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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	25253-30675/US
		Application Number	
Title of Invention	Just-in-Time Distributed Video Cache		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

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

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Erik	R.	Swenson		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	Opera Software Ireland Limited				
Address 2	77 Sir John Rogerson's Quay, Suite 1262				
City	Dublin	State/Province			
Postal Code	2	Country i	IE		

Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Jaime		Heilpern		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	Opera Software Ireland Limited				
Address 2	77 Sir John Rogerson's Quay, Suite 1262				
City	Dublin	State/Province			
Postal Code	2	Country i	IE		

Inventor 3					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Sandeep		Pombra		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	25253-30675/US
		Application Number	
Title of Invention	Just-in-Time Distributed Video Cache		

City	Los Altos	State/Province	CA	Country of Residence i	US
------	-----------	----------------	----	------------------------	----

Mailing Address of Inventor:

Address 1	Opera Software Ireland Limited				
Address 2	77 Sir John Rogerson's Quay, Suite 1262				
City	Dublin	State/Province			
Postal Code	2	Country i	IE		

Inventor 4[Remove](#)**Legal Name**

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ron		Earley	

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	Dublin	State/Province	CA	Country of Residence i	US
------	--------	----------------	----	------------------------	----

Mailing Address of Inventor:

Address 1	Opera Software Ireland Limited				
Address 2	77 Sir John Rogerson's Quay, Suite 1262				
City	Dublin	State/Province			
Postal Code	2	Country i	IE		

Inventor 5[Remove](#)**Legal Name**

Prefix	Given Name	Middle Name	Family Name	Suffix
	Vadim		Arshanskiy	

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	Santa Clara	State/Province	CA	Country of Residence i	US
------	-------------	----------------	----	------------------------	----

Mailing Address of Inventor:

Address 1	Opera Software Ireland Limited				
Address 2	77 Sir John Rogerson's Quay, Suite 1262				
City	Dublin	State/Province			
Postal Code	2	Country i	IE		

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.[Add](#)**Correspondence Information:**Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).☐ An Address is being provided for the correspondence information of this application.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	25253-30675/US	
		Application Number		
Title of Invention	Just-in-Time Distributed Video Cache			
Customer Number	00758			
Email Address	ptoc@fenwick.com		Add Email	Remove Email

Application Information:

Title of the Invention	Just-in-Time Distributed Video Cache			
Attorney Docket Number	25253-30675/US	Small Entity Status Claimed ☐		
Application Type	Nonprovisional			
Subject Matter	Utility			
Total Number of Drawing Sheets (if any)	7	Suggested Figure for Publication (if any)		

Filing By Reference :

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

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

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

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.			
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	00758		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	25253-30675/US
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Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing 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.

When referring to the current application, please leave the application number blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Division of	13945747	2013-07-18
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
13945747	Claims benefit of provisional	61673188	2012-07-18
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

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

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	25253-30675/US
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Title of Invention	Just-in-Time Distributed Video Cache		

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

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

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices
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	25253-30675/US
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Title of Invention	Just-in-Time Distributed Video Cache		

Applicant 1				Remove	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.					
Clear					
☒ Assignee		☐ Legal Representative under 35 U.S.C. 117		☐ Joint Inventor	
☐ Person to whom the inventor is obligated to assign.			☐ Person who shows sufficient proprietary interest		
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:					
Name of the Deceased or Legally Incapacitated Inventor :					
If the Applicant is an Organization check here. ☒					
Organization Name		Opera Software Ireland Limited			
Mailing Address Information For Applicant:					
Address 1		77 Sir John Rogerson's Quay			
Address 2		Suite 1262			
City		Dublin	State/Province		
Country ⁱ	IE	Postal Code		2	
Phone Number			Fax Number		
Email Address					
Additional Applicant Data may be generated within this form by selecting the Add button. Add					

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.	
Assignee 1	
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.	
Remove	
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	25253-30675/US
		Application Number	
Title of Invention	Just-in-Time Distributed Video Cache		

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

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

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

Signature:

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

Signature	/Rajiv P. Patel/		Date (YYYY-MM-DD)	2015-09-04
First Name	Rajiv P.	Last Name	Patel	Registration Number
			39327	

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

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.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

Just-In-Time Distributed Video Cache

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT international application number _____

filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

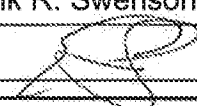
WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Erik R. Swenson

Date (Optional): 7/17/13

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

Just-In-Time Distributed Video Cache

As the below named inventor, I hereby declare that:

This declaration
is directed to



The attached application, or



United States application or PCT international application number _____
filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Jaime Heilpern

Date (Optional)

7.17.13

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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If you need assistance in completing the form, call 1-800-PTO-0199 and select option 2.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

**Title of
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Just-In-Time Distributed Video Cache

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is directed to:



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United States application or PCT international application number _____

filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: **Sandeep Pombra**

Date (Optional): **May 17, 2013**

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

**Title of
Invention**

Just-In-Time Distributed Video Cache

As the below named inventor, I hereby declare that:

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United States application or PCT international application number _____

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by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Vadim Arshanskiy

Date (Optional): 07/17/2013

Signature: V. Arshanskiy

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)****Title of
Invention**

Just-In-Time Distributed Video Cache

As the below named inventor, I hereby declare that:

This declaration
is directed to:

The attached application, or



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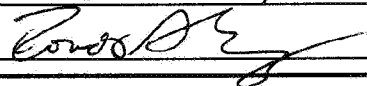
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JUST-IN-TIME DISTRIBUTED VIDEO CACHE

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CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a divisional of U.S. Patent Application No. 13/945,747, filed on July 18, 2013, which claims the benefit of U.S. Provisional Application No. 61/673,188, filed on July 18, 2012, which are incorporated by reference herein in their entirety.

BACKGROUND

1. FIELD OF ART

[0002] The disclosure generally relates to improving user experience on a network, and more specifically, to optimizing video caching in a network.

2. DESCRIPTION OF THE RELATED ART

[0003] Mobile devices, such as smart phones and tablets, have become prevalent in recent years. Given the advances in mobile computing power and far-reaching wireless Internet access, more and more users view streamed videos on their mobile devices. These streamed videos are often streamed at varying qualities, frame rates, frame sizes and compression levels from the various sources users access with their mobile devices. In many cases, videos available on the network are not optimized for wireless transmission or viewing on mobile devices and are streamed at a given quality from the source agnostic to network conditions. For example, an unoptimized video may have a quality level sufficient to provide users with a good viewing

experience on a computer monitor or television. As a result, an unnecessarily large portion of bandwidth may be used to stream an unoptimized video when a smaller portion would suffice for providing an equivalent user viewing experience on the smaller display of the mobile device.

[0004] Existing network providers or media sources have attempted to improve the bandwidth usage during video streaming by performing a video optimization on the streamed video. Optimization often involves transcoding a source file such as a video into a format that more closely fits the capabilities of mobile devices or the network provider's system. While optimization does improve the bandwidth usage with little impact on the quality of the streamed video as viewed on a mobile device, the optimization process usually causes a delay in video streaming and playback as servers begin the transcoding process. These delays ultimately cause an adverse effect on the user's viewing experience, which may lead to the user stopping the video streaming early or switching to another streaming site.

BRIEF DESCRIPTION OF DRAWINGS

[0005] The disclosed embodiments have other advantages and features which will be more readily apparent from the detailed description, the appended claims, and the accompanying figures (or drawings). A brief introduction of the figures is below.

[0006] Figure (FIG.) 1 illustrates a high-level block diagram of an example communications environment for optimized video caching.

[0007] FIG. 2 illustrates an embodiment of components of an example machine able to read instructions from a machine-readable medium and execute them in a process or controller.

[0008] FIGS. 3A-3D illustrate embodiments of example event traces for providing an optimized video to a user device.

[0009] FIG. 4 illustrates a flow diagram of an embodiment of predictive encoding using cached headers.

DETAILED DESCRIPTION

[0010] The Figures (FIGS.) and the following description relate to preferred embodiments by way of illustration only. It should be noted that from the following discussion, alternative embodiments of the structures and methods disclosed herein will be readily recognized as viable alternatives that may be employed without departing from the principles of what is claimed.

[0011] Reference will now be made in detail to several embodiments, examples of which are illustrated in the accompanying figures. It is noted that wherever practicable similar or like reference numbers may be used in the figures and may indicate similar or like functionality. The

figures depict embodiments of the disclosed system (or method) for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles described herein.

OVERVIEW

[0012] Network providers and media sources may use local caching as a method for improving the streaming quality of source files such as video to mobile devices. When a source file is transcoded and optimized by a video optimizer, for example, it may be saved into a local cache. Local caching allows the video optimizer to store the transcoded source file (or optimized version of the source file) for a short duration and respond to a user's requests (e.g., replaying the video or skipping in the timeline of the video) without having to re-retrieve the source file for transcoding. Thus, the local cache configuration avoids repeatedly retrieving and transcoding a particular file for a particular user during a single session.

[0013] Typically, however, the transcoded file is purged from the local cache shortly after the user ends the session. Purging takes place for two main reasons: in order to allow the local caching of other files during transcoding for other users and to avoid copyright violations. The latter results from the video optimizer storing (and streaming) an optimized version of a copyrighted file that is no longer available from the copyright holder. This opens the transcoding service provider up to unwanted liability. Even if cached files are not purged, a user has to be fortunate enough to be routed to a particular video optimizer, out of potentially thousands, having cached the optimized source file. Otherwise, the user has to wait through the same

transcoding operation as the user who had previously streamed the video from another video optimizer.

[0014] Embodiments disclosed herein include a cache database for monitoring local caching of optimized video occurring at numerous video optimizers. The cache database maintains entries corresponding to each optimized video locally cached at a given optimizer. In turn, when a user requests the optimization of a given source file on a source server at a video optimizer, the cache database is able to provide the video optimizer with the locations and addresses of other optimizers that have previously optimized and stored the given source file in their local cache. The optimizer receiving the optimization request for the source file may then retrieve the optimized file from another optimizer or redirect the user device to the second optimizer, thus eliminating the need to generate redundant optimized source files. By accessing existing optimized source files rather than repeatedly transcoding the same source files, fewer video optimizers are needed to provide resource heavy transcoding operations.

[0015] In an example embodiment, when a user device requests a source file from an origin server storing a plurality of source files, a steering device may detect the request and intercept the request for processing at a network controller. The network processor is capable of gathering data about network flows as they traverse the network, redirecting requests and other data to optimize the bandwidth usage in the network. In one embodiment, the network controller inspects the request and related traffic (i.e., a network flow) to determine information about the source file, the state of the network, and the user device. Additionally, the network controller may forward the request for the source file to an origin server and intercept the origin server's

response to determine whether the source file corresponds to a video. The intercepted request and/or response may contain video information or a portion of the source file itself.

[0016] The network controller processes the information to determine whether to transcode the requested source file and determine optimization parameters for transcoding the source file for the user device. The network controller may generate an identifier (ID) key uniquely associated with both the original source file and the optimized source file (e.g., based on the specified optimization parameters). In turn, the network controller may redirect the user device to a video optimizer. In one embodiment, the network controller includes the ID key within a redirect request transmitted to the user device. Alternatively, the network controller may transmit the ID key to the video optimizer that the user device was redirected to. By sending the ID key and redirecting the user device to a video optimizer for retrieving the source video file, the user may receive an optimized version of the source file without direct input or even knowing the process occurs.

[0017] To eliminate the need to re-transcode a source file that has already been transcoded, the video optimizer may query its local cache and/or a cache database storing reference ID keys corresponding to optimized versions of source files stored on video optimizers reporting to the cache database. If a reference ID key matches the ID key for the requested source file, an existing optimized version of the source file may be provided to the user device. Importantly, the ID key uniquely identifies both the source file and the optimized source file. If there are any changes to the source file, no reference keys will match the generated ID key and a new source video file will be retrieved and transcoded. Thus, for example, if a copyright owner of the source file modifies the source file, only optimized versions of the source file as currently available

from the copyright holder are provided to the user device. Matching of the optimized version of the source file to the specified optimization parameters for the user device requesting the source file ensures that an appropriately optimized version (as there may be more than one, e.g., for a tablet display size as opposed to that of a mobile phone or 4G connection speed as opposed to that of a 3G connection) is provided to the user device.

[0018] In an embodiment, the source file has not been previously transcoded or transcoded based on the specified optimization parameters and thus an optimized version of the source file meeting the needs of the user device does not exist on any of the video optimizers. Accordingly, the ID key will not match any reference key in the cache database. The cache database returns a cache miss indication to the video optimizer querying the cache database with the ID key, which prompts the video optimizer to retrieve the source file from the origin server and begin transcoding and streaming the source file to the user. Once at least a portion of the optimized source file is cached in the video optimizer, the video optimizer may update the cache database with an entry corresponding to the portion of the optimized source file now locally cached on the video optimizer. In one embodiment, the video optimizer submits the ID key received from the network controller for storage in the cache database as a new reference key uniquely identifying the source file and the parameters of the optimized version of the source file stored in the local cache of the video optimizer. Other video optimizers querying the cache database with an ID key matching the stored reference key for the same portion of the source file may be referred to the existing optimized version of the source file stored in the local cache of the video optimizer instead of having to re-transcode the same portion of the source file.

[0019] In another example embodiment, the source file has already been previously transcoded by another optimizer and an optimized version having the desired parameters is stored in a local cache of one of the other optimizers. The cache database sends a cache hit indication to the video optimizer querying the cache database with the ID key. The cache hit response indicates a second video optimizer has an optimized version of the source file with a reference key matching the specified optimization parameters in the ID key in its local cache. In one instance, the optimizer may request the optimized source file from the second optimizer that has locally cached the optimized version of the source file. The first optimizer then may forward the optimized video to the user device for playback. In another instance, the first optimizer may send a redirect to the user device. The redirect causes the user device to connect to the second video optimizer storing the optimized version of the source file. The redirect may include the location of the second optimizer on the network and the generated ID key. In this instance, the second optimizer responds by directly streaming the optimized version of the source file to the user device.

[0020] In some instances, a popular source file may be frequently requested by many users. In response to the increased demand for that particular source file, a video optimizer may request to duplicate an optimized version of the source file that exists on a second optimizer. By storing the optimized version of the frequently requested source file in the first optimizer, the first optimizer is able to share the request load for the source file with the second optimizer, thus reducing the burden on the second optimizer. The benefit is that both optimizers are able to offer the same optimized version of the source file and are able to respond more quickly to requests for the source file while still processing other source file optimization requests.

OPTIMIZED VIDEO CACHING ENVIRONMENT

[0021] Referring now to FIG. (Figure) 1, it illustrates a high-level block diagram of an example communications environment 100 for optimized video caching. The environment 100 comprises user devices 110A and 110B (collectively referred to as user devices 110), an origin server 170, a steering device 130, a network controller 140, a video optimizer 150, a cache database 160 and a network 120. The network 120 is a communication network that transmits data between the user devices 110, the steering device 130 and the origin server 170 and/or the video optimizer 150. In one embodiment the network 120 includes wireless network and the Internet.

[0022] A network efficiency strategy that aspires to keep capital expenditure from outpacing revenues has to be balanced with demands from consumers for better user experiences that rely increasingly on higher data usage. Today, mobile operators are employing a variety of tools to manage capacity including data usage caps, Wi-Fi offload and intelligent optimization. The environment 100 demonstrates such a solution that provides a unified foundation with deep session intelligence, integrated services management, and dynamic adaptability to fit any service offering. Together, the network controller 140 and the video optimizer 150 deliver a world-class media optimization solution that brings a surgical capacity advantage to wireless operators as well as Internet service providers with better peak capacity savings than alternative solutions.

[0023] In one embodiment, the user devices 110 are computing devices with network capabilities. Oftentimes, for example, the user devices 110 are wireless enabled mobile computing device with a web browser and media display capability. The user devices 110 as mobile computing devices may include laptops, netbooks, tablets, smart telephones, or personal

digital assistants (PDAs). While only two user devices 110A and 110B are illustrated in FIG. 1, the environment 100 may include thousands or millions of such devices. The web browsers may be software applications running on mobile devices 110 for retrieving source files comprising web content from the origin server 170 and presenting the web content on a display coupled to the mobile device. Multimedia web content accessed by the user devices 110 may include text, images, audio and video content. Source files may include one or more types of multimedia web content. The multimedia content can be played back by the browsers, for example, HTML5 compatible browsers, plug-in or a standalone media player. The browsers can also invoke the media players or plug-ins available on the user devices 110 and passes images, audio and/or video to the media player or plug-in for playback.

[0024] The steering device 130 may be a load balancer or a router located between the user device 110 and the network 120. The steering device 130 provides the user device 110 with access to the network and thus, provides the gateway through which the user device traffic flows onto the network and vice versa. In one embodiment, the steering device 130 categorizes traffic routed through it to identify flows of interest for further inspection at the network controller 140. Alternatively, the network controller 140 interfaces with the steering device 130 to coordinate the monitoring and categorization of network traffic, such as identifying large and small objects in HTTP traffic flows. In this case, the steering device 130 receives instructions from the network controller 140 based on the desired criteria for categorizing flows of interest for further inspection.

[0025] However, information on the wireless/cellular user devices 110 side is often not available at the steering device 130 that sits between the cellular network and the wired Internet.

For example, there is often no information about the identifiers of the towers associated with the mobile devices 110. Tower association information only broadcasted when the mobile devices first attached to the network. In addition, user devices 110 do not usually report any identification information except their IP addresses. Therefore, monitoring of the network traffic and detection of the congestion is automated and managed by the controller 140 so that network can be optimized for end user's experience without the mobile user's knowledge.

