copy of the resource, it still makes a request to the far end network optimizer, but this time it includes the version number of the resource copy that it stores locally. The far end network optimizer can then determine a delta between the most current version and the version stored at the near end network optimizer. The delta is sent to the near end network optimizer, and the most-current version is reconstructed and served to the requesting client. (See Graham-Cumming, Col. 6, ll. 4-62.)

Indeed, the actions of the near end network optimizer are not dependent on the current cache policy. Either way, the near end network optimizer will seek the newest version from the far end network optimizer (either the complete version or the delta). In addition, the near end network optimizer stores what it gets back from the far end network optimizer regardless of whether the resource is tagged as "no-cache." This is so that the near end network optimizer can request the delta (instead of the whole resource) upon the next request for the resource from a client. (See, e.g., Col. 5, ll. 56-64.) As such, the near end network optimizer also does not "determin[e], based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally," as claimed. For at least these reasons, claim 1 is allowable over Graham-Cumming.

Similarly, claim 8 requires, *inter alia*:

(A) in response to a request for content, determining if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining a current cache policy associated with the content; and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving the content that is cached locally.

For at least similar reasons as stated above, claim 8 is allowable over Graham-Cumming. All other claims depend from one of claims 1 and 8 and are allowable for at least similar reasons. Allowance of all claims is respectfully requested.

CONCLUSION

This Response fully responds to the Office Action mailed on August 17, 2017. Still, that Office Action may contain arguments and rejections that are not directly addressed by this Amendment due to the fact that they are rendered moot in light of the preceding arguments in favor of patentability. Hence, the failure, if any, of this Response to directly address an argument and/or comment raised in the Office Action should not be taken as an indication that the Applicant believes the argument and/or comment has merit. Additionally, the failure, if any, to address statements and/or comments made in the Office Action does not mean that the Applicants acquiesce to such statements and/or comments. Furthermore, the claims of the present application may include other elements, not discussed in this Response, which are not shown, taught, or otherwise suggested by the art of record. Accordingly, the preceding arguments in favor of patentability are advanced without prejudice to other bases of patentability.

It is believed that no further fees are due with this Response. However, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment with respect to this patent application to deposit account number 50-5063.

In light of the above remarks and amendments, it is believed that the application is now in condition for allowance and such action is respectfully requested. Should any additional issues need to be resolved, the Examiner is requested to telephone the undersigned to attempt to resolve those issues.

Respectfully submitted,

Date: November 17, 2017

/David D. Wier/

David D. Wier, Attorney Reg. No. 48,229
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, CO 80021
(720) 888-3539

83579
PATENT TRADEMARK OFFICE

Electronic Acknowledgement Receipt

EFS ID:	30990260
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier
Filer Authorized By:	
Attorney Docket Number:	0492-US-C1
Receipt Date:	17-NOV-2017
Filing Date:	08-MAY-2017
Time Stamp:	18:50:40
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		20171117Amendment.pdf	54548 126184f5efd4b07a3034db5af95feff107e1fa33	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	9
Warnings:			
Information:			
	Total Files Size (in bytes):	54548	

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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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/588,935	05/08/2017	Christopher Newton	0492-US-C1

CONFIRMATION NO. 2851

PUBLICATION NOTICE

83579
LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

OC000000093668828

Title:CACHING IN A CONTENT DELIVERY FRAMEWORK

Publication No.US-2017-0244804-A1
Publication Date:08/24/2017

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

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/588,935	05/08/2017	Christopher Newton	0492-US-C1	2851

83579 7590 08/17/2017

LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

EXAMINER
DINH, KHANH Q

ART UNIT	PAPER NUMBER
2458	

NOTIFICATION DATE	DELIVERY MODE
08/17/2017	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No. 15/588,935	Applicant(s) NEWTON ET AL.	
	Examiner KHANH DINH	Art Unit 2458	AIA (First Inventor to File) Status Yes

-- 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 *7/11/17*.

☐ 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) *1-14* 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) *1-14* is/are rejected.

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

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

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

Application Papers

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

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

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

2. Claims 1-14 are presented for examination.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will

determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

4. Claims 1 and 8 of the instant application are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over some claims of U.S. Patent No. 9,648,127.

Regarding claims 1 and 8, claims 1` and 9 of U.S. Patent No. 9,648,127 contain every element of claims 1 and 8 of the instant application and as such anticipate claims 1 and 8 of the instant application.

Claim Rejections - 35 USC § 102

5. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

> (a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

7. Claim(s) 1-14 are rejected under 35 U.S.C. 102(a)(2) as being anticipated by Graham-Cumming, US pat. No.9,984,166.

As to claim 1, Graham-Cumming discloses a computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN:

(A) in response to a request for content, determining if the content is cached locally, when it is determined that said content is cached locally, then: (B)(1) determining a current cache policy associated with the content (determining if the data request is locally available, see abstract, col.5 lines 17-55); and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally, (B)(3) based on said determining in (B)(2), when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and when it is acceptable to serve the content that is cached locally, serving the content that is cached locally (determining and processing a new data version upon request, see col.5 line 56 to col.6 line 62).

As to claim 2, Graham-Cumming discloses (C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1) (see col.6 lines 4-55).

As to claim 3, Graham-Cumming discloses the request comprises an HTTP request and wherein the content comprises one or more resources (see col.3 lines 17-26).

As to claim 4, Graham-Cumming discloses the current cache policy is determined from a location distinct from the node (see col.5 line 27 to col.6 line 34).

As to claim 5, Graham-Cumming discloses the location is a database (see col.5 lines 17-55).

As to claim 6, Graham-Cumming discloses the cache policy relates to caching content within the CDN (see col.1 lines 12-31 and col.5 lines 17-55).

As to claim 7, Graham-Cumming discloses the cache policy also relates to caching content outside the CDN (see col.1 lines 12-31 and col.5 lines 17-55).

Claims 8-14 are rejected for the same reasons set forth in claims 1-7 respectively.

Conclusion

7. Claims 1-14 are rejected.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Dinh whose telephone number is (571) 272-3936. The examiner can normally be reached on Monday through Friday from 8:00 A.m. to 5:00 P.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Bates, can be reached on (571) 272-3980. The fax phone number for this group 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).

Any response to this action should be mailed to:
Commissioner for patents
P O Box 1450
Alexandria, VA 22313-1450

/Khanh Dinh/

Primary Examiner, Art Unit 2458

Notice of References Cited	Application/Control No. 15/588,935	Applicant(s)/Patent Under Reexamination NEWTON ET AL.	
	Examiner KHANH DINH	Art Unit 2458	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-9,648,127 B2	05-2017	Newton; Christopher	H04L67/2842	1/1
*	B	US-8,812,695 B2	08-2014	Luna; Michael	H04L43/10	709/223
*	C	US-8,032,586 B2	10-2011	Challenger; James R. H.	G06F17/30902	709/201
*	D	US-7,987,239 B2	07-2011	Agarwalla; Rajesh S.	G06F17/30902	705/6
*	E	US-8,984,166 B2	03-2015	Graham-Cumming; John	H04L67/2828	707/827
*	F	US-2003/0188009 A1	10-2003	Agarwalla, Rajesh S.	H04L29/06	709/236
*	G	US-2008/0065273 A1	03-2008	Gerrity; Dan	G05B13/042	701/1
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

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BIB DATA SHEET

CONFIRMATION NO. 2851

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/588,935	05/08/2017	709	2458	0492-US-C1

APPLICANTS
Level 3 Communications, LLC, Broomfield, CO;

INVENTORS
Christopher Newton, Westlake Village, CA;
William Crowder, Camarillo, CA;

**** CONTINUING DATA ***************************
This application is a CON of 14/570,512 12/15/2014 PAT 9648127

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
05/15/2017

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /KHANH Q DINH/ Examiner's Signature	☐ Met after Allowance KD Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CA	4	14	2

ADDRESS

LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021
UNITED STATES

TITLE

CACHING IN A CONTENT DELIVERY FRAMEWORK

FILING FEE RECEIVED	FEES: Authority has been given in Paper	☐ All Fees
1600	No._____ to charge/credit DEPOSIT ACCOUNT	☐ 1.16 Fees (Filing)
	No._____ for following:	☐ 1.17 Fees (Processing Ext. of time)
		☐ 1.18 Fees (Issue)
		☐ Other _____
		☐ Credit

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

	Complete if Known
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2447
Examiner Name	Not Yet Assigned

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS

Examiner Initial *	Cite No	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear
		20030188021	Oct 2, 2003	Challenger, Jame R.	
		20060095532	May 4, 2006	O'Rourke, Bret P., et al.	
		20120209942	Aug 16, 2012	Zehavi, Ronni et al.	
		20130254343	Sep 26, 2013	Stevens, Matthew J., et al.	
		20160173634	Jun 16, 2016	Newton, Christopher et al.	
		6965968	Nov 15, 2005	Touboul, Shlomo	
		7587515	Sep 8, 2009	Agarwalla, Rajesh S.	
		7730154	Jun 1, 2010	Agarwalla, Rajesh S.	
		7912921	Mar 22, 2011	O'Rourke, Bret P.	
		7987239	Jul 26, 2011	Agarwalla, Rajesh S.	
		8812695	Aug 19, 2014	Luna, Michael	
		8984166	Mar 17, 2015	Graham-Cumming, John	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		International Search Report dated February 10, 2016, Int'l Appl. No. PCT/US15/065476, Int'l Filing Date December 14, 2015; Dkt. No. 0492-WO-01 , 3 pgs.	
		Written Opinion of the International Searching Authority dated February 10, 2016, Int'l Appl. No. PCT/US15/065476, Int'l Filing Date December 14, 2015; Dkt. No. 0492-WO-01 , 4 pgs.	