[0026] In contrast to conventional inline TCP throughput monitoring devices that monitor every single data packets transmitted and received, the network controller 140 is an “out-of-band” computer server that interfaces with the steering device 130 to selectively inspect user flows of interest. The network controller 140 may further identify user flows (e.g., among the flows of interest) for optimization. In one embodiment, the network controller 140 may be implemented at the steering device 130 to monitor traffic. In other embodiments, the network controller 140 is coupled to and communicates with the steering device 130 for traffic monitoring and optimization. When queried by the steering device 130, the network controller 140 determines if a given network flow should be ignored, monitored further or optimized. Optimization of a flow is often decided at the beginning of the flow because it is rarely possible to switch to optimized content mid-stream once non-optimized content delivery has begun. However, the network controller 140 may determine that existing flows associated with a particular subscriber or other entity should be optimized. In turn, new flows (e.g., resulting from seek requests in media, new media requests, resume after pause, etc.) determined to be associated with the entity may be optimized. The network controller 140 uses the network state as well as

historical traffic data in its decision for monitoring and optimization. Knowledge on the current network state, such as congestion, deems critical when it comes to data optimization.

[0027] In an embodiment, the network controller 140 is a moderator between the user device 110 and other components of the environment 100, such as the video optimizer 150 or the origin server 170. When the user device 110 transmits requests for videos or other related source files, the request may be intercepted by the steering device 130 and the flow routed through to the network controller 140 for further analysis. In some cases, the network controller 140 can determine that the requested source file can be further optimized to improve the overall capacity of the network 120. In some instances, the controller 140 may forward the intercepted request to the origin server 170 for the source file and intercept the response from the origin server 170 to determine information about the source file and whether to optimize the source file.

[0028] If the network controller 140 determines that the requested source file should be optimized, the network controller 140 determines optimization parameters for generating an optimized version of the source file. The optimization parameters specify attributes such as target bit rate, frame width, frame height, sample rate, audio properties and the like for transcoding the source file such that it is compatible with the user device 110 and meets the available bandwidth capacity of the network 120 and the user device 110. The network controller 140, in turn, provides the optimization parameters to a video optimizer 150 and redirects the user device 110 to the video optimizer 150 to retrieve an optimized version of the source file (e.g., that is transcoded according to the optimization parameters). If the network controller 140 determines not to optimize the requested source file, the network controller 140

may either continue to monitor the flow or instruct the steering device 130 not to route the flow through to the network controller 140.

[0029] The network controller 140 as shown includes a key generator 145 for generating a identification (ID) key that uniquely identifies request source files and optimization parameters describing how a video optimizer 150 should transcode the source file for the user device 110. To generate the ID key for the source file, the key generator 145 may determine a source file signature from source file information contained in a request intercepted from a device request 110 and/or source file information contained in a response intercepted from the origin server 170 that uniquely describes the requested source file. In an embodiment, the source file signature may comprise a hash of the original file or portion of the original file, attributes of the video (e.g., bit rate, frame width, frame height, sample rate, audio properties and the like), URL of the original file and so forth. In some instances, the URL may be modified such that the URL portion of the source signature is invariant to instances where a domain or website modifies or adds on additional parts in the URL. Additionally, to generate the key, the key generator 145 may receive optimization parameters determined by the network controller 140 for generating the optimized version of the source file. Through these parameters, the generated key can be used to identify particular optimized version of the source file that are stored in the cache of various video optimizers 150. In an embodiment, the generated key is transmitted along with the redirect request to the user device 110. The video optimizer 150 receives the ID key along with the redirected request for the source file. The video optimizer 150 may query its local cache 155 and the cache database 160 with the ID key to determine whether an optimized version of the source video file already exists locally or on another video optimizer.

[0030] The video optimizer 150 is a computer server that provides source file, such as video and image, optimization and delivers optimized video and image content to the user devices 110 via the network 120. The video and image optimization is an on-demand service provided through the transcoding of the video and image content. For example, when a user device attempts to retrieve video from the origin server 170, the network controller 140 may decide that the flow meets certain criteria for content optimization. The network controller 140 then redirected the user devices 110 to the video optimizer 150 to retrieve the optimized content. The video optimizer 150 receives optimization parameters and a location of the video or image content in the redirect request from the user devices 110 or from the network controller 140 and retrieves the video or image content from the corresponding origin server 170 for optimization and subsequent delivery to the user devices 110.

[0031] In an embodiment, the video optimizer 150 ingests source file content directly from an origin server 170 or other source and produces a reduced bit rate stream in real-time. The transcoded and optimized stream can be stored temporarily in a local storage, which may be referred to as a local cache 155. For example, the local cache 155 may be in the form of a serial ATA (SATA)/serial Attached SCSI (SAS) spinning or flash media. In some embodiments, the local cache 155 may be located physically within the video optimizer 150 and connected via a bus to the other components of the video optimizer 150 system. In other embodiments, the local cache 155 may be located outside of the video optimizer 150 and connected to the video optimizer 150 through a network 120 or other types of wired/wireless connections. Because each video optimizer 150 has a large amount of storage compared to the average size of an optimized source file stream, each video optimizer 150 is capable of caching some amount of

optimized data. Several video optimizers 150 may be combined into a video caching cluster, where locally cached optimized source files may be shared between the individual video optimizers 150.

[0032] Because of the limited storage space in the local cache 155 of a video optimizer 150, the cache 155 is efficiently managed to ensure that the newer and/or more popular optimized versions of source files are available for distribution. The video optimizer 150 considers cached files for deletion according to one or more of the following: least recently used files, last access time, number of hits (e.g., total period and last period), number of duplication requests (e.g., trending up), size of file (e.g., larger files may be purged faster than smaller files to save room), or previously/recently purged (e.g., trending down). In an embodiment, the video optimizer 150 deletes cached files in small chunks over a long period of time in order to keep the system processor load necessary for deletion operations down to a minimum. In some instances, the video optimizer 150 can also wait to redirect all users accessing an active file prior to deleting the active file. Once the last user is redirected, the active file can be deleted without affecting a user's streaming experience. In some embodiments, the video optimizer 150 may push all of its cached files onto the cache database 160 for storage.

[0033] To more effectively manage the limited storage space in the local cache 155 of a video optimizer 150, the cache 155 may only store small segments or clips of an optimized source file. In an embodiment, the smaller segment may represent a preview of the optimized source file. Because users typically do not watch an entire video streamed to and played back on a user device 110, storing an entire optimized source file in the local cache 155 is an inefficient use of storage space. Thus, by storing only a portion of the source file as a video preview, many

more optimized source files may be stored in the local cache 155. Furthermore, the video preview files stored in the local cache 155 may be retrieved and stitched to optimized portions of the corresponding source file when the user wishes to watch portions of the source file outside of the video preview segment stored in the local cache 155. If different segments of a source file have been stored as optimized video preview files in local caches 155 of different video optimizers 150, a single video optimizer 150 may also be able to retrieve the segments from the different local caches 155 and stitch the segments together, transcoding additional segments when necessary.

[0034] When the local cache 155 in the video optimizer 150 is modified (e.g., files are added, removed or updated), the video optimizer 150 issues a command to the cache database 160 to update the corresponding entry associated with the modified file. In an embodiment, the commands may comprise “cache add”, “cache remove”, “cache get” or “cache remove all”. “Cache add” and “cache remove” are used to add or remove entries in the cache database 160, such as when optimized source files are updated/stored in the local cache 155 or when files are removed from the local cache 155. “Cache remove all” may be used to remove an entire set of entries associated with a particular video optimizer 150. This is particularly useful when a video optimizer 150 shuts down or crashes, in which case the entire cache may be lost. A “cache get” command is often accompanied with an ID key for querying the cache database 160 to identify an IP address of a given video optimizer 150 or server with the requested optimized version of the source file stored in its local cache 155. Other cache commands may be used in addition to the commands presented in these embodiments.

[0035] In some embodiments, the local cache 155 may also be used for storing headers for optimized source files to be used in predictive encoding. Headers, which will be described in more detail in FIG. 4, are created prior to the start of a transcoding process and contain basic information related to the source file. Media players analyze header files in order to be able to recognize and play source files. When an optimized source file is first generated, the video optimizer 150 predicts the properties of the final optimized source file. Because the predictions are made prior to the transcoding process, the resulting header file may be inaccurate. Through predictive encoding, a video optimizer 150 may store generated headers in the local cache 155 after the transcoding process and retrieve the stored headers for use to generate a more accurate header file during future optimizations of the same source file.

[0036] The cache database 160 enhances the performance of the video optimizer 150 by eliminating the need to transcode source files that have already been previously optimized by another video optimizer 150. In an embodiment, the cache database 160 stores the location of locally cached optimized versions of source files in the optimization cluster in its database. In addition to the location of the cached optimized source file, the cache database 160 may also contain stored reference keys, last access times for each source file/optimized version and total number of hits/requests for each source file/optimized version. Information may be collected on the different optimized versions to identify those most often provided to user devices 110.

[0037] The cache database 160 can be a centralized resource/server or it can be distributed among the video optimizers 150 themselves. When the cache database 160 receives a query for the location of an optimized source file based on an ID key corresponding to the source file and optimized version of the source file for transmission to the user device 110, the cache database

160 may search its database to identify the location of an optimized version of the source file having a matching reference key. The cache database 160 also receives commands from video optimizers 150 for updating the list of entries that it maintains for identifying and locating optimized source files in the video optimizer 150 clusters.

[0038] The disclosed embodiments focus on the caching of optimized versions of source files because video traffic makes up around half of all network traffic – and the percentage is growing every year. Therefore, optimizing video traffic massively reduces congestion in the network. By implementing an efficient method of caching optimized versions of source files, video optimizers would be freed from having to transcode source files that have otherwise been transcoded previously by another video optimizer. These freed video optimizers may be more effectively used in transcoding other requested source files, which overall provides users with a better streaming experience. By saving optimized source files in the local caches 155 of the video optimizers 150 and providing a cache database for searching through the various video optimizers, the system for optimized video caching streamlines the process of video optimization by having to primarily transcode source files that do not already have optimized versions. The cache database can also be used to manage the storage and caching of multiple optimized versions of source files through the entire video optimizer cluster such that heavily requested optimized versions of source files may be duplicated onto several video optimizers to lessen the number of requests routed to a single video optimizer.

[0039] The video optimizer 150, cache database 160 and origin server 170 are typically formed of one or more computer servers, which may include components and functionality described in more detail with reference to FIG. 2. While only one server of each video optimizer

150, cache database 160 and origin server 170 is shown in the environment 100 of FIG. 1, different embodiments may include multiple web servers and video servers operated by a single entity or multiple entities. In other embodiments, a single server may also provide different functionalities, such as delivering web content as a web server, as well as serving optimized video content. Steering device 130, network controller 140, and user devices 110 may also include components and functionality similar to those described in FIG. 2.

COMPUTING MACHINE ARCHITECTURE

[0040] Turning now to FIG. 2, it is a block diagram illustrating components of an example machine able to read instructions from a machine-readable medium and execute them in a processor (or controller) to implement the disclosed system for on-demand real-time network monitoring and subscriber identification. Specifically, FIG. 2 shows a diagrammatic representation of a machine in the example form of a computer system 200 within which instructions 224 (e.g., software) for causing the machine to perform any one or more of the methodologies discussed herein may be executed. In alternative embodiments, the machine operates as a standalone device or may be connected (e.g., networked) to other machines. In a networked deployment, the machine may operate in the capacity of a server machine or a client machine in a server-client network environment, or as a peer machine in a peer-to-peer (or distributed) network environment.

[0041] The machine may be a server computer, a client computer, a personal computer (PC), a tablet PC, a set-top box (STB), a personal digital assistant (PDA), a cellular telephone, a smart phone, a web appliance, a network router, switch or bridge, or any machine capable of executing instructions 224 (sequential or otherwise) that specify actions to be taken by that machine.

Further, while only a single machine is illustrated, the term “machine” shall also be taken to include any collection of machines that individually or jointly execute instructions 224 to perform any one or more of the methodologies discussed herein.

[0042] The example computer system 200 includes one or more processors 202 (e.g., a central processing unit (CPU), a graphics processing unit (GPU), a digital signal processor (DSP), one or more application specific integrated circuits (ASICs), one or more radio-frequency integrated circuits (RFICs), or any combination of these), a main memory 204, and a static memory 206, which are configured to communicate with each other via a bus 208. The computer system 200 may further include graphics display unit 210 (e.g., a plasma display panel (PDP), a liquid crystal display (LCD), a projector, or a cathode ray tube (CRT)). The computer system 200 may also include alphanumeric input device 212 (e.g., a keyboard), a cursor control device 214 (e.g., a mouse, a trackball, a joystick, a motion sensor, or other pointing instrument), a storage unit 216, and a network interface device 220, which also are configured to communicate via the bus 208.

[0043] The storage unit 216 includes a machine-readable medium 222 on which is stored instructions 224 (e.g., software) embodying any one or more of the methodologies or functions described herein. The instructions 224 (e.g., software) may also reside, completely or at least partially, within the main memory 204 or within the processor 202 (e.g., within a processor's cache memory) during execution thereof by the computer system 200, the main memory 204 and the processor 202 also constituting machine-readable media. The instructions 224 (e.g., software) may be transmitted or received over a network 120 via the network interface device 220.

[0044] While machine-readable medium 222 is shown in an example embodiment to be a single medium, the term “machine-readable medium” should be taken to include a single medium or multiple media (e.g., a centralized or distributed database, or associated caches and servers) able to store instructions (e.g., instructions 224). The term “machine-readable medium” shall also be taken to include any medium that is capable of storing instructions (e.g., instructions 224) for execution by the machine and that cause the machine to perform any one or more of the methodologies disclosed herein. The term “machine-readable medium” includes, but not be limited to, data repositories in the form of solid-state memories, optical media, and magnetic media.

OPTIMIZED VIDEO CACHING

[0045] FIGS. 3A-D illustrate example event traces for providing an optimized video to a user device. FIG. 3A specifically shows an example of a source file request followed by a database query. FIGS. 3B-D show various embodiments of how video optimizers may react to different responses from the database. In some embodiments, the video optimizer can simply transcode the video itself, while in other embodiments, the video optimizer may have to redirect the request to other video optimizers. Shown are a user device 110, network controller 140, video optimizer 150, cache database 160, and origin server 170. A steering device (not shown in FIGS. 3A-3D) may manage traffic flow between one or more of the entities across a network 120. In FIGS. 3C and 3D, two video optimizers 150A and 150B exist. These video optimizers may operate independently of each other but may also share optimized source files stored in a shared local cache 155.

[0046] FIG. 3A is an example event trace illustrating a process for handling a source video request at a video optimizer. The process includes a user device 110, network controller 140, video optimizer 150, cache database 160 and origin server 170. The process starts when the user device 110 generates 302 a request from a user for a source file. For example, the user may browse an Internet site containing a video that the user wishes to view. The user device 110 generates 302 the request and transmits a HTTP GET video request 304 to retrieve the video source file content from the origin server 170. In an embodiment, the steering device 130 intercepts requests and responses associated with providing video to the user device 110. The steering device 130 redirects the video content request to the network controller 140, which forwards a modified HTTP Get video request 306 to the origin server 170. In the modification, the network controller 140 instructs that the origin server 170 respond with video information for the source file. By intercepting the HTTP RESPONSE with video information 308, the network controller 140 can determine whether a HTTP redirect instruction should be forwarded to the user device 110 in order to direct the user device 110 to a video optimizer 150 or whether the video content retrieved from the origin server 170 should be directly sent to the user device 110 (i.e., the video content does not need further optimization).

[0047] In response to receiving the HTTP RESPONSE with video information 308, the network controller 140 uses the received information in the HTTP GET Video 304 request and/or HTTP response 308 and determined information about the condition of the network and the user device from monitoring flows to generate 310 an ID key. The ID key comprises a source signature uniquely identifying the original source file on the origin server 170 and

determined optimization parameters identifying an optimized version of the source file compatible with the user device and meeting the capabilities of the network.

[0048] The network controller 140 determines that the user device 110 can be redirected to a video optimizer 150 in order to obtain the optimized version of the source file, which may be generated directly by transcoding the source file or retrieved from a local cache 155 of a video optimizer 150. The network controller 140 determines a corresponding instruction for the HTTP RESPONSE request and sends a HTTP redirect instruction 312 along with the generated key to the user device 110. In an embodiment, the HTTP redirect instruction 312 may be a rewrite of the HTTP RESPONSE request 308. In other embodiments, the HTTP redirect instruction 312 may be instructions mapping to the received HTTP RESPONSE request 308 or a translation of the request 308. In an embodiment, the network controller 140 randomly chooses a video optimizer 150 to redirect a user device 110 to. In another embodiment, the network controller 140 acts as a load balancer and redirects the user device 110 based on the current processing load of each video optimizer associated with the network controller 140. For example, the network controller 140 monitors video optimizer 150 workloads and may redirect the user device 110 to the video optimizer 150 that has the most available processing capacity or least number of requests at the moment. Upon receiving the instructions, the user device 110 sends a HTTP GET request and the received key 314 to the video optimizer 150 that the network controller 140 indicated in its HTTP redirect instructions 312.

[0049] In an embodiment, once the video optimizer 150 receives the HTTP GET request along with the key associated with the original source file 314, the video optimizer 150 queries the cache database 160 to determine whether an optimized source file exists. The video

optimizer 150 may also determine whether its local cache 155 contains an optimized version of the source video. The cache database 160 searches 318 its database based on the received key to determine whether the database contains any reference key entries that match the key. In an instance where a reference key entry matches the key, the cache database 160 sends a database reply 320 indicating that an optimized version of the source file exists on another video optimizer 150 and includes the location of the optimized source file. This is known as a cache hit and indicates that the video optimizer 150 does not have to transcode the source file in order to send an optimized version of the source file to the user device 110. In an instance where none of the reference key entries match the key, the cache database 160 sends a database reply 320 indicating that the requested optimized version of the source file is not stored in the cache of any video optimizers 150 reporting to the cache database 160. This is known as a cache miss and indicates that the video optimizer 150 has to transcode the source file in order to send an optimized source file to the user device 110.