EXAMINER	/KHANH Q DINH/	DATE CONSIDERED	08/14/2017

Substitute Disclosure Statement Form (PTO-1449)

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional) [2] Applicant is to place a check mark here if English language Translation is attached

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.Q.D/

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15588935	NEWTON ET AL.
	Examiner	Art Unit
	KHANH DINH	2458

CPC- SEARCHED		
Symbol	Date	Examiner
H04L29/08072, G06F17/30902, H04L29/06	8/7/2017	KD

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	213, 217, 218, 220	8/7/2017	KD

* 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
WEST, INVENTOR SEARCHES	8/7/2017	KD

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15588935	NEWTON ET AL.
	Examiner	**Art Unit**
	KHANH DINH	2458

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

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

CLAIM		DATE								
Final	Original	08/07/2017								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								

MENU

Refine Search

Search Results

Term	Documents
(36 AND 8).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS.	18
(L36 and l8).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS.	18

Database: US Pre-Grant Publication Full-Text Database; US Patents Full-Text Database; US Patents OCR Backfile; EPO Abstracts Database; JPO Abstracts Database; Derwent World Patents Index; IBM Technical Disclosure Bulletin Database

Search Type: ⊙ Prior Art ○ Interference

Search: L37 Refine Search

Order By: ⊙ Date ○ Hits

Recall Text Clear Interrupt

Search History

DATE: Monday, August 07, 2017 Purge Queries Printable Copy Create Case

Order By	Set Name Side by Side	Query	Hit Count	Set Name Result Set	Set Name Grid	Set Name Classification
Prior Art Searches						
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD,FPRS; PLUR=YES; OP=ADJ					
Date	L37	L36 and l8	18	L37	L37	L37
Date	L36	L35 and l6	76	L36	L36	L36
Date	L35	L34 and l24	76	L35	L35	L35
Date	L34	L24 and l5	76	L34	L34	L34
Date	L33	L24 and l15	0	L33	L33	L33
	L25	L24 and L7	18	L25	L25	L25
	L24	L6 and (h04l29/06 or ho4l29/08072 or h04l67/34)	441	L24	L24	L24
	L23	L22 and (h04l29/06 or ho4l29/08072 or h04l67/34)	0	L23	L23	L23
	L22	L21 and L6 and L7	20	L22	L22	L22
	L21	cdn or content delivery network	25124	L21	L21	L21
	L20	(check$4 or detect$4) same identical same cache	2166	L20	L20	L20
	L19	L18 and L13	18	L19	L19	L19
	L18	L9 and (h04l29/06 or ho4l29/08072)	76	L18	L18	L18
	L17	L5 and (h04l29/06 or ho4l29/08072)	4024	L17	L17	L17
	L16	L15 and L8	3	L16	L16	L16
	L15	cache policy same check$4	168	L15	L15	L15
	L14	L13 and L8	57	L14	L14	L14
	L13	L12 and L6	57	L13	L13	L13
	L12	L8 and L5	425	L12	L12	L12
	L11	L10 and L8	0	L11	L11	L11
	L10	L9 and L7	20	L10	L10	L10
	L9	L5 and L6	296	L9	L9	L9
	L8	new version same content	6153	L8	L8	L8
	L7	cache policy	2395	L7	L7	L7
	L6	check$4 same local cache	3828	L6	L6	L6
	L5	content delivery network or cdn	25124	L5	L5	L5
	L4	L3 and http	1	L4	L4	L4

	L3	8984166.pn.	2	L3	L3	L3
Date	L2	9479408.pn.	3	L2	L2	L2
Date	L1	9667665.pn.	3	L1	L1	L1
Interference Searches						
DB=PGPB,USPT; PLUR=YES; OP=ADJ						
	L32	L31 and L5	4	L32	L32	L32
	L31	L30 and (h04129/06 or ho4129/08072 or h04167/34)	4	L31	L31	L31
	L30	L8 and L7	16	L30	L30	L30
	L29	L28 and L9	0	L29	L29	L29
	L28	L24 and L7	18	L28	L28	L28
	L27	L6 and (h04129/06 or ho4129/08072 or h04167/34)	418	L27	L27	L27
	L26	L24 and L7	18	L26	L26	L26

END OF SEARCH HISTORY

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

	Complete if Known
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2447
Examiner Name	Not Yet Assigned

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS

Examiner Initial *	Cite No	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		International Preliminary Report on Patentability dated June 20, 2017, Int'l Appl. No. PCT/US15/65476, Int'l Filing Date December 14, 2015; Dkt. No. 0492-WO-01 , 6 pgs.	

EXAMINER /KHANH Q DINH/ **DATE CONSIDERED** 08/14/2017

Substitute Disclosure Statement Form (PTO-1449)

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional) [2] Applicant is to place a check mark here if English language Translation is attached

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.Q.D/

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2447
Examiner Name	Not Yet Assigned

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS					
Examiner Initial *	**Cite No**	**Document Number**	**Publication Date**	**Name of Patentee or Applicant of Cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	**Cite No**	**Foreign Patent Document**	**Publication Date**	**Name of Patentee or Applicant of cited Document**	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	**T[2]**

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	**Cite No [1]**	**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, page(s), volume-issue number(s), publisher, city and/or country where published.**	**T[2]**
		International Preliminary Report on Patentability dated June 20, 2017, Int'l Appl. No. PCT/US15/65476, Int'l Filing Date December 14, 2015; Dkt. No. 0492-WO-01 , 6 pgs.	

EXAMINER **DATE CONSIDERED**

Substitute Disclosure Statement Form (PTO-1449)
* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional) [2] Applicant is to place a check mark here if English language Translation is attached

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
TRANSMITTAL OF COPY OF INTERNATIONAL
PRELIMINARY REPORT ON PATENTABILITY
(CHAPTER I OF THE PATENT COOPERATION
TREATY)
(PCT Rule 44bis.1(c))

To:

DURBIN, Gregory P.
Polsinelli PC
900 W. 48th Place
Suite 900
Kansas City, Missouri 64112
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 29 June 2017 (29.06.2017)	
Applicant's or agent's file reference 0492-WO-01	**IMPORTANT NOTICE**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2015/065476	14 December 2015 (14.12.2015)	15 December 2014 (15.12.2014)

Applicant
LEVEL 3 COMMUNICATIONS, LLC

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer
Athina Nickitas-Etienne

e-mail: pct.team4@wipo.int

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 0492-WO-01	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2015/065476	International filing date *(day/month/year)* 14 December 2015 (14.12.2015)	Priority date *(day/month/year)* 15 December 2014 (15.12.2014)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant LEVEL 3 COMMUNICATIONS, LLC		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 20 June 2017 (20.06.2017)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Athina Nickitas-Etienne e-mail: pct.team4@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: GREGORY P. DURBIN
POLSINELLI PC
900 W. 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	10 FEB 2016
Applicant's or agent's file reference 0492-WO-01	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2015/065476	14 December 2015	15 December 2014

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G06F 17/30 (2016.01)
CPC - G06F 17/30902 (2016.01)

Applicant LEVEL 3 COMMUNICATIONS, LLC

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	01 February 2016	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (January 2015)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2015/065476

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established 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)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

a. ☐ forming part of the international application as filed:

☐ in the form of an Annex C/ST.25 text file.

☐ on paper or in the form of an image file.

b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2015/065476

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	None	YES
	Claims	1-16	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-16	NO
Industrial applicability (IA)	Claims	1-16	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-16 lack novelty under PCT Article 33(2) as being anticipated by O'Rourke et al. (hereinafter O'Rourke).

Regarding Claims 1 and 9, O'Rourke discloses a computer-implemented method and a computer program product having computer readable instructions stored on non-transitory computer readable media, the computer readable instructions including instructions (computer-readable media provide nonvolatile storage of computer readable instructions, data structures, program modules and other data for computer 642, para. [0056]) for implementing a computer-implemented method, said method operable on a device comprising hardware including memory and at least one processor and running a service on said hardware (Computer 642 includes one or more processors or processing units 644, a system memory 646, para. [0055]), operable with a content delivery network (CDN), the method comprising, by a node in the CDN (cache server 204 is able to redistribute the media content to multiple local clients, para. [0025]):
(A) in response (handling a client request to receive pre-recorded content, para. [0039]) to a request for content (receives a request for content, para. [0038]), determining if the content is cached locally (the cache policies determine whether the requested content is available on the cache server, para. [0041]);
(B) when it is determined that said content is cached locally (determine whether the requested content is available on the cache server (block 508). If the requested content is available, then , para. [0041]), then:
(B)(1) determining a current (identifies the policies related to requests for pre-recorded content, para. [0039]) cache policy (cache policies, para. [0039]) associated with the content (associated with the requested content, para. [0039]); and then
(B)(2) determining, based on (An acceptable version is determined based on the cache policies, para. [0041]) said current cache policy associated with the content (identifies the policies related to requests for [...] content, para. [0044]), whether it is acceptable to serve the content that is cached locally (then the cache policies determine whether the cached version of the requested content is an acceptable version, para. [0041]);
(B)(3) based on said determining in (B)(2) (If the cached version is acceptable, the procedure continues to block 512, para. [0041]),
(i) when it is not acceptable to serve the content that is cached locally (If the cached version of the requested content is not acceptable, then the procedure branches from block 510 to block 514, para. [0041]), obtaining a new version of the content (block 514, where the cache server downloads the current version of the requested content from the origin server, para. [0041]) and then serving the new version of the content (after it has finished downloading), the cache server provides the current version to the client, para. [0041]), and
(ii) when it is acceptable to serve the content that is cached locally (determine whether the cached version of the requested content is an acceptable version [...] If the cached version is acceptable, para. [0041]), serving the content that is cached locally (the cache server provides the cached version of the requested content to the client, para. [0041]).

Regarding Claims 2 and 10, O'Rourke discloses the method and computer program product further comprising: (C) when it is determined that said content is not cached locally (If block 508 determines that the requested content is not available on the cache server, then, para. [0042]), then (C)(1) obtaining the content (he procedure branches to block 514, where the cache server downloads the current version of the requested content from the origin server, para. [0042]) and then
(C)(2) serving the content obtained in (C)(1) (provides the current version to the client, para. [0041]).

Regarding Claims 3 and 11, O'Rourke discloses the method and computer program product wherein the request comprises an HTTP request (a URL associated with the requested content , para. [0039]) and wherein the content comprises one or more resources (data is cached in multiple cache servers 254 and 255, para. [0029]).

Regarding Claims 4 and 12, O'Rourke discloses the method and computer program product wherein the current cache policy is determined from a location distinct from the node (Cache server 204 receives a set of cache policies 210 (also referred to as "policy plug-ins"), para. [0024], a data storage device 310 for storing data and other information used by the various components of the cache server, para. [0035]).

Regarding Claims 5 and 13, O'Rourke discloses the method and computer program product wherein the location is a database (Cache server 204 receives a set of cache policies 210 (also referred to as "policy plug-ins"), para. [0024], a data storage device 310 for storing data and other information used by the various components of the cache server, para. [0035])..