[0050] FIG. 3B is an example event trace illustrating an embodiment of a process for providing an optimized source file to a user device in response to a cache miss. If there is a cache miss (e.g., the ID key does not match any reference key), the cache database 160 responds to the video optimizer's query by sending a database reply 320 indicating that no optimized version of the original source file exist in any of the caches in video optimizers 150 associated with the cache database 160. In response to this database reply 320, the video optimizer 150 has to transcode the original source file itself in order to provide an optimized version of the source file to the user device. The video optimizer 150 begins the transcoding process by sending a HTTP GET video request 332 to the origin server 170, requesting the original source file for

transcoding. Once the video optimizer 150 receives the HTTP RESPONSE video content 334 from the origin server 170, the video optimizer 150 transcodes 336 the video to a format optimized and usable by the user device 110 according to the optimization parameters provided in the ID key. Thus, the optimization may be based on information the video optimizer 150 receives on the user device 110 regarding the user device's specifications and capabilities (e.g., screen size, processor, network connections, storage space, screen resolution, buffer, cache, operating system and the like) as well as the network properties (e.g., service provider, bandwidth, network congestion and the like).

[0051] In an embodiment, the video optimizer 150 streams the optimized video to the user device 110 as the video is transcoded in order to minimize the delay that the user may experience. In other embodiments, the optimized stream 338 may be slightly delayed by the video optimizer 150 so that the video optimizer 150 is able to build a buffer for instances when the transcoding may lag. When the video optimizer 150 transcodes a part of the source file, the video optimizer 150 sends a database update 340 to the cache database 160 to indicate that part of the optimized version of the source file is now available in the local cache 155 of the video optimizer 150 for future media content requests. The database update 340 may include the location of the optimized version of the source file in the local cache 155, the key comprising the source signature of the original source file retrieved from the origin server 170 and the parameters of the optimized version of the source file, and the segment of the original source file that is transcoded. In an embodiment, the video optimizer 150 may send the database update 340 before the entire video is optimized. Thus, if another request is received while the transcoding process is still underway, the segment of the video that has been transcoded may be provided to

another video optimizer 150 for streaming to another user device 110. In response to receiving the database update 340, the cache database 160 updates 342 the database entries so that the cache database 160 can identify the location of optimized version of the source file for responding to future database queries.

[0052] FIG. 3C is an example event trace illustrating embodiments of a process for providing an optimized source file to a user device in response to a cache hit. In FIG. 3C, two video optimizers 150A and 150B exist to illustrate the data transfer that is possible between a network of video optimizers. Each of these video optimizers 150A, 150B are functionally identical to the video optimizer 150 presented previously, but each video optimizer 150A and 150B may have different optimized source files stored in their local caches 155. In response to a cache hit (e.g., the ID key matches a reference key), the cache database 160 responds to the first video optimizer's query to identify an optimized version of the source file by sending a database reply 320 and 332 indicating that an optimized version of the original source file is located in a local cache 155 of video optimizer 150B associated with the cache database 160.

[0053] In an embodiment of the process 350 for handling a cache hit, the first video optimizer 150A may retrieve or stream the optimized version of the source file from video optimizer 150B and, in turn, stream the optimized source file itself to the user device 110. In this embodiment, the first video optimizer 150A may send a HTTP GET video, or other request 352 for retrieving the optimized version of the source file to the second video optimizer 150B. Upon receiving the request 352, the second video optimizer 150B provides an optimized stream 354 to the first video optimizer 150A. In an embodiment, the first video optimizer 150A may locally cache the received optimized version of the source file as it transmits the optimized stream 356

to the user device 110. For example, the video optimizer 150A may locally cache an optimized version of a frequently requested source file. Through this process, the first video optimizer 150A locally caches the portion of the optimized stream 356 received from video optimizer 150B for future streaming purposes. In another embodiment, the first video optimizer 150A may forgo caching the received optimized stream 354 and choose to only forward the optimized stream 356 to the user device 110. For example, the first video optimizer 150A may not store the optimized stream in response to determining that the optimized source file is not requested frequently or that the local cache 155 is already full. Statistics for optimized versions of a source file may be maintained individually at the video optimizers 150 themselves and/or at the cache database 160, which may provide the statistics with responses to queries.

[0054] In another embodiment, the first video optimizer 150A may decide to redirect the user device 110 to retrieve the optimized source file from the second video optimizer 150B instead of forwarding 354, 356 the optimized stream. By redirecting the user device 110 to retrieve the optimized source file from the second video optimizer 150B, the first video optimizer 150A frees up processor loads and network bandwidths to process other media requests. The first video optimizer 150A sends an HTTP redirect instruction 362 to the user device 110, indicating the video optimizer where the desired optimized source file may be located. The user device 110 then transmits a HTTP GET request 364 to the second video optimizer 150B that was indicated in the HTTP redirect instruction, requesting the second video optimizer 150B stream the requested optimized source file. In response to the HTTP GET request 364, the second video optimizer 150B transmits the optimized stream 366 to the user device. In some embodiments, the first optimizer 150A generates an HTTP redirect including the generated ID key, which the

second optimizer 150B uses to identify the optimized version of the source file in its local cache 155. The second optimizer 150B may generate another database query 316 as explained previously with reference to FIG. 3A.

[0055] In some instances, a cache hit error may occur due to various different factors. In one example, the source signature, ID key or reference entry stored in the cache database 160 may be mismatched to the optimized version of the source file stored in a video optimizer 150. For example, the cache database 160 may have erroneously saved or corrupted an entry or the video optimizer 150 may have experienced an error in which the locally cached optimized version of the source file was corrupted or deleted. In another embodiment, the video optimizer 150 may send instructions to the cache database 160 requesting that the entry is deleted. Each video optimizer 150 associated with the cache database 160 may also synchronize locally cached resources with the entries stored in the cache database 160 periodically to determine whether entries need to be flushed from the cache database 160.

[0056] In another embodiment, a first video optimizer 150A may be redirected by the cache database 160 to a second video optimizer 150B that has a certain optimized source file. However, the second video optimizer 150B may be unavailable for some reason, such as due to a server crash or network connection issues. The first video optimizer 150A may respond by notifying the cache database 160 that the second video optimizer 150B is unavailable. In response, the cache database 160 may temporarily remove the second video optimizer 150B from its set of available server resources until the second video optimizer 150B syncs with the cache database 160 or responds to a request from another video optimizer 150.

[0057] In some embodiments, the first video optimizer 150A may detect that an error has occurred, such as the second video optimizer 150B not having the optimized file that a cache database 160 reported the second video optimizer 150B as having. In response to the error, the second video optimizer 150B may compare its current server load with that of the first video optimizer 150A to determine which has more bandwidth. If the first video optimizer 150A is less loaded than the second video optimizer 150B, then the first video optimizer 150A can transcode and optimize the source file. If the second video optimizer 150B is less loaded than the first video optimizer 150A, then the second video optimizer 150B can transcode and optimize the source file. In some embodiments, the video optimizers 150 may also compare connection quality or proximity to the client as deciding factors on which video optimizer 150 transcodes the source file. The video optimizers 150 may also send a database update instruction to the cache database 160 to update the entries related to the locations of cached optimized source files.

[0058] FIG. 3D is an example event trace illustrating an embodiment of a process for providing an optimized source file to a user device and duplicating the optimized source file in response to a cache hit. Similar to FIG. 3C, FIG. 3D includes a user device 110, network controller 140, first video optimizer 150A, second video optimizer 150B and cache database 160. In response to a database query by the first video optimizer 150A, the cache database 160 sends a database reply 320 indicating that a second video optimizer 150B has the requested optimized source file. In an embodiment, the first video optimizer 150A may duplicate the optimized version of the source file stored on the second video optimizer 150B in its local cache 155. For an example, the first video optimizer 150A may determine that the specific optimized version of the source file is often requested and would save processing time if the optimized version of the

source file was stored and cached locally. The optimized version of the source file may experience a high hit rate, overwhelming a single video optimizer 150 storing the optimized version of the source file. Accordingly, another optimizer requesting an optimized version of a source file with a high hit rate may request to do duplicate the optimized version for storage within its local cache 155 to prevent the single server from being overwhelmed. By duplicating the optimized source file, the video optimizers load balance requests among the video optimizers reporting to the cache database 160. In another example, the requested optimized source file may represent only a segment of the original source file's total playback length. The first video optimizer 150A may submit requests to multiple video optimizers 150 to collect as many optimized segments of the original source file as possible before transcoding remaining unoptimized segments. Optimized source file stitching is discussed below in conjunction with the video preview cache.

[0059] In an embodiment, the first video optimizer 150A sends a HTTP GET video request and a duplication request 382 to the second video optimizer 150B that has the desired optimized version of the source file. In response to the request, the second video optimizer 150B sends the optimized stream 384 to the first video optimizer 150B. In another embodiment, the first video optimizer 150A sends a HTTP GET video request without requesting a duplication of the optimized version of the source file. In response to the request, the second video optimizer 150B may determine that it is overloaded with requests or transcoding processes. The second video optimizer 150B may respond to the first video optimizer 150A by sending the optimized stream to the first video optimizer 150A as well as a request for the first video optimizer 150A to store 386 the duplicated optimized video. As the first video optimizer 150A receives the optimized

stream 384, it stores 386 the optimized version of the source file in a local cache 155 while sending the optimized stream 388 to the user device 110 for playback. Since the first video optimizer 150A now possesses a locally cached version of the optimized source file, the first video optimizer 150A sends instructions for a database update 390 to the cache database 160. In response to the received instructions, the cache database 160 updates 392 the database to add an entry indicating that both video optimizers 150A and 150B have the specific optimized version of the source file cached locally.

VIDEO PREVIEW CACHE

[0060] An additional possibility with optimized video caching is a video preview cache. Rather than locally caching a large number of full-length optimized versions of source files at a video optimizer 150, an even greater number of partial-length optimized versions may be stored. Thus, each video optimizer 150 may directly begin to handle a larger number of requests without having to begin a transcoding process or stream the optimized version from another optimizer. For example, if the video optimizer 150 stores 1 minute portion of an optimized version of a source file requested by the user device 110, when a user abandons the video (e.g., in the first 30 seconds) before a transcoding process or streaming process needs to take place to seamlessly deliver the stream, no additional processing is required. Thus, the preview cache may store the first 30-60 seconds of an optimized version to reduce requests and bandwidth used on the network because a large number of users do not view past the initial segments. Thus rather than spending the additional processor bandwidth transcoding and storing segments of a source file that users often do not watch, the video optimizer 150 can more efficiently manage its content by creating short optimized video previews. A shorter optimized video also allows more optimized

versions of source files to be stored in the same limited storage cache in the video optimizer 150. Popular files may still be stored in full-length optimized versions but purged and updated more frequently to follow user trends.

[0061] In an embodiment, the video optimizer 150 begins to transcode a source file and streams the optimized source file to the user device 110. When the user cancels playback on the user device 110, the video optimizer 150 stops optimizing the source file and stores the segment that is already optimized. The video optimizer 150 may update the cache database 160 with an entry indicating the source file that was optimized, a key associated with the original source file, and also the segment of the video that is optimized. If later users request the same segment of the source file, the cache database 160 can redirect the requesting video optimizer 150 to the correct local cache 155 that contains the optimized video segment. In other embodiments, a portion of the optimized version of a source file may be distributed among the various video optimizers 150.

[0062] In some embodiments, the user may request a segment of a source file that has not been fully optimized. In this embodiment, the video optimizer 150 may determine the video segments that have been optimized already so as to prevent having to re-transcode an already existing optimized segment of the source file. As the video optimizer 150 streams the optimized video segments to the user device, it continues to monitor whether the video transcoding process is approaching a segment that has not previously been optimized. The video optimizer 150 may begin transcoding the portion of the source file that is not optimized from any key frame and continue transcoding until it reaches the beginning of a previously optimized video segment. Prior to or when the transcoding process reaches the beginning of a previously optimized video

segment, the video optimizer 150 requests the previously optimized video segment from another video optimizer where the segment is stored. In response to the request, the other video optimizer sends the requested optimized video segment to the initial video optimizer 150, which stitches the received optimized video segment with the segment the video optimizer itself transcoded at the last key frame.

[0063] For example, three consecutive video segments may be cached in a cluster of video optimizers 150, each video optimizer 150 holding a different segment. A first video optimizer may stream a stored preview from the optimized version of the source file and subsequently retrieve the source file beginning from a last key frame of the stored preview and transcode the source file from the last key frame, stitching the newly transcoded stream at the key frame to provide seamless playback on the user device 110. The first video optimizer continues transcoding the source file and streaming the optimized version until it reaches the beginning of an optimized video segment identified on another video optimizer. The first video optimizer may then retrieve the segment that has already been transcoded from the corresponding video optimizer. The first video optimizer 150 may continue requesting segments from the other video optimizers until the user stops watching the video or no optimized segments are available for a portion of the source file. In the case where no optimized segments are available for a portion of the source file, then the initial video optimizer 150 transcode the source file from where the last optimized segment left off. If desired, the video optimizer may also locally cache the entire stream in order to make it available for future optimized video requests.

[0064] During local cache management, the video optimizer 150 may decide to flush only portions of optimized versions of source files in order to create empty space in a storage drive for

other optimized versions of source files. For example, a 30 minute optimized version of source file may be segmented and processed so that only the first minute of the optimized version of source file is saved while the rest of the optimized version of source file is purged from the local cache 155. Local cache 155 purging frees up large amounts of storage space while still preserving a fast response and initial streaming time for the user, especially for optimized versions of source files that are less popular than others. In response to the deletion and other cache management operations, the video optimizer 150 sends a database update to the cache database 160 to update the entries stored in the database.

PREDICTIVE ENCODING IMPROVEMENT

[0065] FIG. 4 illustrates a flow diagram of an embodiment of predictive encoding using cached headers. In an embodiment, the process shown in FIG. 4 is performed by the video optimizer 150 for source files comprising headers. For example, headers may be generated for MP4 files, AVI files, MPEG files, MOV files, MKV files, OGM files, and other types of media files. For clarity, MP4 source files and headers are referred to in the following description but other types of media files may also apply. When optimized versions of MP4 source files are generated, a predictive header is created prior to the start of the transcoding process based on the original source file and/or the original source file header. The predictive header contains basic information related to the source file in order for media players to recognize and play the optimized version of the source file. For example, the predictive header may contain information such as source profile, frame/sample rates, frame type, size of output sample, size of each output frame, encoding used, compression and so forth. Because the predictive header is created prior to the source file being entirely transcoded to allow real-time streaming, the video optimizer 150

must predict information to insert into the header. As a result, the header may contain overestimations or underestimations of the media container size necessary for transcoding the frames in the transcoded media. To compensate for underestimations of frame size, the video optimizer 150 may have to re-transcode frames to reduce their quality and thus size, which may cause distortions in the optimized version of the source file and require additional processing time. To compensate for overestimations of frame size, redundant bits or data may be added to a frame to pad the frame in order to meet the pre-specified size. Thus, the optimized version of the source file may contain frames that are over optimized.

[0066] The distortions and differences in estimated quality may be reduced by performing multiple passes on transcoding the source file, with each pass using the predictive header previously generated to more accurately predict the new header data for the next pass. The video optimizer 150 may fix errors in header generation by reducing the padding necessary in some frames while smoothing the quality of the entire optimized source file. By reducing the padding in optimized source file, the video optimizer 150 is also able to reduce the storage space needed to locally cache the optimized source file. However, because video transcoding and optimization is often performed on-the-fly, it is not feasible for the video optimizer 150 to perform a multi-pass on the original source file. Additionally, these passes should not occur needlessly and thus may only be performed when required to provide a source file to a user device 110.

[0067] In an embodiment, optimized video caching provides a system for improving predictive encoding. When an original source file is first transcoded, a predictive header is generated in the conventional method that involves using predictive algorithms on the source file or a small portion of the source file and/or the header of the source file to make a best guess on

the characteristics of the output optimized version of the source file. The predictive header can be stored along with the optimized version of the source file in the cache of a video optimizer 150 or in the cache database 160 with a key corresponding to the optimized version of the source file and can also be retrieved for use in improving later header predictions. The predictive headers stored subsequent to the transcoding of the source file may be updated to include information relative to the optimized version of the source file generated during transcoding. For example, the updated predictive header may include actual frame sizes of the optimized version, initial frame sizes of the source file, last frame sizes that required re-transcoding due to too large a size, and number of times the predictive header has been updated for the optimized version of the source file. Thus, later transcoding processes may yield improved optimization and higher quality compared to the first pass and, if a threshold number of passes have been completed, a video optimizer 150 may utilize the predictive header information directly without performing another pass.

[0068] As illustrated through FIG. 4, when a video optimizer 150 receives a request to transcode a source file, the video optimizer 150 retrieves 402 the original source file from the origin server 170 and also receives the original source file header as well. In response to receiving the original source file header and ID key, the video optimizer 150 queries 404 the cache database 160 to determine whether the cache database 160 has the location of any corresponding previously optimized version of the source file and header. In a database reply, the cache database 160 determines 406 whether an optimized version of the source file and associated header are located in the local cache 155 of another video optimizer, header information has been cached but the requested optimized version of the source file does not exist

in any local cache 155, or that the both an optimized version of the source file and associated header do not exist in the video optimizer cluster. In the latter case, the transcoding process may proceed as described with reference to FIGS. 3A-D with the header information for the source file and/or the predictive header information for the first pass optimized version (and updated header information based thereon) stored locally or updated in the cache database 160 for future use by the video optimizers 150. In some embodiments, predictive header information for a same source file but different optimized version may be used to aid in generating a new optimized version of the source file of higher or lower quality.