Regarding Claims 6 and 14, O'Rourke discloses the method and computer program product wherein the cache policy relates to caching content within the CDN (cache policies will determine whether a copy of the requested content should be cached by the cache server, para. [0052]).

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2015/065476

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Regarding Claims 7 and 15, O'Rourke discloses the method and computer program product wherein the cache policy also relates to caching content outside the CDN (cache policies dictate that the client be redirected to a different server, para. [0042]).

Regarding Claims 8 and 16, O'Rourke discloses the method and computer program product wherein version identifiers are associated with caching policies, and wherein said determining said current cache policy in (B)(1) (cache server 300 can be "customized" by each system administrator by defining their own set of cache policies 304, para. [0036]) comprises:
(i) comparing a first version identifier associated with the current cache policy with a second version identifier associated with a cache policy associated with the content at the node in the CDN (cache policies may determine [...] how often to check the "freshness", para. [0037], operate in different manners (e.g., caching different types of content) based on differences in the cache policies applied to the cache servers, para. [0031])
(ii) using the cache policy associated with the content at the node as the current cache policy when the first version identifier is identical to the second version identifier (the two sets of cache policies 260 are identical, para. [0030]), otherwise obtaining the current cache policy from a location distinct from the node (Additional cache plug-in modules can be installed by the system administrator at any time and existing cache plug-in modules can be removed by the system administrator at any time, para. [0033]).

Claims 1-16 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Electronic Acknowledgement Receipt

EFS ID:	29747357
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	11-JUL-2017
Filing Date:	08-MAY-2017
Time Stamp:	14:25:54
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	Transmittal Letter	492USC1_IDS.pdf	37394 0f766eba1826ab6a72d1855aa75320e134457d8f	no	5
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	492USC1_sb08.pdf	29654 ca5c6fdf6982d0c44b94324643d408e07a682b6	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	PCTUS1565476_IPRP_20Jun17_492WO01.PDF	261906 0c811d21fbccd82f9fd5900e1312065038c7ded3	no	6
Warnings:					
Information:					
			Total Files Size (in bytes):	328954	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/588,935	Confirmation No.	:	2851
First Applicant	:	NEWTON, et al.	Art Unit	:	2447
Filed	:	May 8, 2017	Examiner	:	Not Yet Assigned
Title	:	CACHING IN A CONTENT DELIVERY FRAMEWORK			
Docket No.	:	0492-US-C1			

Submitted Via EFS-Web

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT PURSUANT TO 37 C.F.R. §§ 1.56, 1.97, AND 1.98

Sir:

The Examiner is respectfully requested to consider the patents, patent applications, publications, or other information cataloged on the enclosed Form (e.g., PTO-1449, PTO-892, PTO/SB/08, etc.) during examination of the above-identified patent application. The order of presentation of the references should not be construed as an indication of importance. These references are submitted for the Examiner's consideration and are submitted pursuant to an Applicant's duty of disclosure under 37 C.F.R. § 1.56.

Copies of all of the cited documents:

☐ are enclosed unless otherwise indicated on the enclosed Form PTO/SB/08a.

☐ have been previously furnished to the Office in prior application No. __, filed ___, which the present application relies upon for an earlier effective filing date under 35 U.S.C. § 120. Therefore, no copies of the cited documents are included herewith pursuant to 37 C.F.R. § 1.98(d); MPEP § 609(III)(A)(2).

☒ are enclosed unless they are U.S. patents or U.S. patent application publications pursuant to 37 C.F.R. § 1.98(a).

I
BASIS

This information disclosure statement is filed pursuant to

☒ 37 C.F.R. § 1.97(b).
This information disclosure statement is filed either (1) within three months of the filing date of a national application other than a continued prosecution application under 37 C.F.R. § 1.53(d); (2) within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application; (3) before the mailing date of a first Office action on the merits; (4) concurrently with the filing of a request for continued examination under 37 C.F.R. § 1.114; or (5) before the mailing of a first Office action after the filing of a request for continued examination under 37 C.F.R. § 1.114, whichever event occurs last.

Accordingly, this information disclosure statement requires no fee and no certification.

☐ 37 C.F.R. § 1.97(c).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing date of any of (1) a final action under 37 C.F.R. § 1.113; (2) a notice of allowance under 37 C.F.R. § 1.311; or (3) an action that otherwise closes prosecution in the application.

Accordingly, this information disclosure statement requires either the fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c), or a statement under 37 C.F.R. § 1.97(e).

☐ 37 C.F.R. § 1.97(d).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(c) since a:

☐ final action under 37 C.F.R. § 1.113

☐ notice of allowance under 37 C.F.R. § 1.311

was mailed to the Applicant on _____.

Accordingly, this information disclosure statement requires the fee set forth in 37 C.F.R. § 1.17(p) to consider an information disclosure statement under 37 C.F.R. § 1.97(d), and a statement under 37 C.F.R. § 1.97(e).

If this statement crosses in the mail with an Office action, or is otherwise not in the indicated category of 37 C.F.R. § 1.97, it is respectfully requested that this statement be treated in the next appropriate category and made of record. To the extent required, please treat this paper as a conditional petition for acceptance of the information disclosure statement.

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

☐ Please charge the required fee to Deposit Account No. 505063.

☒ The Commissioner is hereby authorized to charge any additional required fees or credit any overpayments associated with this information disclosure statement to the account.

III

CERTIFICATION

Pursuant to 37 C.F.R. § 1.97(e), I state as follows:

☒ No statement is necessary.

☐ Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(1).

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to my knowledge after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(2).

Pursuant to 37 C.F.R. § 1.704(d), I state as follows:

☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of this information disclosure statement.

IV
FOREIGN LANGUAGE REFERENCES

Pursuant to 37 C.F.R. § 1.98(a)(3)(i), any information disclosure statement filed under 37 C.F.R. § 1.97 shall include a concise explanation of the relevance, as it is presently understood by the individual designated in § 1.56(c) most knowledgeable about the content of the information, of each patent, publication, or other information listed that is not in the English language. The concise explanation may be either separate from the specification or incorporated therein. In compliance with the rules, the Applicant states as follows:

☐ No concise explanation is required since all cited references are in English.

☐ A concise explanation of the relevance of one or more foreign language references is attached.

☐ According to the procedural policy adopted by the PTO with regard to disclosure requirements, the Applicant is satisfying the disclosure requirement pursuant to MPEP § 609.04(a)(III) by submitting herewith the following:

- ☐ English language versions of any non-English language documents.
- ☐ English language versions of one or more search reports or other actions by one or more foreign patent offices in one or more counterpart foreign applications, which indicate the degree of relevance found by the foreign office(s).
- ☐ Pursuant to 37 C.F.R. § 1.98(a)(3)(ii), a copy of a translation is not submitted herewith because a written English-language translation of a non-English-language document, or portion thereof, is not within the possession, custody, or control of, or is readily available to any individual designated in § 1.56(c).

The Applicant has not analyzed these documents and, therefore, declines to comment on their relevance at this time.

☐ One or more English language abstracts for the non-English language references are also enclosed.

V
REMARKS

It is respectfully requested that:

(1) The Examiner sign the enclosed Form to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application; and

(2) The citations for the cited information be printed on any patent that issues from this application.

The submission of this information disclosure statement by the Applicant shall not be construed as a representation that a search has been performed or that no other material information under 37 C.F.R. § 1.56 exists. See 37 C.F.R. § 1.97(g).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, material to the patentability of one or more of the pending claims in this application pursuant to 37 C.F.R. § 1.56(b), unless specifically designated by the Applicant as such. See 37 C.F.R. § 1.97(h).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, or even qualifies as "prior art" under 35 U.S.C. § 102 with respect to this invention, unless specifically designated by the Applicant as such.

Notwithstanding any statements by the Applicant, the Examiner is urged to form his or her own conclusion regarding the relevance of the cited information.

VI
CONCLUSION

The Examiner is encouraged to contact the undersigned attorney to discuss any questions concerning this information disclosure statement or any of the information cited or referred to herein.

Respectfully submitted,

Date: July 11, 2017

/JCS/

Jonathan C. Siekmann, Reg. No. 58,259
USPTO Customer No. 83579
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-2140
Fax: 720-888-5619

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/588,935	05/08/2017	Christopher Newton	0492-US-C1

CONFIRMATION NO. 2851

83579
LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

POA ACCEPTANCE LETTER

OC000000091590858

Date Mailed: 05/25/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/22/2017.

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

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

/dgela/

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. 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 TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

■ Practitioners associated with Customer Number: 83579

OR

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

Name	Registration Number	Name	Registration Number

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

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

☐ The address associated with Customer Number:

OR

☐	Firm or Individual Name		
	Address		
	City	State	Zip
	Country		
	Telephone	Email	

Assignee Name and Address: LEVEL 3 COMMUNICATIONS, LLC
1025 Eldorado Blvd.
Broomfield, CO 80021

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

SIGNATURE of Assignee of Record

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

Signature	/David D. Wier/	Date	May 22, 2017
Name	David D. Wier	Telephone	720-888-3539
Title	VP Patent Counsel		

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.**

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.

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

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Level 3 Communications, LLC

Application No./Patent No.: 15/588,935 Filed/Issue Date: 05/08/2017

Titled: Apparatus, System, and Method for Asymmetrical and Dynamic Routing

Level 3 Communications, LLC, a Limited Liability Company

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

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

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

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

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

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

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

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

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

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

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

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

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

1. From: Newton, Christopher To: Level 3 Communications, LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 042415, Frame 0361, or for which a copy thereof is attached.

2. From: Crowder, William To: Level 3 Communications, LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 042415, Frame 0404, or for which a copy thereof is attached.

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

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

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

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

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

4. From: _____ To: _____

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

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

5. From: _____ To: _____

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

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

6. From: _____ To: _____

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

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

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

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

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

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

/David D. Wier/	May 22, 2017
Signature	Date
David D. Wier	48,229
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

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

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

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

Electronic Acknowledgement Receipt

EFS ID:	29275533
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	22-MAY-2017
Filing Date:	08-MAY-2017
Time Stamp:	15:46:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA.pdf	80597 62aec92771b6ef107b1a54f6a90d4473be24e9e9	no	2
Warnings:					

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	492USC1_373c.pdf	120613 36867e75694a5402aebbcfa8c098b59c5d5fd500	no	3
Warnings:					
Information:					
			Total Files Size (in bytes):	201210	

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/588,935	05/08/2017	2447	1600	0492-US-C1	14	2

CONFIRMATION NO. 2851

FILING RECEIPT

83579
LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

OC000000091370851

Date Mailed: 05/16/2017

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

Inventor(s)

Christopher Newton, Westlake Village, CA;
William Crowder, Camarillo, CA;

Applicant(s)

Level 3 Communications, LLC, Broomfield, CO;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/570,512 12/15/2014 PAT 9648127

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: No

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

If Required, Foreign Filing License Granted: 05/15/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/588,935**

Projected Publication Date: 08/24/2017

Non-Publication Request: No

Early Publication Request: No

Title

CACHING IN A CONTENT DELIVERY FRAMEWORK

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).

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).

SelectUSA

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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/588,935

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			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	14 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 420 =	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			TOTAL	1600

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	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	15/588,935
Filing Date	May 8, 2017
First Named Inventor	Christopher Newton
Art Unit	2447
Examiner Name	Not Yet Assigned

Sheet	1	of	1	Attorney Docket No: 0492-US-C1

US PATENT DOCUMENTS

Examiner Initial *	Cite No	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear
		20030188021	Oct 2, 2003	Challenger, Jame R.	
		20060095532	May 4, 2006	O'Rourke, Bret P., et al.	
		20120209942	Aug 16, 2012	Zehavi, Ronni et al.	
		20130254343	Sep 26, 2013	Stevens, Matthew J., et al.	
		20160173634	Jun 16, 2016	Newton, Christopher et al.	
		6965968	Nov 15, 2005	Touboul, Shlomo	
		7587515	Sep 8, 2009	Agarwalla, Rajesh S.	
		7730154	Jun 1, 2010	Agarwalla, Rajesh S.	
		7912921	Mar 22, 2011	O'Rourke, Bret P.	
		7987239	Jul 26, 2011	Agarwalla, Rajesh S.	
		8812695	Aug 19, 2014	Luna, Michael	
		8984166	Mar 17, 2015	Graham-Cumming, John	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		International Search Report dated February 10, 2016, Int'l Appl. No. PCT/US15/065476, Int'l Filing Date December 14, 2015; Dkt. No. 0492-WO-01 , 3 pgs.	
		Written Opinion of the International Searching Authority dated February 10, 2016, Int'l Appl. No. PCT/US15/065476, Int'l Filing Date December 14, 2015; Dkt. No. 0492-WO-01 , 4 pgs.	

EXAMINER **DATE CONSIDERED**

Substitute Disclosure Statement Form (PTO-1449)

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional) [2] Applicant is to place a check mark here if English language Translation is attached

Electronic Acknowledgement Receipt

EFS ID:	29158097
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	09-MAY-2017
Filing Date:	
Time Stamp:	14:46:33
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	Transmittal Letter	492USC1_IDS.pdf	37470 e2749a4f044ad3983e6a3986596385ffe33577da	no	5
Warnings:					305

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	492USC1_sb08.pdf	31616 4700b4c63ed95d98c4b68175a32c24398fbbaab1	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
			Total Files Size (in bytes):	69086	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/588,935	Confirmation No.	:	2851
First Applicant	:	NEWTON, et al.	Art Unit	:	2447
Filed	:	May 8, 2017	Examiner	:	Not Yet Assigned
Title	:	CACHING IN A CONTENT DELIVERY FRAMEWORK			
Docket No.	:	0492-US-C1			

Submitted Via EFS-Web

INFORMATION DISCLOSURE STATEMENT
PURSUANT TO 37 C.F.R. §§ 1.56, 1.97, AND 1.98

Sir:

The Examiner is respectfully requested to consider the patents, patent applications, publications, or other information cataloged on the enclosed Form (e.g., PTO-1449, PTO-892, PTO/SB/08, etc.) during examination of the above-identified patent application. The order of presentation of the references should not be construed as an indication of importance. These references are submitted for the Examiner's consideration and are submitted pursuant to an Applicant's duty of disclosure under 37 C.F.R. § 1.56.

Copies of all of the cited documents:

☐ are enclosed unless otherwise indicated on the enclosed Form PTO/SB/08a.

☒ have been previously furnished to the Office in prior application No. 14/570,512, filed December 15, 2014, which the present application relies upon for an earlier effective filing date under 35 U.S.C. § 120. Therefore, no copies of the cited documents are included herewith pursuant to 37 C.F.R. § 1.98(d); MPEP § 609(III)(A)(2).

☐ are enclosed unless they are U.S. patents or U.S. patent application publications pursuant to 37 C.F.R. § 1.98(a).

I
BASIS

This information disclosure statement is filed pursuant to

☒ 37 C.F.R. § 1.97(b).
This information disclosure statement is filed either (1) within three months of the filing date of a national application other than a continued prosecution application under 37 C.F.R. § 1.53(d); (2) within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application; (3) before the mailing date of a first Office action on the merits; (4) concurrently with the filing of a request for continued examination under 37 C.F.R. § 1.114; or (5) before the mailing of a first Office action after the filing of a request for continued examination under 37 C.F.R. § 1.114, whichever event occurs last.

Accordingly, this information disclosure statement requires no fee and no certification.

☐ 37 C.F.R. § 1.97(c).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing date of any of (1) a final action under 37 C.F.R. § 1.113; (2) a notice of allowance under 37 C.F.R. § 1.311; or (3) an action that otherwise closes prosecution in the application.

Accordingly, this information disclosure statement requires either the fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c), or a statement under 37 C.F.R. § 1.97(e).

☐ 37 C.F.R. § 1.97(d).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(c) since a:

☐ final action under 37 C.F.R. § 1.113

☐ notice of allowance under 37 C.F.R. § 1.311

was mailed to the Applicant on _____.

Accordingly, this information disclosure statement requires the fee set forth in 37 C.F.R. § 1.17(p) to consider an information disclosure statement under 37 C.F.R. § 1.97(d), and a statement under 37 C.F.R. § 1.97(e).

If this statement crosses in the mail with an Office action, or is otherwise not in the indicated category of 37 C.F.R. § 1.97, it is respectfully requested that this statement be treated in the next appropriate category and made of record. To the extent required, please treat this paper as a conditional petition for acceptance of the information disclosure statement.

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

☐ Please charge the required fee to Deposit Account No. 505063.

☒ The Commissioner is hereby authorized to charge any additional required fees or credit any overpayments associated with this information disclosure statement to the account.

III

CERTIFICATION

Pursuant to 37 C.F.R. § 1.97(e), I state as follows:

☒ No statement is necessary.

☐ Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(1).

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to my knowledge after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(2).

Pursuant to 37 C.F.R. § 1.704(d), I state as follows:

☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of this information disclosure statement.

IV
FOREIGN LANGUAGE REFERENCES

Pursuant to 37 C.F.R. § 1.98(a)(3)(i), any information disclosure statement filed under 37 C.F.R. § 1.97 shall include a concise explanation of the relevance, as it is presently understood by the individual designated in § 1.56(c) most knowledgeable about the content of the information, of each patent, publication, or other information listed that is not in the English language. The concise explanation may be either separate from the specification or incorporated therein. In compliance with the rules, the Applicant states as follows:

☐ No concise explanation is required since all cited references are in English.

☐ A concise explanation of the relevance of one or more foreign language references is attached.

☐ According to the procedural policy adopted by the PTO with regard to disclosure requirements, the Applicant is satisfying the disclosure requirement pursuant to MPEP § 609.04(a)(III) by submitting herewith the following:

- ☐ English language versions of any non-English language documents.
- ☐ English language versions of one or more search reports or other actions by one or more foreign patent offices in one or more counterpart foreign applications, which indicate the degree of relevance found by the foreign office(s).
- ☐ Pursuant to 37 C.F.R. § 1.98(a)(3)(ii), a copy of a translation is not submitted herewith because a written English-language translation of a non-English-language document, or portion thereof, is not within the possession, custody, or control of, or is readily available to any individual designated in § 1.56(c).

The Applicant has not analyzed these documents and, therefore, declines to comment on their relevance at this time.

☐ One or more English language abstracts for the non-English language references are also enclosed.

V
REMARKS

It is respectfully requested that:

(1) The Examiner sign the enclosed Form to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application; and

(2) The citations for the cited information be printed on any patent that issues from this application.

The submission of this information disclosure statement by the Applicant shall not be construed as a representation that a search has been performed or that no other material information under 37 C.F.R. § 1.56 exists. See 37 C.F.R. § 1.97(g).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, material to the patentability of one or more of the pending claims in this application pursuant to 37 C.F.R. § 1.56(b), unless specifically designated by the Applicant as such. See 37 C.F.R. § 1.97(h).

The submission of this information disclosure statement by the Applicant shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, or even qualifies as "prior art" under 35 U.S.C. § 102 with respect to this invention, unless specifically designated by the Applicant as such.

Notwithstanding any statements by the Applicant, the Examiner is urged to form his or her own conclusion regarding the relevance of the cited information.

VI
CONCLUSION

The Examiner is encouraged to contact the undersigned attorney to discuss any questions concerning this information disclosure statement or any of the information cited or referred to herein.

Respectfully submitted,

Date: May 9, 2017

/JCS/

Jonathan C. Siekmann, Reg. No. 58,259
USPTO Customer No. 83579
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Broomfield, Colorado 80021
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PTO/AIA/01 (06-12)
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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	CACHING IN A CONTENT DELIVERY FRAMEWORK

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

■ United States application or PCT international application number 14/570,512 filed on 12-15-2014.

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: William Crowder Date (Optional): 3/25/2015

Signature: William C. C

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.

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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	CACHING IN A CONTENT DELIVERY FRAMEWORK

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

■ United States application or PCT international application number 14/570,512 filed on 12-15-2014.

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: Christopher Newton Date (Optional): 23rd March 2015

Signature: C. Newton

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.

CACHING IN A CONTENT DELIVERY FRAMEWORK

BACKGROUND OF THE INVENTION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of and claims the benefit of priority from U.S. Patent Application No. 14/570,512, entitled "CACHING IN A CONTENT DELIVERY FRAMEWORK," filed December 15, 2014, the entire contents of which are fully incorporated by reference herein for all purposes.