[0069] In an embodiment where an optimized source file and associated header are available in the cache database 160 and/or at another video optimizer, the initial video optimizer 150 may retrieve 402 original source file header information and/or the ID key generated for the source file and query 404 the cache database 160 to retrieve any previously generated predictive header and optimized version of the source file information. If the initial video optimizer 150 receives previously generated predictive header and optimized version of the source file information, the initial video optimizer 150 determines whether the optimized version of the source file should be re-transcoded in order to improve the quality of the optimized version with another pass, or to generate a different optimized version, (e.g., of a different quality level) prior to streaming to the user device 110.

[0070] The video optimizer 150 analyzes 412 the attributes of the header and file to generate 414 a new predictive header based on the analysis. In an embodiment, the video optimizer 150 may use predictive algorithms to analyze 412 the optimized source file header, the optimized version of the source file, the original source file and/or the original source file header to better

determine information in the new predictive header. Thus, with each subsequent pass, a previously generated header may be analyzed 412 to fine tune the new session's predictive algorithm to generate a more accurate header for the optimized version of the source file. The newly generated header is then stored 430 with the optimized source file and updated in the cache database 160 for later optimized video requests and predictive encoding operations. In order to aid in future predictive encoding operations, the video transcoder 150 may record information about the transcoding process and update 430 the predictive header to include information such as actual frame sizes of the optimized version, initial frame sizes of the source file, last frame sizes that required re-transcoding due to too large a size, and number of times the predictive header has been updated for the optimized version of the source file.

[0071] In the instance where no previous optimized source file header exists 406, the video optimizer 150 predicts 422 the attributes for the new optimized source file using its best guess. Using this method, the video optimizer 150 will often create inaccuracies in the generated 424 header based on the predictions, resulting in overestimations or underestimations of optimized video frame sizes. As mentioned previously, the video optimizer 150 has to reduce the quality of frames to compensate for underestimations and pad the frames with redundant bits for overestimations. While later passes may reduce these errors, it is often infeasible for the video optimizer 150 to perform a second pass during a streaming operation. The newly predictive header is stored 430 with the optimized source file for later optimized video requests and predictive encoding operations. In order to aid in future predictive encoding operations, the video transcoder 150 may record information about the transcoding process and update 430 the predictive header to include information such as actual frame sizes of the optimized version,

initial frame sizes of the source file and last frame sizes that required re-transcoding due to too large a size.

ADDITIONAL CONFIGURATION CONSIDERATIONS

[0072] The disclosed configurations beneficially allow optimized source files to be quickly retrieved and streamed to user devices without requiring an optimizer to re-transcode source files by introducing a cache database. In conventional systems, source files are either streamed to the user device without any optimization, which is an inefficient use of limited network bandwidth, or source files are optimized every time a user requests a source file, which is an inefficient use of the processing capacity for each optimizer. Because optimizers are often separate and operate independently of each other, introducing a cache database allows a central management catalog for determining which local caches contain certain optimized source files. Optimized source files can thus be provided to users quicker and without the need for re-transcoding.

[0073] Throughout this specification, plural instances may implement components, operations, or structures described as a single instance. Although individual operations of one or more methods are illustrated and described as separate operations, one or more of the individual operations may be performed concurrently, and nothing requires that the operations be performed in the order illustrated. Structures and functionality presented as separate components in example configurations may be implemented as a combined structure or component. Similarly, structures and functionality presented as a single component may be implemented as separate components. These and other variations, modifications, additions, and improvements fall within the scope of the subject matter herein.

[0074] Certain embodiments are described herein as including logic or a number of components, modules, or mechanisms. Modules may constitute either software modules (e.g., code embodied on a machine-readable medium or in a transmission signal) or hardware modules. A hardware module is tangible unit capable of performing certain operations and may be configured or arranged in a certain manner. In example embodiments, one or more computer systems (e.g., a standalone, client or server computer system) or one or more hardware modules of a computer system (e.g., a processor or a group of processors 102) may be configured by software (e.g., an application or application portion) as a hardware module that operates to perform certain operations as described herein.

[0075] In various embodiments, a hardware module may be implemented mechanically or electronically. For example, a hardware module may comprise dedicated circuitry or logic that is permanently configured (e.g., as a special-purpose processor, such as a field programmable gate array (FPGA) or an application-specific integrated circuit (ASIC)) to perform certain operations. A hardware module may also comprise programmable logic or circuitry (e.g., as encompassed within a general-purpose processor or other programmable processor) that is temporarily configured by software to perform certain operations. It will be appreciated that the decision to implement a hardware module mechanically, in dedicated and permanently configured circuitry, or in temporarily configured circuitry (e.g., configured by software) may be driven by cost and time considerations.

[0076] The various operations of example methods (e.g., as described with FIGS. 3A-D and 4) described herein may be performed, at least partially, by one or more processors (e.g., processor 202) that are temporarily configured (e.g., by software) or permanently configured to

perform the relevant operations. Whether temporarily or permanently configured, such processors may constitute processor-implemented modules that operate to perform one or more operations or functions. The modules referred to herein may, in some example embodiments, comprise processor-implemented modules.

[0077] Some portions of this specification are presented in terms of algorithms or symbolic representations of operations on data stored as bits or binary digital signals within a machine memory (e.g., a computer memory 204). These algorithms or symbolic representations are examples of techniques used by those of ordinary skill in the data processing arts to convey the substance of their work to others skilled in the art. As used herein, an “algorithm” is a self-consistent sequence of operations or similar processing leading to a desired result. In this context, algorithms and operations involve physical manipulation of physical quantities. Typically, but not necessarily, such quantities may take the form of electrical, magnetic, or optical signals capable of being stored, accessed, transferred, combined, compared, or otherwise manipulated by a machine. It is convenient at times, principally for reasons of common usage, to refer to such signals using words such as “data,” “content,” “bits,” “values,” “elements,” “symbols,” “characters,” “terms,” “numbers,” “numerals,” or the like. These words, however, are merely convenient labels and are to be associated with appropriate physical quantities.

[0078] Unless specifically stated otherwise, discussions herein using words such as “processing,” “computing,” “calculating,” “determining,” “presenting,” “displaying,” or the like may refer to actions or processes of a machine (e.g., a computer) that manipulates or transforms data represented as physical (e.g., electronic, magnetic, or optical) quantities within one or more

memories (e.g., volatile memory, non-volatile memory, or a combination thereof), registers, or other machine components that receive, store, transmit, or display information.

[0079] As used herein any reference to “one embodiment” or “an embodiment” means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment.

[0080] Some embodiments may be described using the expression “coupled” and “connected” along with their derivatives. For example, some embodiments may be described using the term “coupled” to indicate that two or more elements are in direct physical or electrical contact. The term “coupled,” however, may also mean that two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other. The embodiments are not limited in this context.

[0081] As used herein, the terms “comprises,” “comprising,” “includes,” “including,” “has,” “having” or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, “or” refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

[0082] In addition, use of the “a” or “an” are employed to describe elements and components of the embodiments herein. This is done merely for convenience and to give a general sense of the invention. This description should be read to include one or at least one and the singular also includes the plural unless it is obvious that it is meant otherwise.

[0083] Upon reading this disclosure, those of skill in the art will appreciate still additional alternative structural and functional designs for a system and a process for providing interactive video ad with an HTML underlay through the disclosed principles herein. Thus, while particular embodiments and applications have been illustrated and described, it is to be understood that the disclosed embodiments are not limited to the precise construction and components disclosed herein. Various modifications, changes and variations, which will be apparent to those skilled in the art, may be made in the arrangement, operation and details of the method and apparatus disclosed herein without departing from the spirit and scope defined in the appended claims.

CLAIMS

WHAT IS CLAIMED IS:

1. A method for streaming optimized video to a client device, the method comprising:
receiving a request to optimize an original source file from a client device, the original source file stored on an origin server and the request including a key specifying parameters for optimizing the original source file and uniquely identifying the original source file;
identifying, based on the key, a preview of an optimized version of the original source file in a local cache of a video optimization server, the preview corresponding to a first portion of the optimized version of the original source file;
generating a query, based on the key, to a cache database maintaining a plurality of reference keys corresponding to a plurality of optimized versions of source files stored on a plurality of other video optimization servers, each reference key specifying parameters of an optimized version of a source file and uniquely identifying the source file;
receiving, from the cache database, a response indicating whether the key matches a reference key maintained in the database;
receiving from the cache database, in response to a reference key matching the key, the address of another video optimizer storing a segment of the requested optimized version of the original source file;
stitching the generated segment of the original source file with the segment of the optimized version of the original source file stored on the other video optimizer;
and

streaming the stitched optimized version of the original source file for playback on the client device.

2. The method of claim 1, further comprising:
storing a segment of the stitched optimized version of the original source file in the cache of the video optimizer; and
transmitting, to the cache database, instructions for updating the cache database in response to storing the segment of the stitched optimized version of the original source file stored in the video optimizer.
3. The method of claim 1, wherein the received response indicates that different segments of the optimized version of the same original source file are stored on a plurality of different video optimizers.
4. The method of claim 3, further comprising:
transmitting, to the plurality of different video optimizers, a request for the segment of the optimized version of the original source file stored on each video optimizer;
and
stitching the different segments of the optimized version of the same original source file with the generated segment of the original source file.
5. The method of claim 1, wherein the key comprises a source content signature, the source content signature being a hash of the original source file.
6. The method of claim 1, wherein the cache database comprising data entries identifying a plurality of optimization server storing an optimized version of the original source file,

the entries being modified through instructions transmitted to the cache database to update a location where the optimized version of the original source file is stored.

7. The method of claim 1, further comprising:

determining a second segment of the optimized version of the original source file is not stored by the plurality of other video optimization servers;

responsive to the determination, transcoding the second segment of the original source file;

storing the transcoded second segment in the local cache of the video optimization server;

and

stitching the transcoded second segment with the stitched optimized version of the original source file.
8. The method of claim 7, further comprising transmitting to the cache database, instructions for updating the cache database with a reference key corresponding to the transcoded second segment of the optimized version of the source file stored at the video optimization server.
9. The method of claim 7, wherein transcoding the second segment of the original source file comprises:

identifying a third segment of the optimized version of the original source file, subsequent to the second segment, that is stored by one of the plurality of other video optimization servers; and

transcoding the original source file from a start of the second segment to a start of the third segment.

10. The method of claim 1, wherein the preview is maintained in the local cache of the video optimization server after one or more purges of the local cache.
11. A system for streaming optimized video to a client device, comprising:
at least one processor; and
a non-transitory computer-readable storage medium storing executable computer program instructions that when executed by the processor, cause the processor to:
receive a request to optimize an original source file from a client device, the original source file stored on an origin server and the request including a key specifying parameters for optimizing the original source file and uniquely identifying the original source file;
identify, based on the key, a preview of an optimized version of the original source file in a local cache of a video optimization server, the preview corresponding to a first portion of the optimized version of the original source file;
generate a query, based on the key, to a cache database maintaining a plurality of reference keys corresponding to a plurality of optimized versions of source files stored on a plurality of other video optimization servers, each reference key specifying parameters of an optimized version of a source file and uniquely identifying the source file;
receive, from the cache database, a response indicating whether the key matches a reference key maintained in the database;
receive from the cache database, in response to a reference key matching the key, the address of another video optimizer storing a segment of the requested optimized version of the original source file;

stitch the generated segment of the original source file with the segment of the optimized version of the original source file stored on the other video optimizer; and stream the stitched optimized version of the original source file for playback on the client device.

12. The system of claim 11, wherein the storage medium further comprises instructions that when executed cause the processor to:
store a segment of the stitched optimized version of the original source file in the cache of the video optimizer; and
transmit, to the cache database, instructions for updating the cache database in response to storing the segment of the stitched optimized version of the original source file stored in the video optimizer.
13. The system of claim 11, wherein the received response indicates that different segments of the optimized version of the same original source file are stored on a plurality of different video optimizers, and wherein the storage medium further comprises instructions that when executed cause the processor to:
transmit, to the plurality of different video optimizers, a request for the segment of the optimized version of the original source file stored on each video optimizer; and
stitch the different segments of the optimized version of the same original source file with the generated segment of the original source file.
14. The system of claim 11, wherein the key comprises a source content signature, the source content signature being a hash of the original source file.

15. The system of claim 11, wherein the cache database comprises data entries to identify a plurality of optimization servers storing an optimized version of the original source file, the entries being modified through instructions transmitted to the cache database to update a location where the optimized version of the original source file is stored.
16. The system of claim 11, wherein the storage medium further comprises instructions that when executed cause the processor to:

determine a second segment of the optimized version of the original source file is not stored by the plurality of other video optimization servers;

transcode, responsive to the determination, the second segment of the original source file;

store the transcoded second segment in the local cache of the video optimization server;

and

stitch the transcoded second segment with the stitched optimized version of the original source file.
17. The system of claim 16, wherein the storage medium further comprises instructions that when executed cause the processor to transmit to the cache database, instructions for updating the cache database with a reference key corresponding to the transcoded second segment of the optimized version of the source file stored at the video optimization server.
18. The system of claim 16, wherein the instructions on the computer readable storage medium to transcode the second medium further comprises instructions that when executed cause the processor to:

identify a third segment of the optimized version of the original source file, subsequent to the second segment, that is stored by one of the plurality of other video optimization servers; and
transcode the original source file from a start of the second segment to a start of the third segment.

19. The system of claim 11, wherein the preview is maintained in the local cache of the video optimization server after one or more purges of the local cache.

ABSTRACT

A video optimizer receives a request to optimize a source file and stream the optimized file. The request may be accompanied by a key uniquely identifying the original source file to be optimized and an optimized version of the source file to stream to the client. The key uniquely identifies the source video file as it exists on an origin server to prevent transmission of modified source video and the optimized version of the source file by optimization parameters to ensure compatibility with the user device. The video optimizer queries a cache database in response to the received request, which contains references keys and locations of optimized source files among local caches in a cluster of video optimizers. The cache database responds indicates whether a matching optimized version of the source file exists in a local cache of a given video optimizer in the cluster.

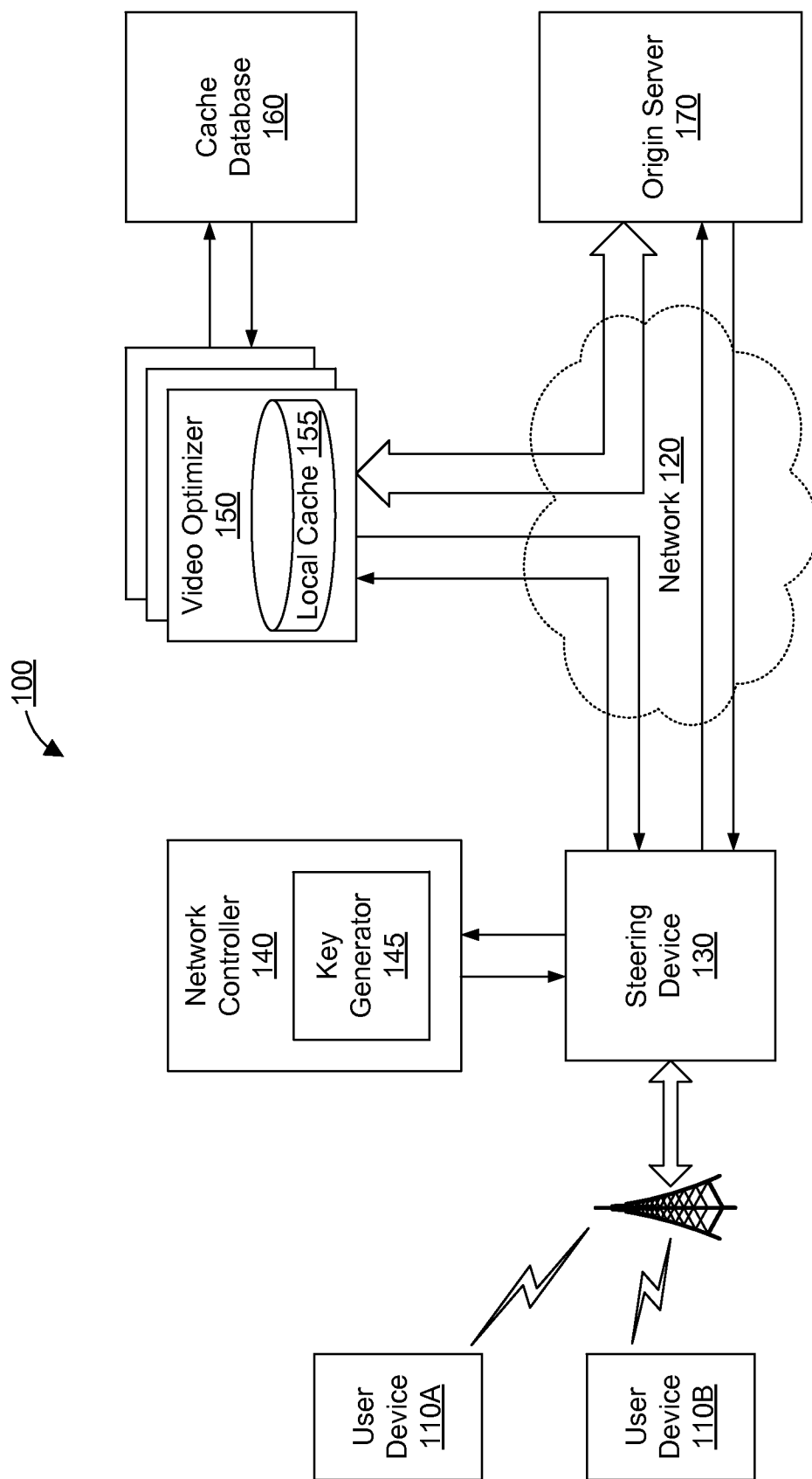


FIG. 1

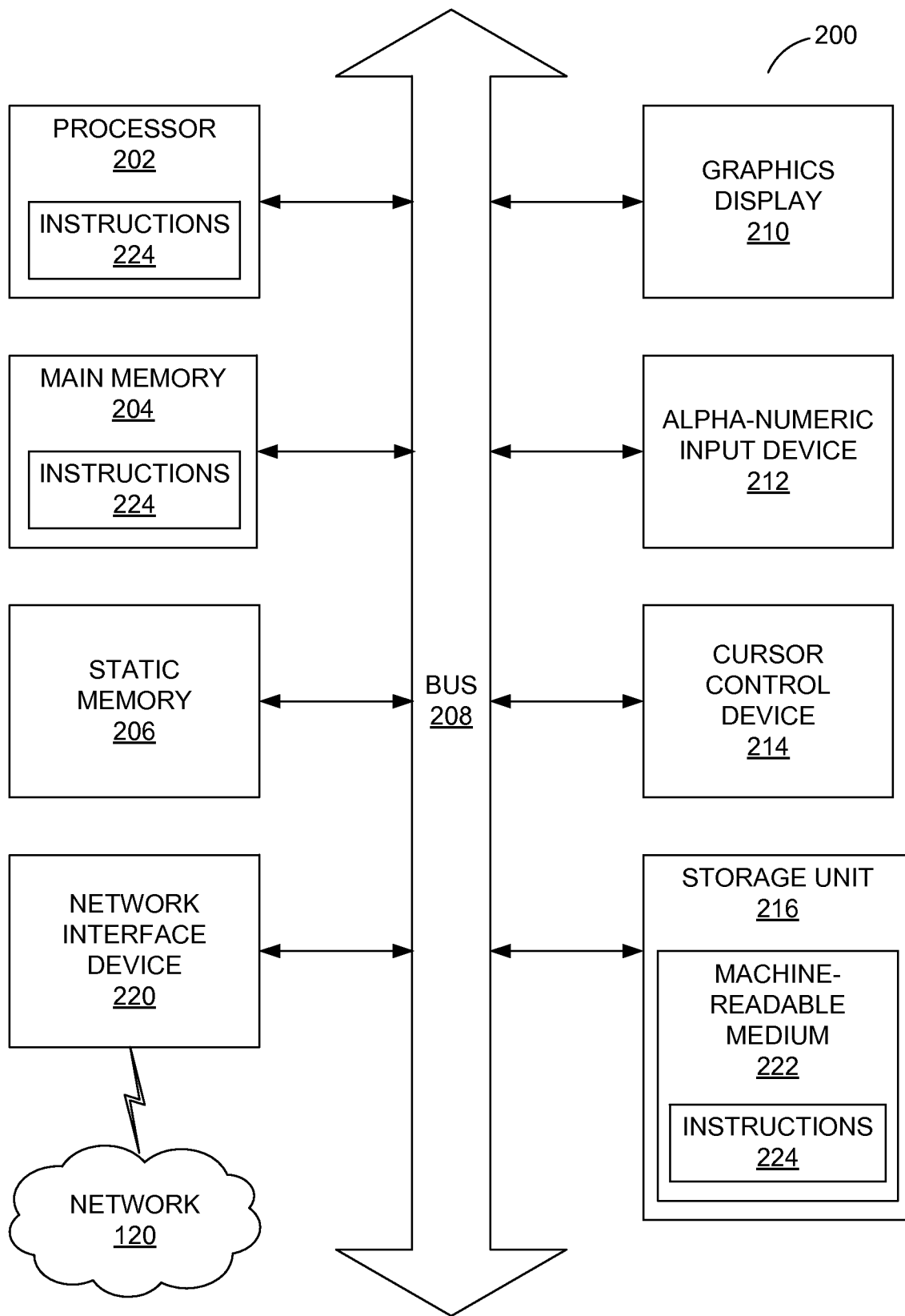


FIG. 2

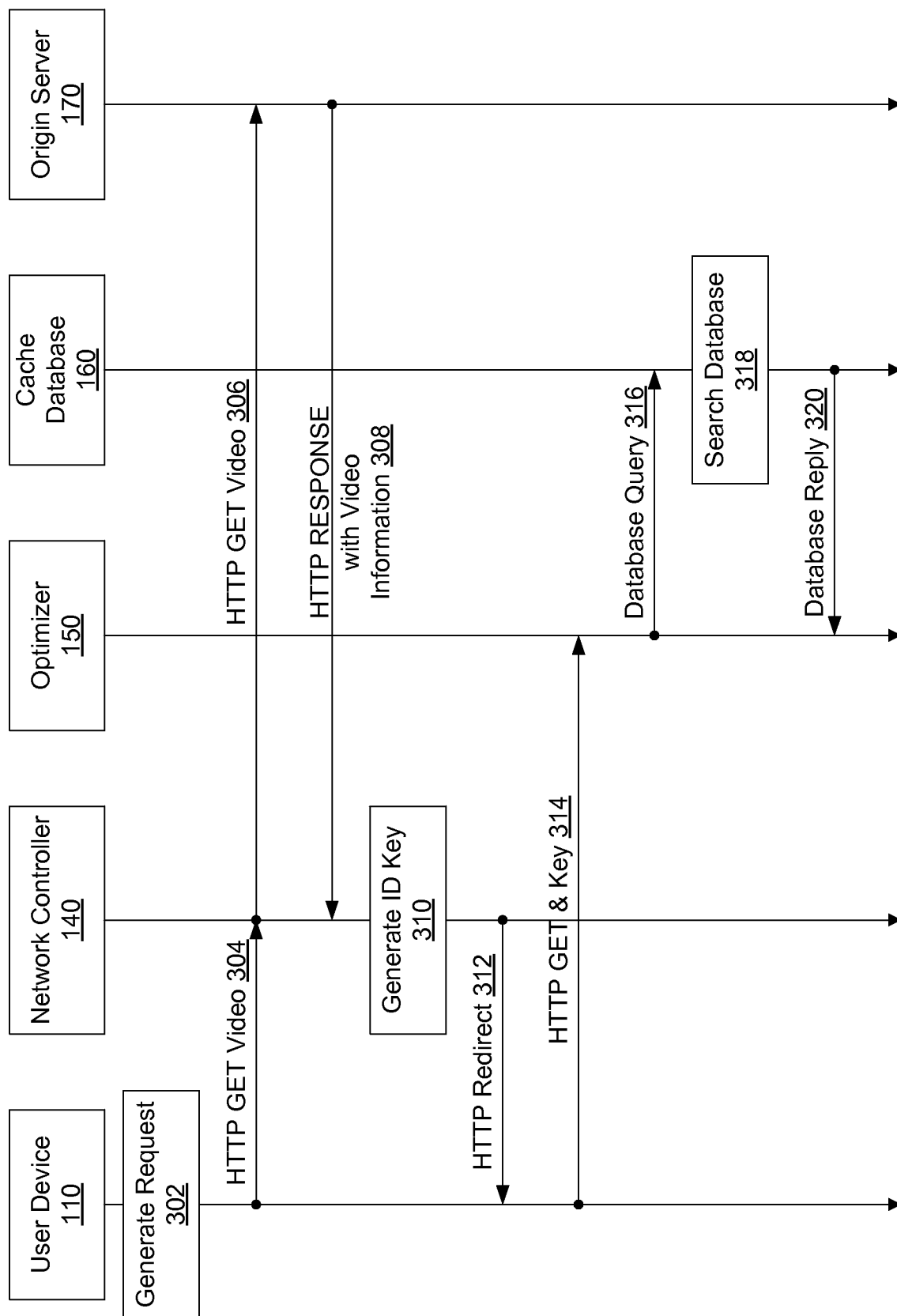


FIG. 3A

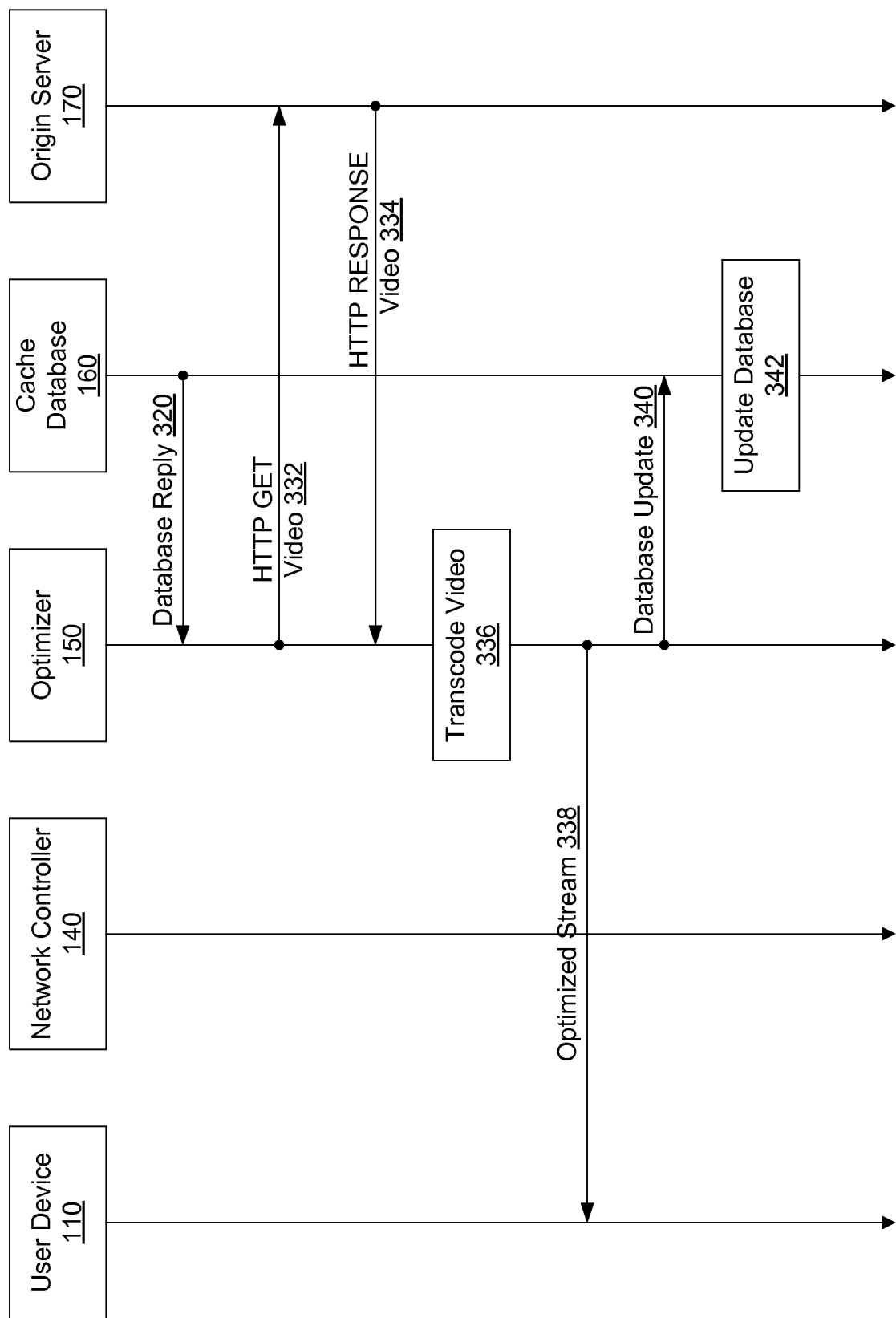


FIG. 3B

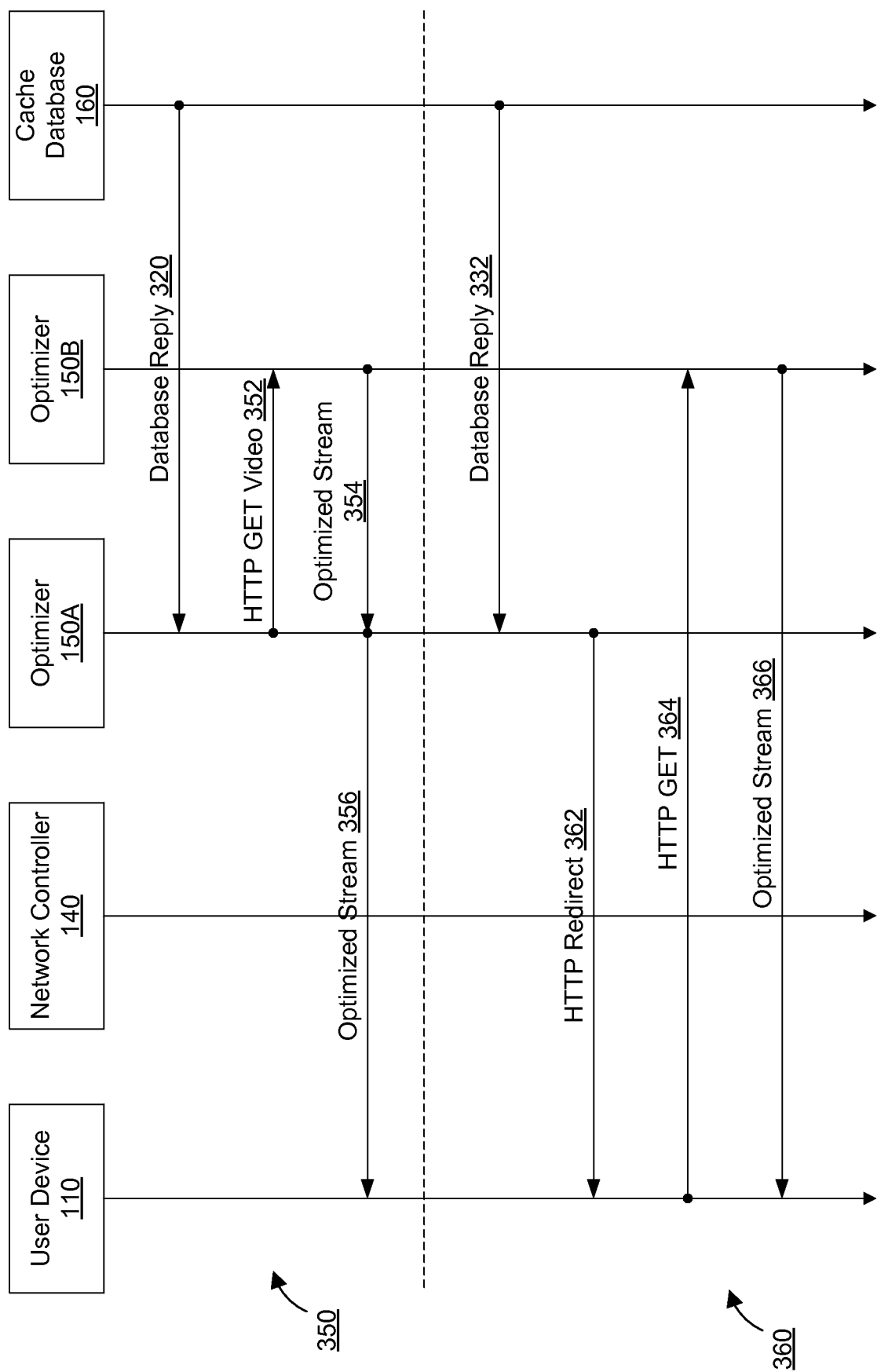


FIG. 3C

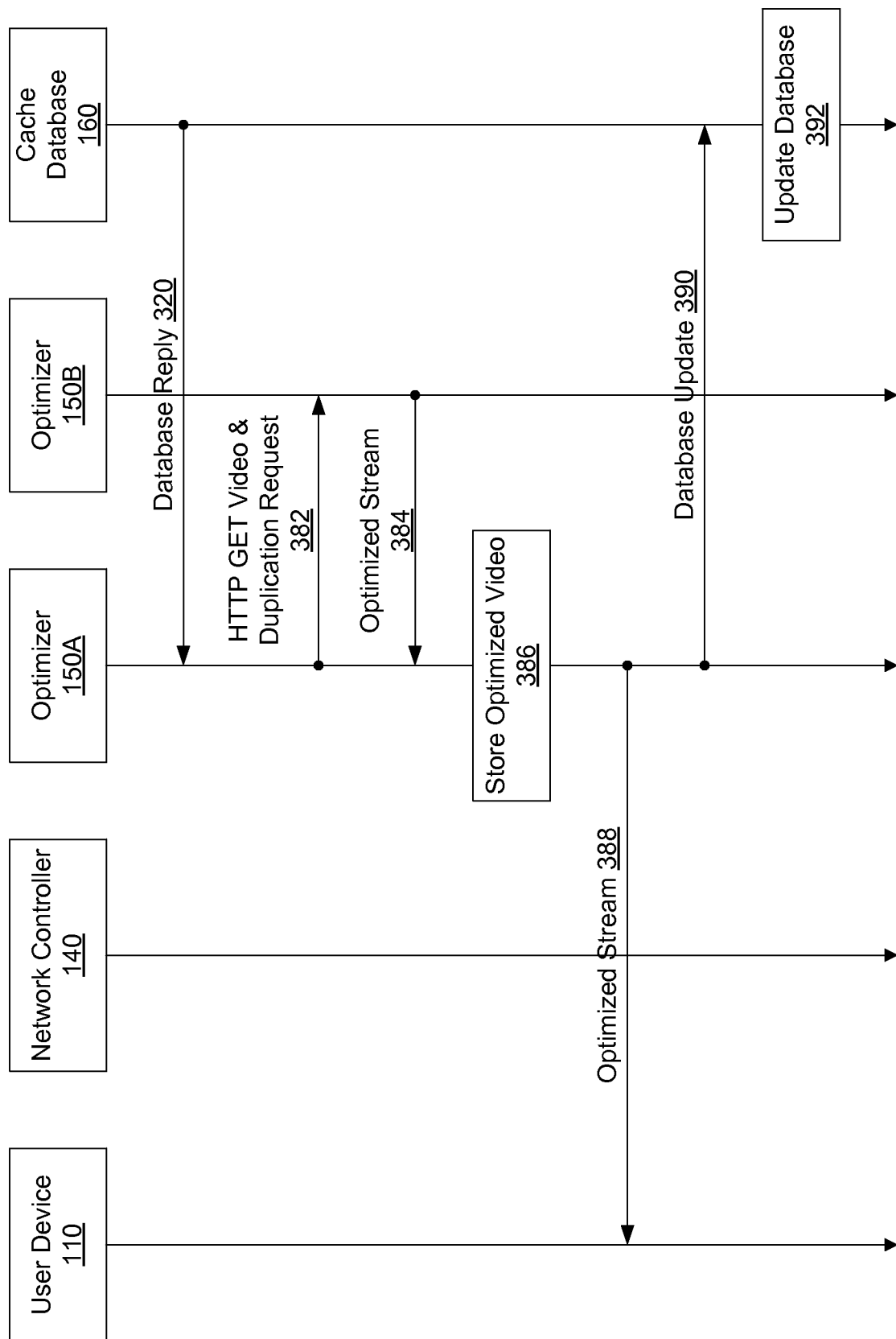


FIG. 3D

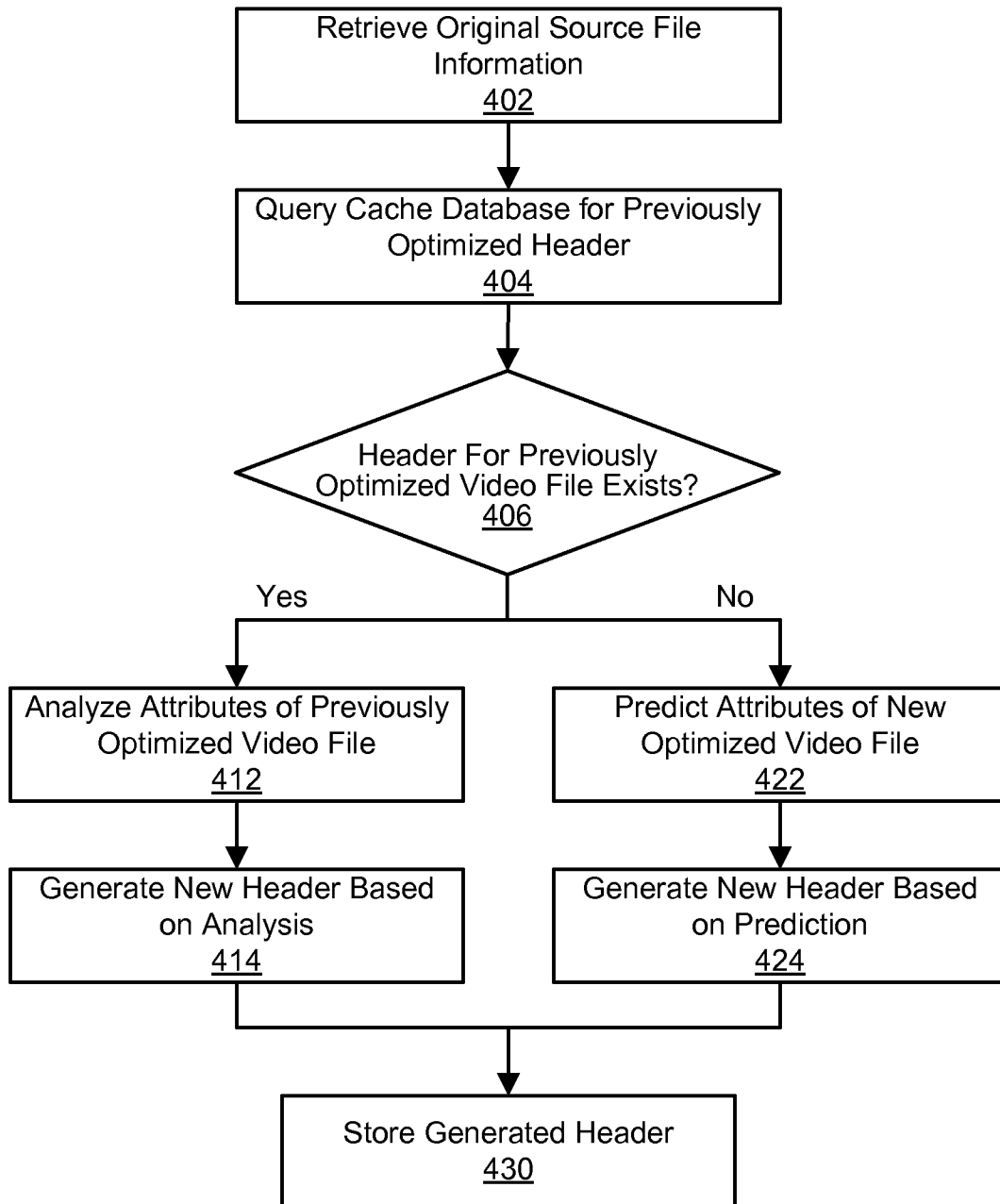


FIG. 4

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	Just-in-Time Distributed Video Cache			
First Named Inventor/Applicant Name:	Erik R. Swenson			
Filer:	Rajiv P. Patel/Alyona Eidingen			
Attorney Docket Number:	25253-30675/US			
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:	23416375
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	04-SEP-2015
Filing Date:	
Time Stamp:	20:18:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 1600
RAM confirmation Number	19773
Deposit Account	192555
Authorized User	PATEL, RAJIV P.

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Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

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Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

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Charge any Additional Fees required under 37 C.F.R. Section 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	Application Data Sheet	30675_US_ADS.PDF	1819280	no	8
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Warnings:					
Information:					
2	Oath or Declaration filed	30675_US_Declaration_from_parent_case_23538.PDF	585058	no	5
			048e20b7f8b88cd494fd5eb946e0c9e310a779d		
Warnings:					
Information:					
3		30675_US_Specification.pdf	177903	yes	51
			a1fa501b4b970bba69bac57a2bda7405af5d49dd		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	43	
	Claims		44	50	
	Abstract		51	51	
Warnings:					
Information:					
4	Drawings-only black and white line drawings	30675_US_Drawings_from_parent_case_23538_.PDF	86880	no	7
			2d7f2e52f320499fb4daa2947c86bff3872f8ea0		
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	35008	no	2
			8955bcc2ac34ecc3b8ca0cf4c176907d1c27a8f3		
Warnings:					
Information:					
Total Files Size (in bytes):			2704129		

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Acknowledgement Receipt

EFS ID:	23416375
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	04-SEP-2015
Filing Date:	
Time Stamp:	20:18:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 1600
RAM confirmation Number	19773
Deposit Account	192555
Authorized User	PATEL, RAJIV P.

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

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

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Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 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	Application Data Sheet	30675_US_ADS.PDF	1819280	no	8
			eccb09d7f8e44600b818bccbb8c8015980ae4e22		
Warnings:					
Information:					
2	Oath or Declaration filed	30675_US_Declaration_from_parent_case_23538.PDF	585058	no	5
			048e20b7f8b88cdd494fd5eb946e0c9e310a779d		
Warnings:					
Information:					
3		30675_US_Specification.pdf	177903	yes	51
			a1fa501b4b970bba69bac57a2bda7405af5d49dd		
	Multipart Description/PDF files in .zip description				
	Document Description	Start	End		
	Specification	1	43		
	Claims	44	50		
	Abstract	51	51		
Warnings:					
Information:					
4	Drawings-only black and white line drawings	30675_US_Drawings_from_parent_case_23538_.PDF	86880	no	7
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Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	35008	no	2
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Warnings:					
Information:					
Total Files Size (in bytes):			2704129		

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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	14/846,647
Filing Date	September 4, 2015
First Named Inventor	Erik R. Swenson
Title	Just-in-Time Distributed Video Cache
Art Unit	2447
Examiner Name	Not yet assigned
Attorney Docket Number	25253-30675/US

SIGNATURE of Applicant or Patent Practitioner

Signature	/Rajiv P. Patel/	Date (Optional)	
Name	Rajiv P. Patel	Registration Number	39,327
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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



*Total of ONE forms are submitted.

This collection of information is required by 37 CFR 1.131, 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.**

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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

(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:

00758

OR



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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

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The address associated with Customer Number:

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Firm or
Individual Name

Address

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State

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Email

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

Opera Software Ireland Limited



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)

5/15/2014

Name

Roar Olbergsveen

Title

Director

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.



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Electronic Acknowledgement Receipt

EFS ID:	23436886
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	09-SEP-2015
Filing Date:	
Time Stamp:	16:49:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	30675_US_Power_of_Attorney_AIA82.PDF	1807724 054431c44a1685f7109fe621ab7e86e9684f159b	no	2

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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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 14/846,647			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	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), (l), 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(j))	19	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)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=		OR	x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	=		OR	x	=	
	Application Size Fee (37 CFR 1.16(s))					OR			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR			
			TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE		
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=		OR	x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	=		OR	x	=	
	Application Size Fee (37 CFR 1.16(s))					OR			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR			
			TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
14/846,647	09/04/2015	2447	1600	25253-30675/US	19	2

CONFIRMATION NO. 8052

FILING RECEIPT



0000000077542978

758

FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

Date Mailed: 09/22/2015

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)

Erik R. Swenson, San Jose, CA;
Jaime Heilpern, San Francisco, CA;
Sandeep Pombra, Los Altos, CA;
Ron Earley, Dublin, CA;
Vadim Arshanskiy, Santa Clara, CA;

Applicant(s)

Opera Software Ireland Limited, Dublin, IRELAND;

Power of Attorney: The patent practitioners associated with Customer Number 00758

Domestic Priority data as claimed by applicant

This application is a DIV of 13/945,747 07/18/2013 PAT 9154361
which claims benefit of 61/673,188 07/18/2012

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.

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If Required, Foreign Filing License Granted: 09/18/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/846,647**

Projected Publication Date: 12/31/2015

Non-Publication Request: No

Early Publication Request: No

Title

Just-in-Time Distributed Video Cache

Preliminary Class

709

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

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/846,647	09/04/2015	Erik R. Swenson	25253-30675/US

CONFIRMATION NO. 8052

PUBLICATION NOTICE



OC000000079654665

758
FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

Title:Just-in-Time Distributed Video Cache

Publication No.US-2015-0381677-A1

Publication Date:12/31/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Complete if Known

Application Number	14/846,647
Filing Date	September 4, 2015
First Named Inventor	Erik R. Swenson
Art Unit	2447
Confirmation Number	8052
Examiner Name	Not yet known
Attorney Docket Number	25253-30675/US

Sheet 1 of 3

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document No. Number – Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	US-8639718	01-28-2014	Bhupalam et al.