INCORPORATION BY REFERENCE

[0002] The following U.S. Patent and published U.S. patent applications are hereby fully incorporated herein by reference for all purposes:

1. U.S. Patent No. 9,456,053, entitled "Content Delivery Network," issued September 27, 2016 (filed December 14, 2012);
2. U.S. Patent No. 9,451,045, entitled "Content Delivery Network," issued September 20, 2016 (filed December 14, 2012);
3. U.S. Published Patent Application No. US 2014-0344399 A1, entitled "Origin Server-Side Channel In A Content Delivery Framework," filed June 17, 2014; and
4. U.S. Patent No. 6,185,598, entitled "Optimized Network Resource Location," issued February 6, 2001 (filed February 10, 1998).

FIELD OF THE INVENTION

[0003] This invention relates to content delivery and content delivery networks, and, more specifically, to caching in content delivery networks.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Other objects, features, and characteristics of the present invention as well as the methods of operation and functions of the related elements of structure, and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification.

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[0005] **FIG. 1** shows aspects of an exemplary content delivery framework in accordance with an exemplary embodiment hereof;

[0006] **FIG. 2** shows aspects of an exemplary content delivery network (CDN) according to exemplary embodiments hereof;

[0007] **FIG. 3** is a flowchart of aspects of processing according to exemplary embodiments hereof; and

[0008] **FIG. 4** depicts aspects of computing according to exemplary embodiments hereof.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EXEMPLARY EMBODIMENTS

GLOSSARY

[0009] As used herein, unless used otherwise, the following terms or abbreviations have the following meanings:

[0010] CD means Content Delivery;

[0011] CDN means Content Delivery Network;

[0012] HTTP means Hyper Text Transfer Protocol;

[0013] HTTPS means HTTP Secure;

[0014] TTL means time to live;

[0015] URI means Uniform Resource Identifier;

[0016] URL means Uniform Resource Locator.

BACKGROUND AND OVERVIEW

[0017] A content delivery network (CDN) distributes content (*e.g.*, resources) efficiently to clients on behalf of one or more content providers, preferably via a public Internet. Content providers provide their content (*e.g.*, resources) via origin sources (origin servers or origins), and a CDN can also provide an over-the-top transport mechanism for efficiently sending content in the reverse direction – from a client to an origin server. Both end-users (clients) and content providers benefit from using a CDN. Using a CDN, a content provider is able to take pressure off (and thereby reduce the load on) its own servers (*e.g.*, its origin servers). Clients benefit by being able to obtain content with fewer delays.

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[0018] With reference to **FIG. 1** which shows an exemplary content delivery framework **100** according to exemplary embodiments hereof, content **102** associated with one or more subscribers **104** may be distributed to clients **106** via one or more CDNs **108**. The CDN(s) **108** may be any kind of CDN and may include sub-CDNs, delegated CDNs, partial CDNs, etc. Exemplary CDNs are described in U.S. Published Patent Applications Nos. US 2013-0159472 and US 2013-0159473, both filed December 12, 2012; and No. US 2014-0344399 A1, filed June 17, 2014; and U.S. Patent No. 6,**185**,**598**, filed February 10, 1998, the entire contents of each of which has been fully incorporated herein by reference for all purposes. **FIG. 2** shows aspects of an exemplary CDN **108** according to exemplary embodiments hereof.

[0019] As used herein, clients are agents (*e.g.*, browsers, set-top boxes, or other applications) used, *e.g.*, by end users to issue requests (*e.g.*, DNS and HTTP requests) within the system. When no CDN or other intermediaries are in use, such requests may go directly to the subscriber's own servers (*e.g.*, their origin servers) or to other components in the Internet. When a content provider subscribes to CD services (*e.g.*, as described U.S. Published Patent Applications Nos. US 2013-0159472 and US 2013-0159473), various requests may go to intermediate CD services that may map the end-user requests to origin requests, possibly transforming and caching content along the way.

[0020] Each distinct origin (*e.g.*, origin server) is typically associated with one subscriber, but a subscriber may be associated with any number of origins, including subscriber-owned and CDN provided origins.

[0021] The physical origins with which the CDN interacts may actually be intermediaries that acquire content from a chain of intermediaries, perhaps, *e.g.*, elements of a separate content acquisition system that ultimately terminates at a subscriber's actual origin servers. As far as the internals of the CDN are concerned, however, the origin is that service outside the system boundary from which content is directly acquired.

[0022] As used herein, an end user is an entity (*e.g.*, person or organization) that ultimately consumes some Internet service (*e.g.*, a web site, streaming service, etc.) provided by a service provider entity. This provider entity is sometimes referred to as a subscriber in this description because they subscribe to CDN services in order to

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efficiently deliver their content, *e.g.*, from their origins to their consumers. A CDN may provide value-added mediation (*e.g.*, caching, transformation, etc.) between its subscribers and their end-users.

CACHING

[0023] Content (*e.g.*, a resource) may be cached both within a CDN and by other entities, including by a client to which that content has been served. As should be appreciated, a client may also be an entity within a CDN. In some cases content may be cached by intermediaries both within a CDN and external to the CDN. With reference again to the content delivery framework **100** in **FIG. 1**, at least some content **102** may be cached within the CDN(s) **108**, *e.g.*, CDN caches or cache services **110**.

[0024] Cached and cacheable content typically has a caching policy associated therewith, and it is generally expected that entities that process such content will obey those caching policies. Caching policies of particular interest here include those policies relating to the expiration of content, it being appreciated that it is generally undesirable to serve stale or expired content or to serve content in a manner that is inconsistent with the caching policy associated with that content.

[0025] Caching policies may be specified as cache directives associated with content, and cache directives may depend, *e.g.*, on the type of resource. For example, HTTP resources (including HTTPS resources) preferably use conventional HTTP caching directives such as described in Internet Engineering Task Force (IETF) Request for Comments (RFC) 7234, "Hypertext Transfer Protocol (HTTP/1.1): Caching," the entire contents of which are hereby fully incorporated herein by reference for all purposes. As is known, in the case of HTTP resources the cache directives may be provided via headers associated with the resources. If no cache directives are provided with a resource then an entity (*e.g.*, a cache node) may use default caching policies for resources of that type or from that provider. The entity may determine the default caching policies from another source. In general, a cache directive (or caching policy) associated with content (*e.g.*, a resource or set of resources) may be provided with that content (*e.g.*, as a header in the case of an HTTP resource) and/or be available from a location or entity (*e.g.*, database or the like) distinct from the content.

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[0026] A CDN may cache content on behalf of its subscribers, and preferably a CDN allows for specification, *e.g.*, within a CDN node, of a cache expiration policy of content the CDN caches on behalf of its subscribers. A CDN may have or support an internal caching policy for content (*e.g.*, a resource or set of resources), where the internal caching policy is a policy honored by the CDN cache that is separate and possibly distinct from an external caching policy for the same content (*e.g.*, the caching policy that is conveyed with the content when being delivered to a client).

[0027] In some embodiments a CDN may support a subscriber or other user or entity setting or overriding an internal caching policy for resources. For example, in such a system, a CDN customer/subscriber may access a self-service portal or the like (*e.g.*, via an Application Program(ing) Interface – API) and override a caching policy from the origin server for some or all of their content. For example, a particular CDN subscriber may use a portal to set a caching policy for a particular kind of their content (*e.g.*, for their PDF files or the like), *e.g.*, so that those files are cached for a particular time period (*e.g.*, a week, an hour, etc.).

[0028] Rather than try to invalidate cached content (*e.g.*, resources) every time a caching policy for that content is set, as described herein, the CDN's internal request processing process may determine the caching policy of requested content at request time rather than at fill time. In effect, the request processing uses a late-binding of the caching policy, thereby assuring that the latest internal caching policy is used without having to force invalidations (a potentially expensive process).

[0029] Cache directives similar to those used for external caching may be used for internal cache policies. It should be appreciated, however, that in order to conveniently distinguish internal from external cache policy directives, a CDN will use different names for the internal cache policies and/or provide these policies (*e.g.*, via an internally used HTTP header). In this manner the external cache policies may be provided to external entities while the internal cache policies may be acted upon by the CDN entities (*e.g.*, caches).

[0030] For example, with reference again to the content delivery framework **100** in **FIG. 1**, content **102** from the subscriber(s) **104** may have internal and/or external cache policies (*e.g.*, cache directives) associated therewith. Content **102'** provided by the

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CDN **108** to the client(s) **106** preferably includes external cache policies (*e.g.*, cache directives). The internal cache policies may be provided with the content **102'** to the client(s) **106**, since these policies preferably use directives that the client will not recognize or act on. The cache policies associated with particular content may be included with the content (*e.g.*, in the case of HTTP resources, as HTTP headers), or they may be located elsewhere. A CDN may apply a default caching policy to content in the absence of specific directives associated with that content.

[0031] In some embodiments hereof the caching policies (internal and external) associated with content (*e.g.*, a resource or group of resources) may be stored in a database (sometimes referred to herein as a RuleBase). When a client request for a resource is being processed the RuleBase may be accessed in order to lookup/obtain the required caching policies (internal and external). With reference again to **FIG. 1**, cache(s) **110** may access one or more databases **112** in order to obtain information about internal and/or external caching policies associated with content.

[0032] As noted above, in some embodiments a CDN may support a subscriber or other user or entity setting or overriding an internal caching policy for resources, *e.g.*, via a self-service portal or the like (*e.g.*, via an API). An exemplary portal **114** is shown in **FIG. 1** whereby subscribers may access and/or modify caching policies associated with their content (*i.e.*, with content to be served by the CDN on their behalf).

[0033] Thus, according to exemplary embodiments hereof, as a request for content is received at a CDN node from a client, the node will determine the caching expiration policy for that content (*e.g.*, is there an override policy and if so what is it; otherwise a policy provided by the origin server should be honored). The caching policy for content may be determined, *e.g.*, by access to the RuleBase.

[0034] This policy is then conveyed to the caching node (also referred to as a cache), *e.g.*, as one or more cache constraints. The cache may then use those constraint(s) to determine if the content it has on hand (if any) can be returned to the requesting client, or if a refresh/reload etc. is required. As should be appreciated, if the node does not have the resource available then it needs to obtain the resource regardless of the internal caching policy, although it may honor the then-current caching policy.

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[0035] For example, if the configuration specifies an internal caching policy of "one hour" then that policy is conveyed to the cache when the application requests the resource. If the cache has the resource, then it compares the original fill time of the resource it has to the specified policy (and the current time) to determine if the resource it has can be served from the cached resource or if it needs to be refreshed/reloaded first (or possibly asynchronously).