	A2	US-8145779	03-27-2012	Zhang
	A3	US-7636792	12-22-2009	Ho
	A4	US-7188216	03-06-2007	Rajkumar et al.
	A5	US-6954456	10-11-2005	Cranor et al.
	A6	US-2012/0203861 A1	08-09-2012	Flack et al.
	A7	US-2012/0131138 A1	05-24-2012	Swenson et al.
	A8	US-2012/0030212 A1	02-02-2012	Koopmans et al.
	A9	US-2011/0280216 A1	11-17-2011	Li et al.
	A10	US-2011/0131298 A1	06-02-2011	Courtemanche et al.
	A11	US-2010/0281042 A1	11-04-2010	Windes et al.
	A12	US-2010/0106770 A1	04-29-2010	Taylor et al.
	A13	US-2009/0310668 A1	12-17-2009	Sackstein et al.
	A14	US-2009/0119322 A1	05-07-2009	Mills et al.
	A15	US-2009/0006643 A1	01-01-2009	Lee
	A16	US-2008/0288722 A1	11-20-2008	Lecoq et al.
	A17	US-2008/0139191 A1	06-12-2008	Melnyk et al.
	A18	US-2007/0174471 A1	07-26-2007	Van Rossum
	A19	US-2006/0190616 A1	08-24-2006	Mayerhofer et al.
	A20	US-2004/0098463 A1	05-20-2004	Shen et al.
	A21	US-2003/0217169 A1	11-20-2003	James et al.

EXAMINER SIGNATURE

Examiner Signature	
Date Considered	
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¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.	
⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.	

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Application Number	14/846,647
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First Named Inventor	Erik R. Swenson
Art Unit	2447
Confirmation Number	8052
Examiner Name	Not yet known
Attorney Docket Number	25253-30675/US

Sheet 2 of 3

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ – Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶
	B1	WO 2011/106009	09-01-2011	Mobovivo, Inc.	

OTHER REFERENCES – 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 ⁶
	C1	BHANDARKAR et al. "Collaborative Caching for Efficient Dissemination of Personalized Video Streams in Resource Constrained Environments." MMSys'12 Feb. 22-24, 2012, Chapel Hill, North Carolina, USA. pp. 185-190.	
	C2	SINGH et al. "PTC: Proxies that Transcode and Cache in Heterogeneous Web Client Environments." World Wide Web: Internet and Web Information Systems, vol. 7. 2004. pp. 7-28.	
	C3	U.S. Appl. No. 61/334,548, filed May 13, 2010, Inventors S. Li et al.	
	C4	LI, Y. et al., "Optimized Cache Management for Scalable Video Streaming," Proceedings of the 15th International Conference on Multimedia, ACM, 2007, 4 pages, [Online] [Retrieved on Dec. 30, 2013] Retrieved from the Internet<URL:http://dl.acm.org/citation.cfm?id=1291414>.	
	C5	PCT International Search Report and Written Opinion, PCT Application No. PCT/US13/51126, Jan. 24, 2014, 14 pages.	
	C6	United States Office Action, U.S. Application No. 13/945,747, February 20, 2015, 10 pages.	
	C7	Korean Office Action, Korean Application No. 10-2015-7004371, November 4, 2015, 5 pages (with concise explanation of relevance).	
	C8	European Extended Search Report, European Application No. 13819265.3, December 23, 2015, 13 pages.	
	C9	Chinese Office Action, Chinese Application No. 201380046871.0, January 6, 2016, 7 pages (with concise explanation of relevance).	

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⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.	

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(Not for submission under 37 CFR 1.99)

Complete if Known

Application Number	14/846,647
Filing Date	September 4, 2015
First Named Inventor	Erik R. Swenson
Art Unit	2447
Confirmation Number	8052
Examiner Name	Not yet known
Attorney Docket Number	25253-30675/US

Sheet	3	of	3
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CERTIFICATION STATEMENT

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

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OR

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☒ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. 13/945,747, filed July 18, 2013, and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d), except C6-C9.

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature /Rajiv P. Patel/

Date (YYYY-MM-DD) 2016-02-01

Name/Print Rajiv P. Patel

Registration Number 39,327

25253/30675/DOCS/3847286.1

Electronic Acknowledgement Receipt

EFS ID:	24787402
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	01-FEB-2016
Filing Date:	04-SEP-2015
Time Stamp:	23:46:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	30675_IDS.pdf	191308 e30c3a0eec2e154b9365d264ef668e56da8187d0	no	3

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2	Non Patent Literature	US_Office_Action_Feb_20_2015_US13945747.pdf	374668 177d97a37fa6e121eb7144607eb56c68485f0100	no	10
Warnings:					
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Information:					
5	Non Patent Literature	CN_Office_Action.pdf	702515 07537094085b7e844c7f7da3b24f1aa4eae00779	no	7
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Total Files Size (in bytes):			2662769		
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/846,647
				Filing Date	September 4, 2015
				First Named Inventor	Erik R. Swenson
				Applicant	Opera Software Ireland Limited
				Art Unit	2447
				Confirmation Number	8052
				Examiner Name	Not yet known
Sheet	1	of	2	Attorney Docket Number	25253-30675/US

U.S. PATENT DOCUMENTS				
		Document No.		
Examiner Initials*	Cite No. ¹	Number – Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document

FOREIGN PATENT DOCUMENTS					
		Foreign Patent Document			
Examiner Initials*	Cite No. ¹	Country Code ³ – Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶
	B1	JP 2010-273298 A (with English abstract)	12-02-2010	Broad Earth Inc.	

OTHER REFERENCES – 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 ⁶	
	C1	Japanese First Office Action, Japanese Application No. P2015-523261, January 19, 2016, 4 pages.	X	

EXAMINER SIGNATURE	
Examiner Signature	
Date Considered	
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	
¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.	
⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
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Art Unit	2447
Confirmation Number	8052
Examiner Name	Not yet known
Attorney Docket Number	25253-30675/US

Sheet

2

of

2

CERTIFICATION STATEMENT

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

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

OR

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

☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature /Rajiv P. Patel/

Date (YYYY-MM-DD) 2016-08-17

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Registration Number 39,327

25253/30675/DOCS/3911122.1



Espacenet

Bibliographic data: JP2010273298 (A) — 2010-12-02

CONTENT DISTRIBUTION SYSTEM, DISTRIBUTION CONTROL DEVICE, AND DISTRIBUTION CONTROL PROGRAM

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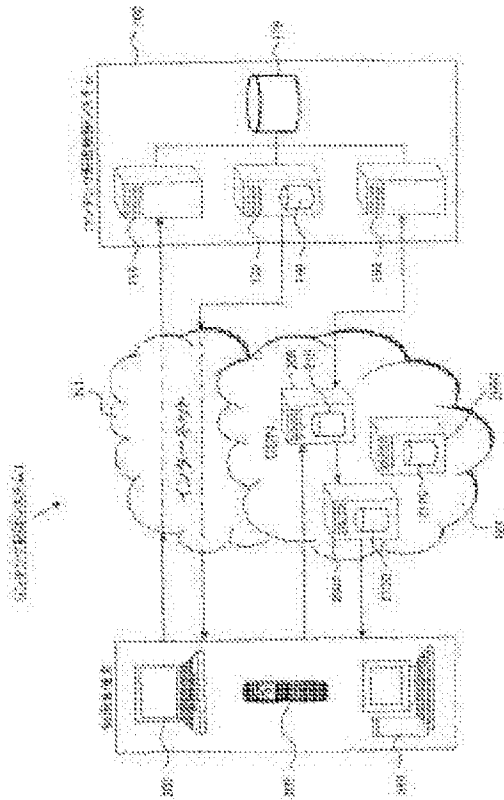
Classification: - **international:** H04N21/238; H04N21/24; H04N7/173
 - **cooperative:** H04N21/23106; H04N21/234309; H04N21/2393; H04N21/2405

Application number: JP20090125726 20090525

Priority number (s): JP20090125726 20090525

Abstract of JP2010273298 (A)

PROBLEM TO BE SOLVED: To provide a content distribution system which distributes contents which have been converted into a data format corresponding to a terminal attribute, and performs appropriate content distribution while minimizing the resources of the entire content distribution system. ;SOLUTION: The content distribution system includes: a first distribution processing device which performs a transcoding process varying, depending on each terminal attribute of a user's terminal device, with respect to untransformed contents held in a content storage device, and performs a real-time transcoding distribution process in response to a content distribution request from the user's terminal device; a distribution control device which monitors the resource load of the first distribution process device, and based on a resource load state when there is the content distribution request, switches the process of distributing contents corresponding to the distribution request, from the real-time transcoding distribution process to a cache distribution process; and a second distribution processing device which, when the cache distribution process is performed, caches transformed contents generated through the transcoding process by the first distribution process device. ;COPYRIGHT: (C)2011,JPO&INPIT



(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2010-273298

(P2010-273298A)

(43) 公開日 平成22年12月2日 (2010. 12. 2)

(51) Int. Cl.

H04N 7/173 (2006.01)

F 1

H04N 7/173 610Z

テーマコード (参考)

5C164

審査請求 未請求 請求項の数 13 O L (全 25 頁)

(21) 出願番号

特願2009-125726 (P2009-125726)

(22) 出願日

平成21年5月25日 (2009. 5. 25)

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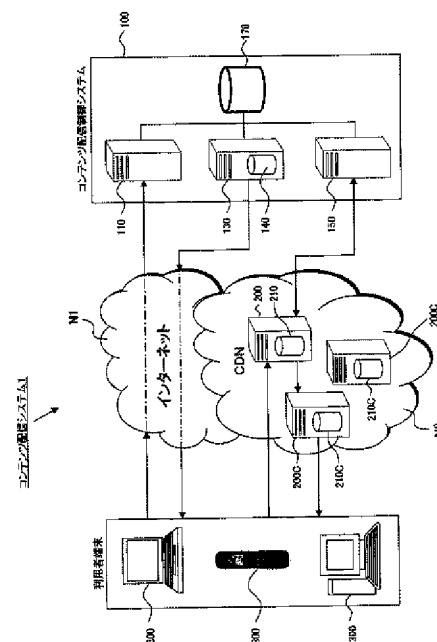
(54) 【発明の名称】 コンテンツ配信システム、配信制御装置及び配信制御プログラム

(57) 【要約】

【課題】 端末属性に応じたデータ形式に変換されたコンテンツを配信するコンテンツ配信システム全体の資源を最小限に抑えつつ、好適なコンテンツ配信が可能なコンテンツ配信システムを提供する。

【解決手段】 コンテンツ記憶装置に保持された変換前コンテンツに対し利用者端末装置の各端末属性に応じて異なるトランスコーディング処理を遂行し、利用者端末装置からのコンテンツ配信要求を契機にリアルタイムトランスコーディング配信処理を遂行する第1配信処理装置と、第1配信処理装置のリソース負荷を監視し、コンテンツ配信要求の際のリソース負荷状態に基づいて、配信要求のあったコンテンツの配信処理をリアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替える配信制御装置と、キャッシュ配信処理に際して第1配信処理装置のトランスコーディング処理を通じて生成される変換後コンテンツをキャッシュする第2配信処理装置とを有する。

【選択図】 図1



【特許請求の範囲】**【請求項1】**

利用者端末装置の各端末属性に応じたデータ形式に変換されたコンテンツを配信するコンテンツ配信システムであって、

コンテンツ記憶装置に保持される変換前コンテンツに対し前記各端末属性に応じて異なるトランスコーディング処理を遂行する機能を有し、前記利用者端末装置からのコンテンツ配信要求を契機にリアルタイムトランスコーディング配信処理を遂行する第1配信処理装置と、

前記第1配信処理装置のリソース負荷を監視し、前記コンテンツ配信要求の際の前記リソース負荷状態に基づいて、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替える配信制御装置と、

前記キャッシュ配信処理に際して前記第1配信処理装置の前記トランスコーディング処理を通じて生成される変換後コンテンツをキャッシュする第2配信処理装置と、

を有することを特徴とするコンテンツ配信システム。

【請求項2】

前記配信制御装置は、

前記リアルタイムトランスコーディング配信処理の同時配信処理接続数を監視し、前記コンテンツ配信要求の際の前記同時配信処理接続数が許容同時配信処理接続数に達しているか否かを判別し、前記同時配信処理接続数が許容同時配信処理接続数に達している場合、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替えることを特徴とする請求項1に記載のコンテンツ配信システム。

【請求項3】

前記配信制御装置は、

前記第1配信処理装置のCPU使用率を監視し、前記コンテンツ配信要求の際の前記CPU使用率が許容CPU使用率に達しているか否かを判別し、前記許容CPU使用率が許容CPU使用率に達している場合、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替えることを特徴とする請求項1又は2に記載のコンテンツ配信システム。

【請求項4】

前記配信制御装置は、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替える場合、前記第2配信処理装置への接続情報を前記利用者端末装置に伝送し、

前記第2配信処理装置は、前記接続情報に基づいて前記利用者端末装置から伝送されるコンテンツ配信要求を契機に、配信要求のあったコンテンツに対応する変換後コンテンツがキャッシュ登録されているか否かを判別し、キャッシュ登録されていない場合に前記キャッシュ配信処理に際して前記第1配信処理装置の前記トランスコーディング処理を通じて生成される変換後コンテンツをキャッシュすることを特徴とする請求項1から3のいずれか1つに記載のコンテンツ配信システム。

【請求項5】

前記コンテンツ記憶装置は、前記変換前コンテンツに対する前記トランスコーディング処理により生成される端末属性毎の変換後コンテンツヘッダを保持する変換後コンテンツヘッダ記憶部をさらに含み、

前記リアルタイムトランスコーディング配信処理は、

前記トランスコーディング処理におけるペイロード変換処理により順次生成される変換後コンテンツの配信パケットを、予め前記変換後コンテンツヘッダ記憶部に格納された該当の変換後コンテンツヘッダ情報と結合して配信することを特徴とする請求項1から4のいずれか1つに記載のコンテンツ配信システム。

【請求項6】

前記コンテンツ記憶装置は、前記コンテンツのメタ情報を格納するコンテンツメタ情報記憶部と、前記コンテンツの配信要求頻度を格納するコンテンツ履歴記憶部と、を有し、

前記配信制御装置は、前記各コンテンツに対して前記リアルタイムトランスコーディング配信処理又は前記キャッシュ配信処理を各コンテンツの配信ポリシーとして割り当てる配信ポリシー制御部を有し、

前記配信ポリシー制御部は、前記各コンテンツの配信要求頻度をメタ情報別に解析して得られるメタ情報別配信要求頻度を用いて、前記コンテンツ記憶装置に格納される各コンテンツに配信ポリシーを割り当てることを特徴とする請求項1から5のいずれか1つの記載のコンテンツ配信システム。

【請求項7】

前記配信ポリシー制御部は、

前記第2配信処理装置のキャッシュ容量における空き容量が所定値よりも小さいか否かを判別し、前記空き容量が所定値よりも小さい場合、前記メタ情報別配信要求頻度に関らずに前記リアルタイムトランスコーディング配信処理を配信ポリシーとして割り当てることを特徴とする請求項6に記載のコンテンツ配信システム。

【請求項8】

前記コンテンツ履歴記憶部は、前記各コンテンツの最大同時配信数をさらに格納し、

前記配信ポリシー制御部は、

前記コンテンツの配信要求頻度又は最大同時配信数の少なくとも一方が所定の各閾値よりも大きい場合に、前記リアルタイムトランスコーディング配信処理が割り当てられた前記コンテンツの配信ポリシーを、前記キャッシュ配信処理に変更する更新処理を遂行することを特徴とする請求項6に記載のコンテンツ配信システム。

【請求項9】

前記配信ポリシー制御部は、

前記コンテンツの配信要求頻度及び最大同時配信数の各々が所定の各閾値よりも小さい場合に、前記キャッシュ配信処理が割り当てられた前記コンテンツの配信ポリシーを、前記リアルタイムトランスコーディング配信処理に変更する更新処理を遂行することを特徴とする請求項8に記載のコンテンツ配信システム。

【請求項10】

利用者端末装置の各端末属性に応じたデータ形式に変換されたコンテンツを配信するコンテンツ配信方法であって、

第1配信処理装置が、コンテンツ記憶装置に保持された変換前コンテンツに対し前記各端末属性に応じて異なるトランスコーディング処理を遂行し、前記利用者端末装置からのコンテンツ配信要求を契機にリアルタイムトランスコーディング配信処理を遂行するステップと、

配信制御装置が、前記第1配信処理装置のリソース負荷を監視し、前記コンテンツ配信要求の際の前記リソース負荷状態に基づいて、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替えるステップと、

第2配信処理装置が、前記キャッシュ配信処理に際して前記第1配信処理装置の前記トランスコーディング処理を通じて生成される変換後コンテンツをキャッシュするステップと、

を含むことを特徴とするコンテンツ配信方法。

【請求項11】

利用者端末装置の各端末属性に応じたデータ形式に変換されたコンテンツを配信するコンテンツ配信システムであって、

コンテンツ記憶装置に保持された変換前コンテンツに対し前記各端末属性に応じて異なるトランスコーディング処理を遂行する機能を有し、前記利用者端末装置からのコンテンツ配信要求を契機にリアルタイムトランスコーディング配信処理を遂行するリアルタイムトランスコーディング配信処理装置と、

前記リアルタイムトランスコーディング配信処理装置のリソース負荷を監視し、前記コンテンツ配信要求の際の前記リソース負荷状態に基づいて、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替える配信制御装置と、

前記キャッシュ配信処理に際して変換後コンテンツをキャッシュするキャッシュ配信処理装置から伝送されるキャッシュ要求に基づいて、前記リアルタイムトランスコーディング配信処理装置の前記トランスコーディング処理を通じて生成される前記変換後コンテンツを前記キャッシュ配信処理装置に伝送するインターフェース装置と、

を有することを特徴とするコンテンツ配信システム。

【請求項12】

利用者端末装置の各端末属性に応じて異なるトランスコーディング処理を遂行し、リアルタイムトランスコーディング配信処理を遂行する第1配信処理装置を含むコンテンツ配信システムの配信制御装置であって、

前記第1配信処理装置のリソース負荷を監視する負荷情報監視部と、

前記利用者端末装置からのコンテンツ配信要求の際の前記リソース負荷状態に基づいて、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理から前記トランスコーディング処理を通じて生成される端末属性に応じた変換後のコンテンツをキャッシュする第2配信処理装置を通じて配信するキャッシュ配信処理に切り替える配信処理制御部と、を有し、

前記配信処理制御部は、

配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替える場合、前記第2配信処理装置への接続情報を前記利用者端末装置に伝送することを特徴とする配信制御装置。

【請求項13】

利用者端末装置の各端末属性に応じて異なるトランスコーディング処理を遂行し、リアルタイムトランスコーディング配信処理を遂行する第1配信処理装置を含むコンテンツ配信システムの配信制御プログラムであって、

前記第1配信処理装置のリソース負荷を監視する第1機能と、

前記利用者端末装置からのコンテンツ配信要求の際の前記リソース負荷状態に基づいて、配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理から前記トランスコーディング処理を通じて生成される端末属性に応じた変換後のコンテンツをキャッシュする第2配信処理装置を通じて配信するキャッシュ配信処理に切り替える第2機能と、

配信要求のあったコンテンツの配信処理を前記リアルタイムトランスコーディング配信処理からキャッシュ配信処理に切り替える場合に、前記第2配信処理装置への接続情報を前記利用者端末装置に伝送する第3機能と、

をコンピュータに実現させるための配信制御プログラム。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、コンテンツ配信システムに関し、より詳細には、システム全体のシステム資源（リソース）の効率化を図りつつ、好適な配信が可能なコンテンツ配信システムに関する。

【背景技術】

【0002】

コンテンツ配信技術として例えば、CDN（Content Delivery Network）技術がある。CDN技術は、動画像等のデジタルコンテンツを提供するWEBサーバへの同時アクセスやネットワーク負荷によるコンテンツ配信の遅延を解決する技術であり、配信するデジタルコンテンツを出来る限りコンテンツ利用者（利用者端末装置）の近くに置くことを基本に、デジタルコンテンツをネットワーク経由で配信するために最適化されたネットワークを構築することで利用者に快適なコンテンツ閲覧を提供する（非特許文献1参照）。

【0003】

一方、特許文献1に記載のように携帯電話などの移動通信端末装置に対してコンテンツを配信する場合、携帯電話の各機種毎に相違する画像表示機能（画像表示能力）やデータ形式に対応したコンテンツ配信が要求される。すなわち、携帯電話からコンテンツ配信要求があった場合、要求元の携帯電話の機種（画像表示能力）に対応するデータ形式のコンテンツに変換（トランスコーディング処理）した変換後コンテンツを配信する必要がある。

【0004】

しかしながら、従来のトランスコーディング処理を必要とするコンテンツ配信システムでは、以下のような課題があった。つまり、CDNのようにコンテンツをキャッシュする場合、1つのコンテンツに対して予め各機種に対応するデータ形式のコンテンツを複数生成してキャッシュしなければならず、これら各データ形式のコンテンツを保持するためには膨大な記憶容量が必要となる。また、コンテンツ数及び携帯電話の機種数に応じたコンテンツ格納資源を保有するシステムを構築しなければならないが、各コンテンツは各々そのデータ容量が異なり、さらにはコンテンツ数や機種数の増加、アクセス数の増加に対して最適なシステム資源を予測することは困難であった。このため、キャッシュサーバ等のコンテンツ格納資源の確保及びその維持の面において非効率的となり、システム資源、特にコンテンツ格納資源を予測して効率的なシステムを設計（設備設定）することができなかった。

【0005】

一方、CDNのように予め携帯電話の機種毎に複数のデータ形式のコンテンツを保持するのではなく、配信要求都度、オリジナルのデータ形式で格納されているコンテンツをリアルタイムにトランスコーディングし、携帯電話の各機種に対応するデータ形式に変換されたコンテンツを配信することもできる。しかしながら、携帯電話の各機種に対応する複数種類のトランスコーディング処理を遂行しなければならないため、コンテンツ数や機種数の増加、アクセス数の増加に対して過度の処理負荷が発生し、トランスコーディング処理を行う配信サーバ等の処理能力がオーバーフローしてしまう問題があった。

【0006】

このオーバーフローは、配信するコンテンツの品質低下や配信不能の事態を招くおそれがあるため、コンテンツ配信サービスの品質維持のためには、オーバーフローを発生させないだけの処理負荷に耐え得る処理性能（CPU性能及びメモリ）を必要とする。言い換えれば、オーバーフローを防止するために最大処理負荷時に対する処理能力を維持できるだけのCPU性能及びメモリの資源を設計しなければならないが、上述のように配信するコンテンツ数の増加や携帯電話の機種数の増加、同時配信数の増加などを予測した処理能力の設計は困難であった。そこで、予測できない以上は、オーバーフロー（システム資源の枯渇）によるコンテンツ配信サービスの品質低下、配信不能を防止するためには、必要以上の（過剰な）システム資源（CPU性能及びメモリ）を確保するしかなく、非効率的なシステムとなっていた。

【0007】

このように従来のトランスコーディング処理を必要とするコンテンツ配信では、システム全体の資源（コンテンツ格納資源、CPU性能等の処理性能資源）を効率的に活用した配信システムの実現が難しく、特に、システム全体の資源を最小限に抑えつつシステム資源を最大限活用し、品質低下や配信不能等を好適に抑制したコンテンツ配信システムがなかった。