[0036] If the requested resource is not in cache, then a fill is made and stored in cache if and only if the specified policy allows or requires it (*e.g.*, if the response is marked as no-store and there is no internal policy provided that specifies a caching policy, then do not store it, etc.).

[0037] Absent any internal caching policy override, the caching rules of the responses from the origin would still apply (*i.e.*, the cache would return the resource if it saw that the resource was fresh and had no constraints).

[0038] Any external policy would be applied as the resource is delivered to the client. This allows for different classes of client to specify different constraints. For instance, in some cases an internal request for a resource could request the resource in such a way as to always prevent a refresh from occurring; or could similarly require a refresh regardless of what the cache considers the expiration of the resource to be.

[0039] **FIG. 3** is a flowchart of aspects of processing according to exemplary embodiments hereof. As shown in the flowchart in **FIG. 3**, a cache (caching node) in the CDN receives a request for content (C) (at **302**). The request may have reached the caching node in any manner (*e.g.*, via a rendezvous system of the CDN). The content C may be or comprise one or more resources and the request may take the form of a URI or URL specifying those resources. The cache determines (at **304**) whether the requested content C is cached locally. If it is determined (at **304**) that no locally cached copy of C is available then the node gets a copy of the content C, preferably along with C's caching policy (at **306**). The node may obtain the copy of C from an appropriate fill-authoritative node in the CDN, it being understood that the fill-authoritative node will also check that its cached version, if any, is not stale. In other words, the late binding cache policy checking is preferably performed by all intermediate nodes that provide a copy of

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requested content, whether they are providing that content to an external or internal client.

[0040] On the other hand, if it is determined (at **304**) that there is a locally cached copy of the requested content C, then the node obtains (at **310**) the current cache policy associated with content C (*e.g.*, from the database **112**). The current cache policy is then used (at **312**) to determine whether the node can serve the currently cached version of the requested content (C). If, based on the current cache policy obtained/determined in **310**, it is not okay to serve the locally cached version of the requested content C, then the node gets the current version of the content C (at **306**), as described above and serves the current version of C (at **308**). On the other hand, if it is determined (at **312**) that it is acceptable for the node to serve the currently-cached version of the content C (based, at least in part, on the current cache policy for C obtained at **310**), then the currently-cached version of the content C is served (at **308**).

[0041] Caching policies specified in the RuleBase, *e.g.*, policies that are specified based on mime type and/or status code (negative caching being a particular case of this) may be dealt with by extending the constraints passed to the cache. For example, "if cached for no more than an hour, unless it is text/html in which case consider it non-cacheable or text/* in which case cacheable for one day." It should be appreciated that a suitably terse syntax would apply to and be used for such constraints.

[0042] In some cases the RuleBase constraint set may be compilable at sequence generation time since it typically applies property wide – there would need to be provision for additional filters however (the set should be limited and readily selectable amongst during request preparation); negative caching could similarly be handled by including a negative TTL value and a list of status codes to the constraint set.

[0043] As will be appreciated, a downside of this approach is that the caching policy determination must be made for every request. This is unlikely to be free, and could be relatively costly. On the other hand, the benefit of having relatively instant policy updates may not be big since policy updates may be rare. To mitigate that cost, an implementation may store a configuration version number with each resource and only recalculate it if the configuration has changed. For example, such an approach would call into the caching engine with the current configuration version number and have the cache

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compare that to the configuration number associated with the resource. If the configuration numbers are the same, then use the policy information attached to the resource, otherwise call back out to get the current set of constraints. Effectively this approach will only process the RuleBase to get the constraints if it looks like they have changed. In some implementations the version number may be or comprise a checksum or hash or the like of the caching policy (as well as or instead of a sequence number). The hash may be a cryptographic hash such as an MD5 or SHA or the like. In this manner a change that is subsequently undone may be seen as matching a prior version.

[0044] Such a system would deal with odd constraints (*e.g.*, the type of internal request that never wants to cause a refresh) by entering some sentinel sequence number that causes the current constraint to be requested. To support such an approach, the interface to the cache may be such that the request would be allowed to convey a sequence number and/or a set of constraints. If the RuleBase needs to be processed for every request anyway, then the constraints can be gathered during that and conveyed on the request to the cache, which could just ignore it if the sequence number hasn't changed rather than calling out from the cache.

COMPUTING

[0045] **FIG. 4** is example schematic diagram of a computing system **400** implementing a proxy, a parent server, or other computing device that may be used to perform the processes discussed herein. The computing system includes a bus **402** (*i.e.*, interconnect), at least one processor **404**, at least one communication port **414**, a main memory **406**, a removable storage media **410**, a read-only memory **408**, and a mass storage device **412**. Processor(s) **404** can be any known processor, such as, but not limited to, an Intel® Itanium® or Itanium 2® processor(s), AMD® Opteron® or Athlon MP® processor(s), or Motorola® lines of processors. Communication port **414** can be any of an RS-232 port for use with a modem based dial-up connection, a 10/100 Ethernet port, a Gigabit port using copper or fiber, or a USB port. Communication port(s) **414** may be chosen depending on a network such as a Local Area Network (LAN), a Wide Area Network (WAN), or any network to which the computer system connects. The

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server may be in communication with peripheral devices (*e.g.*, display screen **416**, input device **418** via Input/Output (I/O) port **420**.

[0046] Main memory **406** can be Random Access Memory (RAM) or any other dynamic storage device(s) commonly known in the art. Read-only memory **408** can be any static storage device(s) such as Programmable Read-Only Memory (PROM) chips for storing static information such as instructions for processor **404**. Mass storage device **412** can be used to store information and instructions. For example, hard disks such as the Adaptec® family of Small Computer Serial Interface (SCSI) drives, an optical disc, an array of disks such as Redundant Array of Independent Disks (RAID), such as the Adaptec® family of RAID drives, or any other mass storage devices, may be used.

[0047] Bus **402** communicatively couples processor(s) **404** with the other memory, storage and communications blocks. Bus **402** can be a PCI / PCI-X, SCSI, or Universal Serial Bus (USB) based system bus (or other) depending on the storage devices used. Removable storage media **410** can be any kind of external hard drives, floppy drives, IOMEGA® Zip Drives, Compact Disc – Read Only Memory (CD-ROM), Compact Disc – Re-Writable (CD-RW), Digital Video Disk – Read Only Memory (DVD-ROM), etc.

[0048] Embodiments herein may be provided as a computer program product, which may include a machine-readable medium having stored thereon instructions which may be used to program a computer (or other electronic devices) to perform a process. The machine-readable medium may include, but is not limited to, floppy diskettes, optical discs, CD-ROMs, magneto-optical disks, ROMs, RAMs, erasable programmable read-only memories (EPROMs), electrically erasable programmable read-only memories (EEPROMs), magnetic or optical cards, flash memory, or other type of media/machine-readable medium suitable for storing electronic instructions.

[0049] As shown, main memory may be encoded with one or more applications/services **422** that support functionality as discussed above with respect to the various figures and elsewhere. For example, in one embodiment, the application **422** may include or otherwise implement the various processes and/or instructions described herein. The application **422** (and/or other resources as described herein) can be embodied as software code such as data and/or logic instructions (*e.g.*, code stored in the memory or

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on another computer readable medium such as a disk) that supports processing functionality according to different embodiments described herein. During operation of one embodiment, processor(s) **404** accesses main memory **406** via the use of bus **402** in order to launch, run, execute, interpret or otherwise perform the logic instructions of the application **422**. Execution of the application **422** produces processing functionality in application process **424**. In other words, the process **424** represents one or more portions of the application **422** performing within or upon the processor(s) **404** in the computer system **400**.

[0050] The description above includes example systems, methods, techniques, instruction sequences, and/or computer program products that embody techniques of the present disclosure. However, it is understood that the described disclosure may be practiced without these specific details. In the present disclosure, the methods disclosed may be implemented as sets of instructions or software readable by a device. Further, it is understood that the specific order or hierarchy of steps in the methods disclosed are instances of example approaches. Based upon design preferences, it is understood that the specific order or hierarchy of steps in the method can be rearranged while remaining within the disclosed subject matter. The accompanying method claims present elements of the various steps in a sample order, and are not necessarily meant to be limited to the specific order or hierarchy presented.

CONCLUSION

[0051] As used herein, including in the claims, the phrase "at least some" means "one or more," and includes the case of only one. Thus, *e.g.*, the phrase "at least some services" means "one or more services", and includes the case of one service.

[0052] As used herein, including in the claims, the phrase "based on" means "based in part on" or "based, at least in part, on," and is not exclusive. Thus, *e.g.*, the phrase "based on factor X" means "based in part on factor X" or "based, at least in part, on factor X." Unless specifically stated by use of the word "only", the phrase "based on X" does not mean "based only on X."

[0053] As used herein, including in the claims, the phrase "using" means "using at least," and is not exclusive. Thus, *e.g.*, the phrase "using X" means "using at least X."

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Unless specifically stated by use of the word "only", the phrase "using X" does not mean "using only X."

[0054] In general, as used herein, including in the claims, unless the word "only" is specifically used in a phrase, it should not be read into that phrase.

[0055] As used herein, including in the claims, the phrase "distinct" means "at least partially distinct." Unless specifically stated, distinct does not mean fully distinct. Thus, *e.g.*, the phrase, "X is distinct from Y" means that "X is at least partially distinct from Y," and does not mean that "X is fully distinct from Y." Thus, as used herein, including in the claims, the phrase "X is distinct from Y" means that X differs from Y in at least some way.

[0056] As used herein, including in the claims, a list may include only one item, and, unless otherwise stated, a list of multiple items need not be ordered in any particular manner. A list may include duplicate items. For example, as used herein, the phrase "a list of CDN services" may include one or more CDN services.

[0057] It should be appreciated that the words "first" and "second" in the description and claims are used to distinguish or identify, and not to show a serial or numerical limitation. Similarly, the use of letter or numerical labels (such as "(a)", "(b)", and the like) are used to help distinguish and / or identify, and not to show any serial or numerical limitation or ordering.

[0058] No ordering is implied by any of the labeled boxes in any of the flow diagrams unless specifically shown and stated. When disconnected boxes are shown in a diagram, the activities associated with those boxes may be performed in any order, including fully or partially in parallel.

[0059] While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

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CLAIMS

We claim:

1. A computer-implemented method, operable with a content delivery network (CDN), the method comprising, by a node in the CDN:

(A) in response to a request for content, determining if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining a current cache policy associated with the content; and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

(i) when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving the content that is cached locally.

2. The method as recited in claim 1 further comprising:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

3. The method as recited in claim 1 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

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4. The method as recited in claim 1 wherein the current cache policy is determined from a location distinct from the node.

5. The method as recited in claim 4 wherein the location is a database.

6. The method as recited in claim 1 wherein the cache policy relates to caching content within the CDN.

7. The method as recited in claim 6 wherein the cache policy also relates to caching content outside the CDN.

8. A computer program product having computer readable instructions stored on non-transitory computer readable media, the computer readable instructions including instructions for implementing a computer-implemented method, said method operable on a device comprising hardware including memory and at least one processor and running a service on said hardware, said method operable in a content delivery service (CDN), said method comprising:

(A) in response to a request for content, determining if the content is cached locally;

(B) when it is determined that said content is cached locally, then:

(B)(1) determining a current cache policy associated with the content; and then

(B)(2) determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally;

(B)(3) based on said determining in (B)(2),

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(i) when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, and

(ii) when it is acceptable to serve the content that is cached locally, serving the content that is cached locally.

9. The computer program product as recited in claim 8 wherein the method further comprises:

(C) when it is determined that said content is not cached locally, then (C)(1) obtaining the content and then (C)(2) serving the content obtained in (C)(1).

10. The computer program product as recited in claim 8 wherein the request comprises an HTTP request and wherein the content comprises one or more resources.

11. The computer program product as recited in claim 8 wherein the current cache policy is determined from a location distinct from the node.

12. The computer program product as recited in claim 11 wherein the location is a database.

13. The computer program product as recited in claim 8 wherein the cache policy relates to caching content within the CDN.

14. The computer program product as recited in claim 13 wherein the cache policy also relates to caching content outside the CDN.

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ABSTRACT

A computer-implemented method, operable with a content delivery network (CDN) uses late binding of caching policies; by a caching node in the CDN, in response to a request for content, determining if the content is cached locally. When it is determined that said content is cached locally, then: determining a current cache policy associated with the content; and then determining, based on said current cache policy associated with the content, whether it is acceptable to serve the content that is cached locally; based on said determining, when it is not acceptable to serve the content that is cached locally, obtaining a new version of the content and then serving the new version of the content, otherwise when it is acceptable to serve the content that is cached locally, serving the content that is cached locally.

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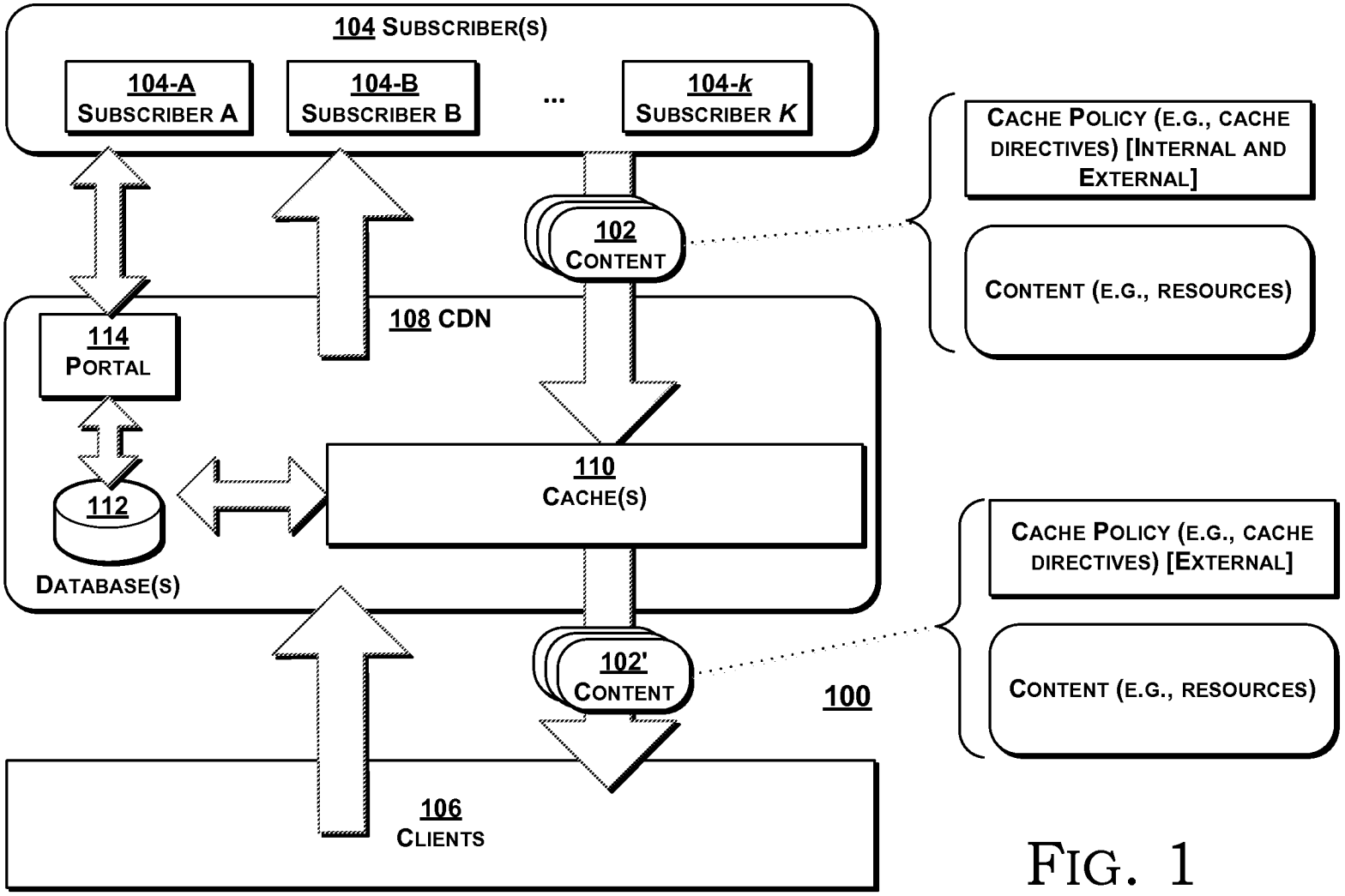


FIG. 1

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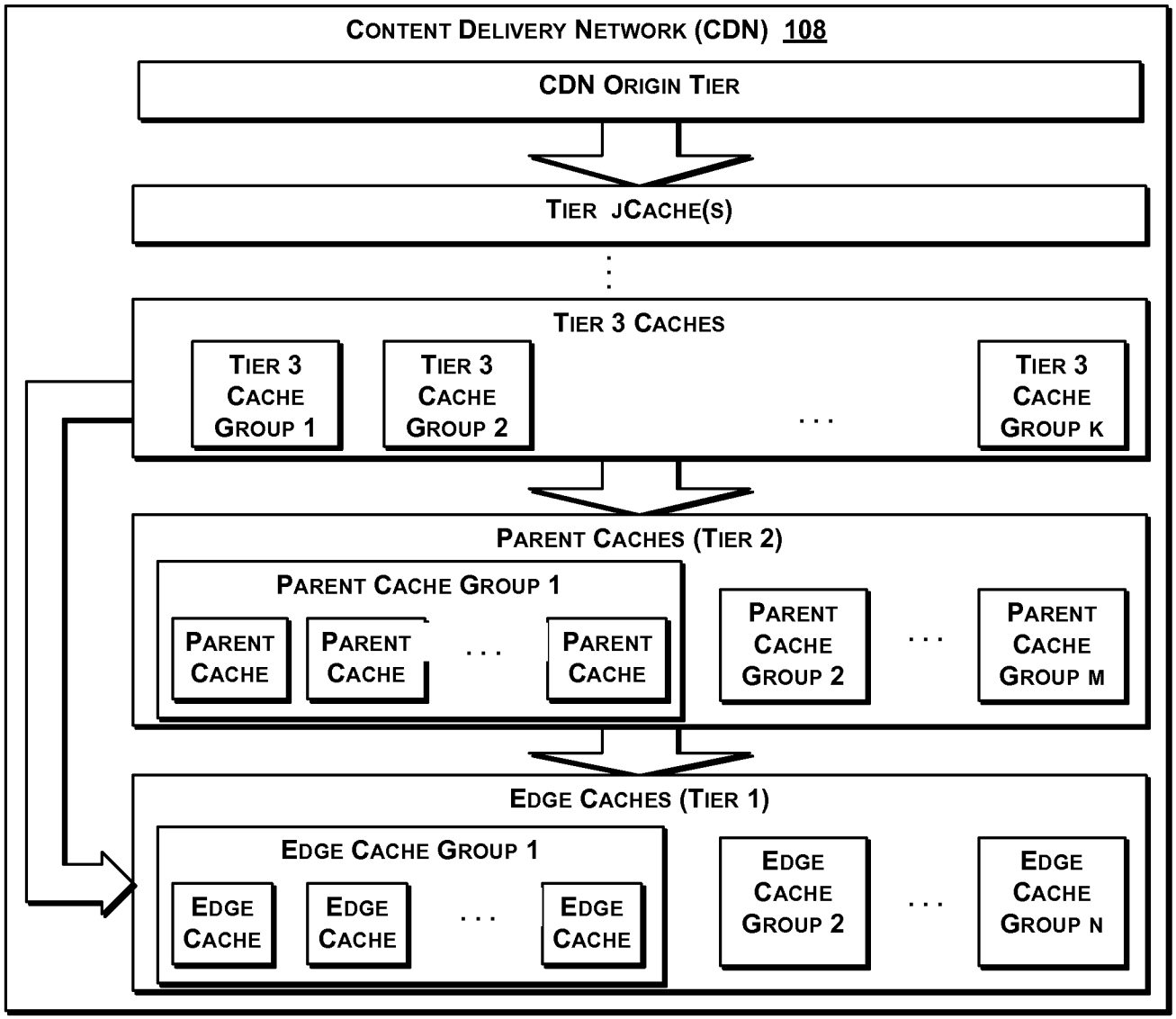


FIG. 2

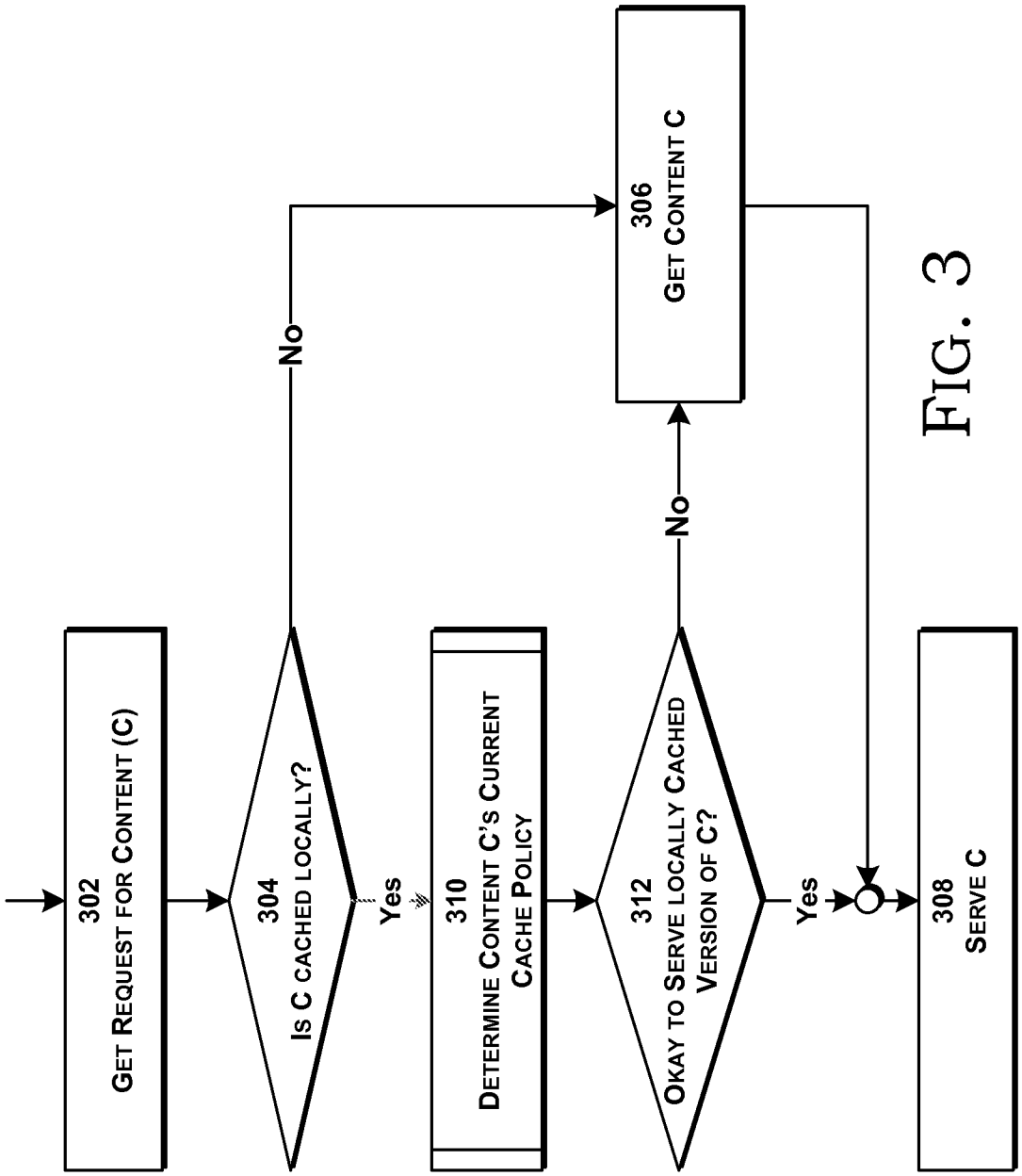


FIG. 3

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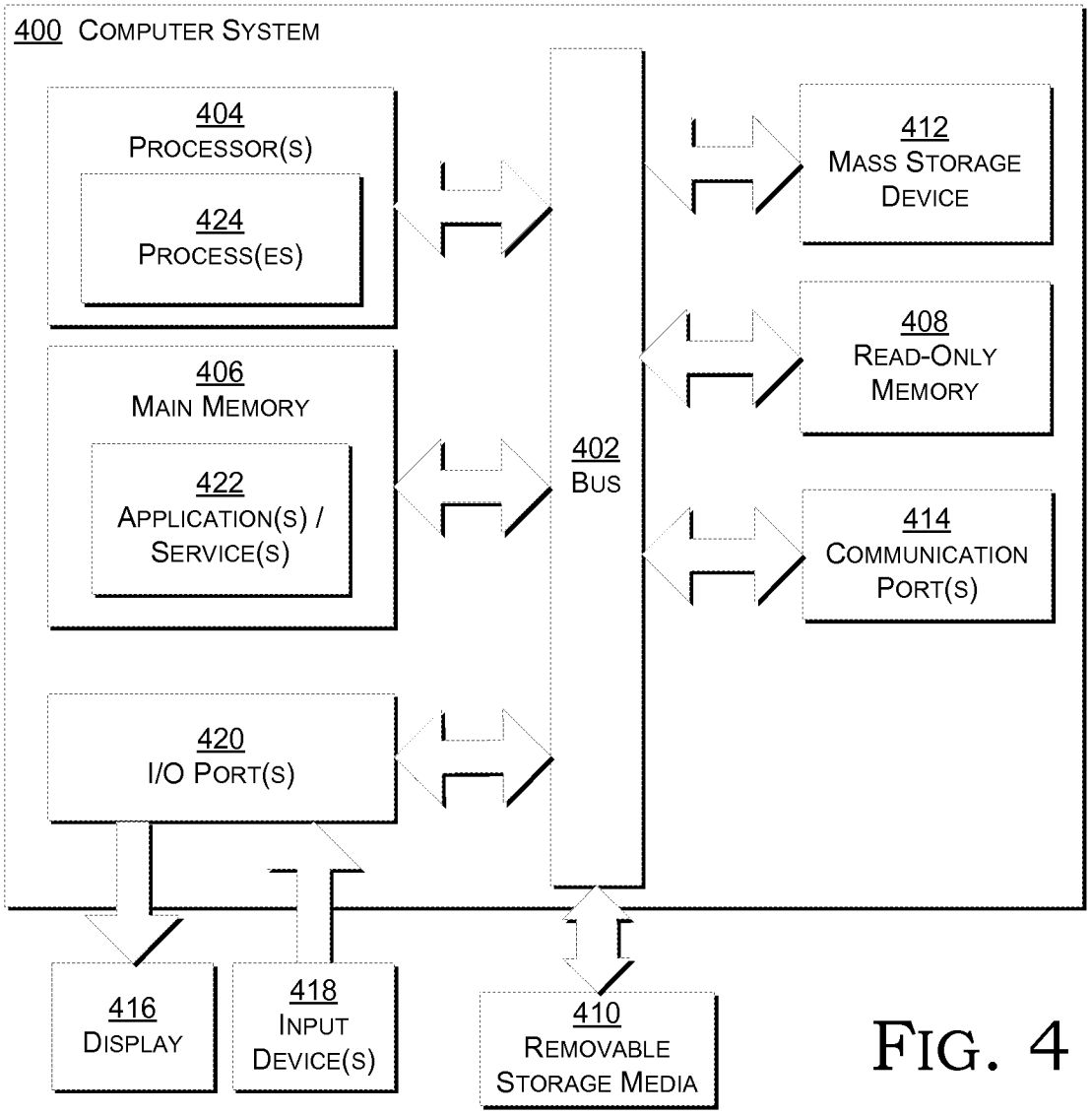


FIG. 4

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	0492-US-C1
	Application Number	
Title of Invention	CACHING IN A CONTENT DELIVERY FRAMEWORK	

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.
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☐ 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.)

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492-US-C1
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Title of Invention	CACHING IN A CONTENT DELIVERY FRAMEWORK	

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Application Information:

Title of the Invention	CACHING IN A CONTENT DELIVERY FRAMEWORK		
Attorney Docket Number	0492-US-C1	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	4	**Suggested Figure for Publication (if any)**	1

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.

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Customer Number	83579		

Domestic Benefit/National Stage Information:

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

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14570512	2014-12-15

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492-US-C1
	Application Number	
Title of Invention	CACHING IN A CONTENT DELIVERY FRAMEWORK	

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 benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. 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(a).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Priority Claimed
			• Yes No

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

Authorization to Permit Access:

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

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

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

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

Applicant Information:

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492-US-C1
	Application Number	
Title of Invention	CACHING IN A CONTENT DELIVERY FRAMEWORK	

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.

Remove

● Assignee	Legal Representative under 35 U.S.C. 117
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 Assignee is an Organization check here. ☒

Organization Name	Level 3 Communications, LLC

Mailing Address Information:

Address 1	1025 Eldorado Boulevard		
Address 2			
City	Broomfield	**State/Province**	CO
Country	US	Postal Code	80021
Phone Number		Fax Number	
Email Address			

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

Signature:

Remove

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

Signature	/JCS/			Date (YYYY-MM-DD)	2017-05-08
First Name	Jonathan	Last Name	Siekmann	Registration Number	58259

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	0492-US-C1
	Application Number	
Title of Invention	CACHING IN A CONTENT DELIVERY FRAMEWORK	

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 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.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0492-US-C1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1600**

Electronic Acknowledgement Receipt

EFS ID:	29139099
Application Number:	15588935
International Application Number:	
Confirmation Number:	2851
Title of Invention:	CACHING IN A CONTENT DELIVERY FRAMEWORK
First Named Inventor/Applicant Name:	Christopher Newton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0492-US-C1
Receipt Date:	08-MAY-2017
Filing Date:	
Time Stamp:	12:14:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1600
RAM confirmation Number	050817INTEFSW12145900
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	Oath or Declaration filed	0492_US_C1_Oath.pdf	157764 e0b6a1178e92c086cba3f43556ac5f75ae9aa38b	no	2
Warnings:					
Information:					
2		0492_US_C1_Specification.pdf	109663 be8fe86e5b39f5cef94dacd0ceb8d4f88aca3a81	yes	16

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	12
Claims	13	15
Abstract	16	16

Warnings:					
Information:					
3	Drawings-only black and white line drawings	0492_US_C1_Figures.pdf	83950 e9146de4c52cfe824f9dfa5f61788c4f7c0021ad	no	4
Warnings:					
Information:					
4	Application Data Sheet	0492_US_C1_ADS_.pdf	870604 c772245a81597ffdd2d562cdbec3367f5c1ffc5c	no	6
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	35325 fd4b4ffda3904c455198ae82139eca71c41f7d81	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	1257306

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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