【図面の簡単な説明】

【0025】

【図1】本発明を適用したコンテンツ配信システムの全体概要図である。

【図2】本発明を適用したコンテンツ配信制御システムの構成ブロック図である。

【図3】本発明を適用したコンテンツ配信システムの全体処理フローを示すフローチャートである。

【図4】本発明の変換後コンテンツヘッダ格納処理（a）、リアルタイムトランスコーディング処理（b）の一例を示す図である。

【図5】本発明の配信処理決定処理の一例を示すフローチャートである。

【図6】本発明のCDNキャッシュ配信処理の一例を示すフローチャートである。

【図7】本発明のメタデータ別配信ポリシー処理の一例を示すフローチャートである。

【図8】本発明のコンテンツ登録時の配信ポリシー決定処理の一例を示すフローチャートである。

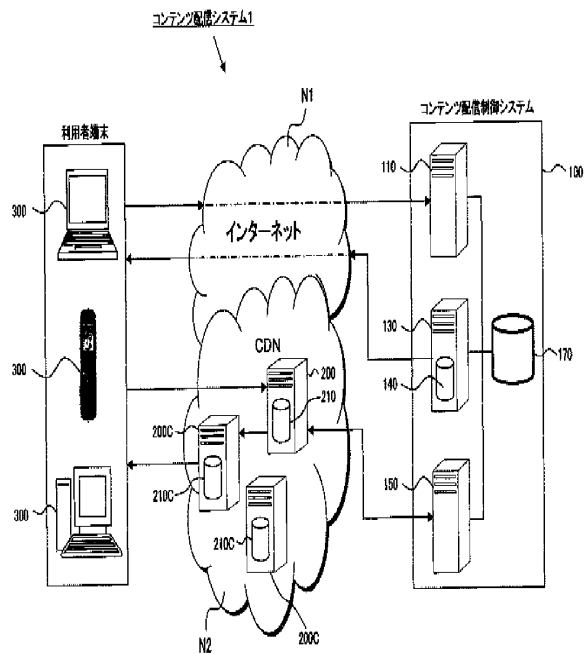
【図9】本発明の配信ポリシー更新処理の一例を示すフローチャートである。

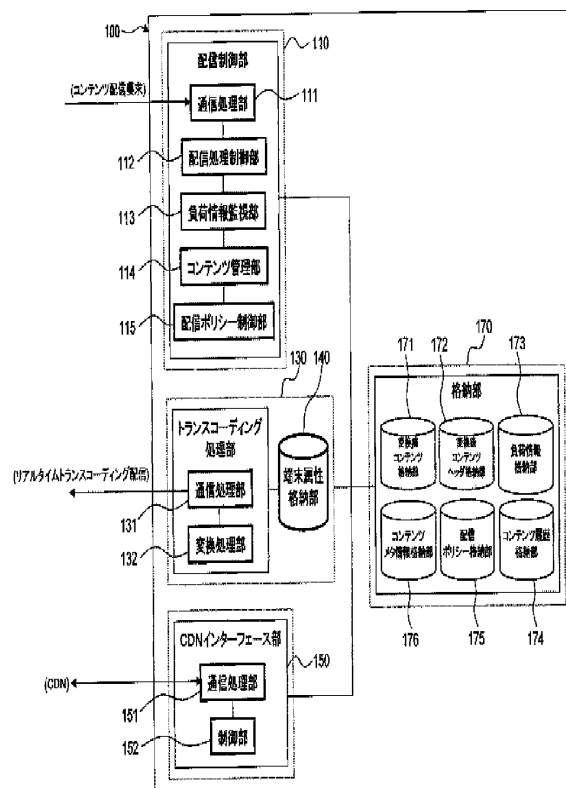
【図10】図9に続くフローチャートである。

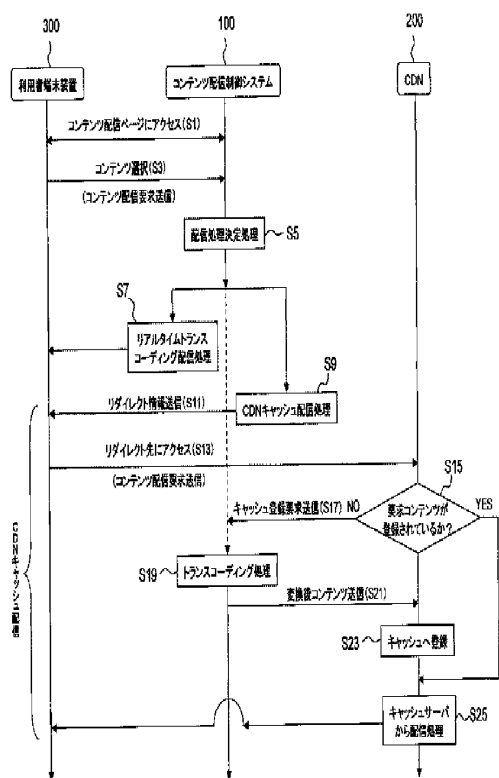
【符号の説明】

【0104】

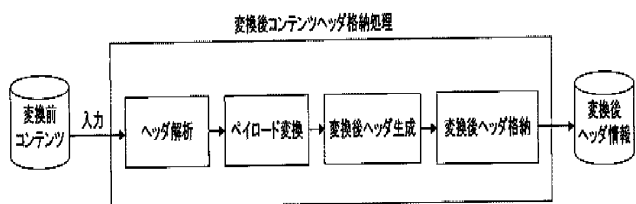
1	コンテンツ配信システム
100	コンテンツ配信制御システム
110	配信制御サーバ
111	通信処理部
112	配信処理制御部
113	負荷情報監視部
114	コンテンツ管理部
115	配信ポリシー制御部
130	トランスコーディングサーバ
131	通信処理部
132	変換処理部
140	端末属性格納部
150	CDNインターフェースサーバ
151	通信処理部
152	制御部
170	格納部
171	変換前コンテンツ格納部
172	変換後コンテンツヘッダ格納部
173	負荷情報格納部
174	コンテンツ履歴格納部
175	配信ポリシー格納部
176	コンテンツメタ情報格納部
200	CDN管理サーバ
210	キャッシュ登録情報格納部
200C	キャッシュサーバ
210C	変換後コンテンツ格納部
300	利用者端末装置



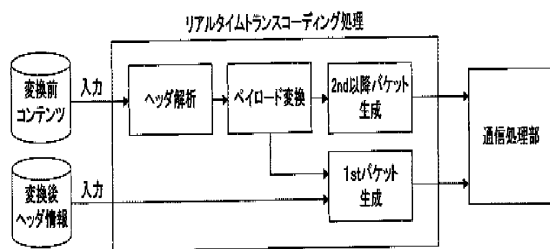


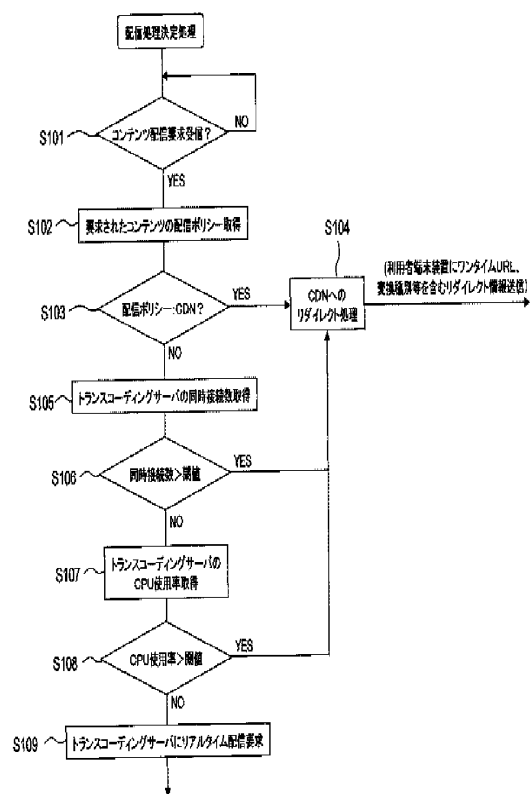


(a)

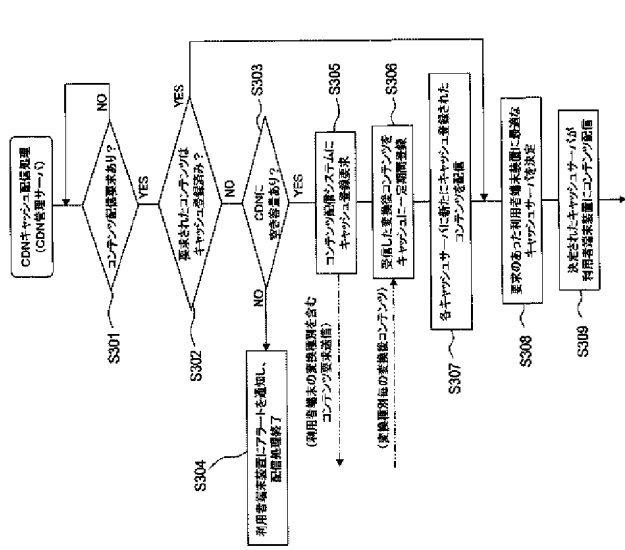


(b)

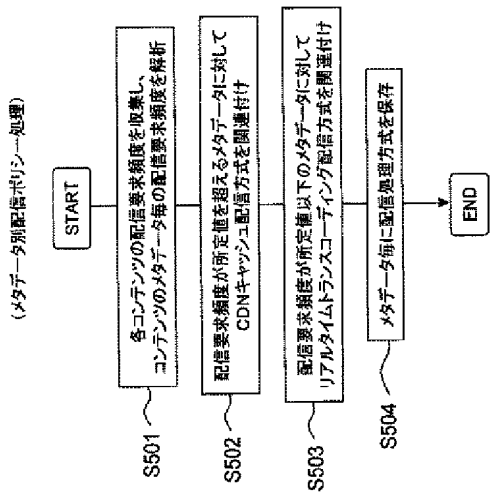




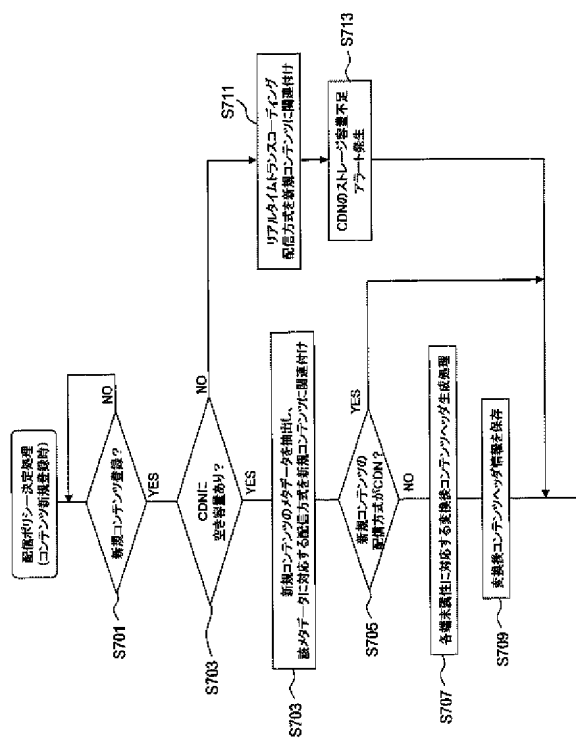
【図6】



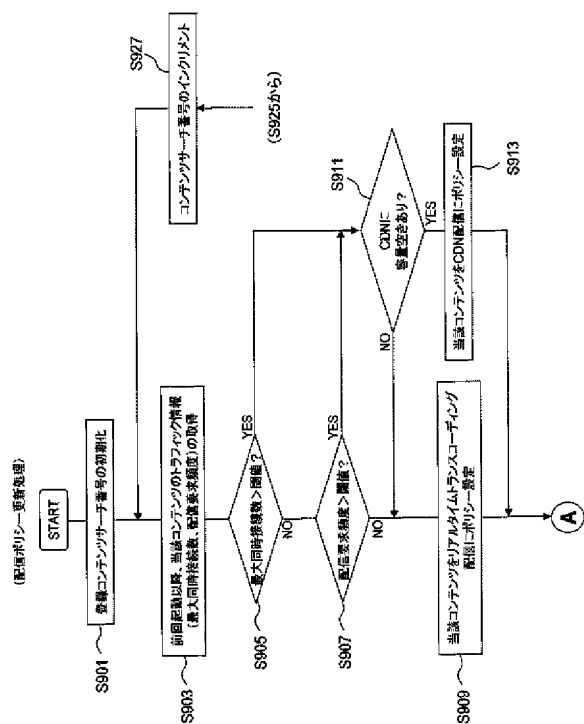
【図7】



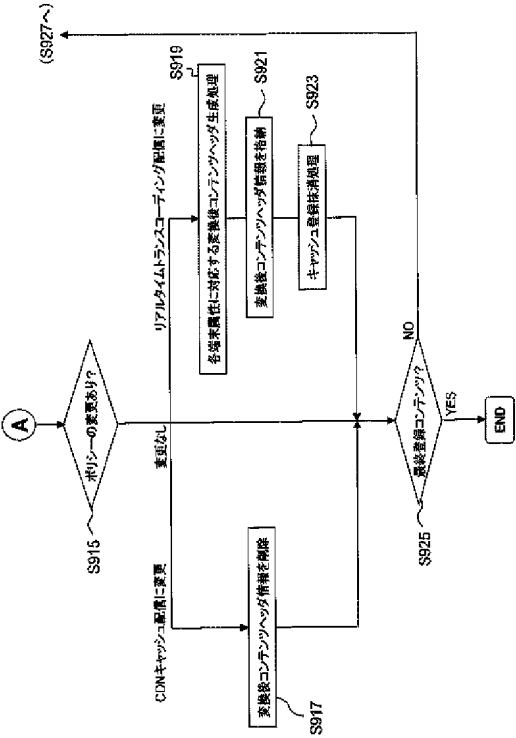
【図8】



【図9】



【図10】



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Fターム(参考) 5C164 FA06 GA03 SA24P SB41P SC22P YA04 YA11

Electronic Acknowledgement Receipt

EFS ID:	26673401
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	17-AUG-2016
Filing Date:	04-SEP-2015
Time Stamp:	19:58:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	30675_IDS.pdf	186698	no	2
			d6910a151a15b43431efe448e8d4ae8cf1d00c69		

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	JP-2010-273298A.pdf	463999 e3d57eceaecd3f33588c949139ad512221a8500	no	19
Warnings:					
Information:					
3	Non Patent Literature	JP_Office_Action_Jan_19_2016.pdf	164051 a0814e397930b20a2c656d389939b653dd2b04f2	no	4
Warnings:					
Information:					
Total Files Size (in bytes):			814748		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/846,647	09/04/2015	Erik R. Swenson	25253-30675/US	8052

758 7590 06/13/2017
FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

EXAMINER

BIAGINI, CHRISTOPHER D

ART UNIT	PAPER NUMBER
----------	--------------

2445

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

06/13/2017

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):

PTOC@Fenwick.com

Office Action Summary	Application No. 14/846,647	Applicant(s) SWENSON ET AL.	
	Examiner Christopher Biagini	Art Unit 2445	AIA (First Inventor to File) Status No

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

Period for Reply

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

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

Status

- 1) ☒ Responsive to communication(s) filed on 9/4/2015.
☐ 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) 1-19 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) 1-19 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 9/4/2015 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) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date _____ | 4) ☐ Other: _____ |

DETAILED ACTION

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

Information Disclosure Statement

The information disclosure statement (“IDS”) filed February 1, 2016 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. In particular, no copy of documents C1, C2, and C4 appear to have been submitted.

The IDS has been placed in the application file, but documents C1, C2, and C4 have not been considered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

(a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-19 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Independent claims 1 and 11 contain numerous instance of a lack of antecedent basis for their terms. Although explicit lack of antecedent basis does not always render a claim indefinite, the number and nature of the deficiencies are such that the scope of the claims would not be reasonably ascertainable by those skilled in the art. Therefore, the claims fail to point out and distinctly claim the subject matter which the applicant regards as the invention. See MPEP 2173.05(e).

Claim 1 recites, on lines 17-18, “the requested optimized version of the original source file.” The claim previously recites “a request to optimize an original source file” (line 2), “a preview of an optimized version of the original source file” (lines 6-7), and “an optimized version of a source file” (line 12). It is not clear whether the reference on lines 17-18 is intended to refer to one of these previous recitations, or introduce a new “requested optimized” version of the source file.

Claim 1 additionally recites “the generated segment of the original source file” on line 19. The claim previously recites segments of files, but none that are “generated” and “of the original source file.” It is not clear if this “generated segment of the original source file” is intended to refer to the “preview” of the source file, which corresponds to a *portion* (as opposed

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to a *segment*) of the optimized version of the original source file, or whether it intends to require or imply an otherwise unmentioned “generation” step that produces a segment of a source file.

Claim 1 additionally recites “the segment of the optimized version of the original source file” on lines 19-20 without having previously recited “a segment of the optimized version of the original source file.” The claim previously recites “a segment of the *requested* optimized version of the original source file,” however. It is not clear whether “the segment of the optimized version” must be the same optimized version requested by the client, or whether this limitation introduces a new optimized version.

Finally, claim 1 recites “the stitched optimized version of the original source file,” but the claim does not previously recite “a stitched optimized version of the original source file.” It is not clear if this limitation is intended to necessarily refer back to the output of the previously-recited “stitching” step.

Claim 11 suffers from the same deficiencies as claim 1 and is rejected for the same reasons.

The Examiner recommends amending claims 1 and 11 to clearly supply antecedent basis for all the terms identified above or, where appropriate and possible for a given term, explain where antecedent basis may be found in the claim.

Dependent claims 2-10 and 12-19 are rejected for inheriting the deficiencies of claims 1 and 11, respectively.

Allowable Subject Matter

Claims 1-19 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), 2nd paragraph, set forth in this Office action.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record does not teach or suggest a combination as claimed in each of the independent claims. For example, the closest prior art document of record, US Pub. No. 2010/0106770 to Taylor et al., teaches using a caching identifier which specifies optimization parameters and identifies a source file (see [0034]), but does not teach the various details claimed, including where the request includes a key specifying parameters for optimizing an original source file and uniquely identifying the original source file, where the key is used to identify a local *preview* of an optimized version of the source file, where the cache database includes keys corresponding to optimized versions on *other* video optimization servers (plural), and where the cache database provides a key of an address of another video optimizer storing a segment of an optimized version that is then stitched to the preview and streamed to the client. Additionally, US Pub. No. 2012/0030212 to Koopmans discloses a system in which a recipient of a request for content queries a cache database for optimized versions of video source files (see, e.g., [0037]), but does not do so in the detailed manner claimed, including where the request includes a key specifying parameters for optimizing an original source file and uniquely identifying the original source file, where the key is used to identify a local *preview* of an optimized version of the source file, where the cache database includes keys corresponding to optimized versions on *other* video optimization servers (plural), and where the cache database provides a key of an address of another video optimizer storing a segment of an optimized version that is then stitched to the

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preview and streamed to the client. Finally, US Pub. No. 2005/0165941 to Eytchison discloses transitioning seamlessly between initial and subsequently acquired streaming data (see [0006], [0085]), but does not "stitch" the streaming data at a device that receives requests as claimed, and is not sufficient to render obvious independent claims 1 and 11, either considered alone or in combination with one or both of Taylor and Koopmans.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Biagini whose telephone number is (571)272-9743. The examiner can normally be reached on business days from 9:00 AM to 5:00 PM.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Oscar Louie can be reached on business days at (571) 270-1684. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2445

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

/Christopher Biagini/
Primary Examiner, Art Unit 2445

Notice of References Cited	Application/Control No. 14/846,647		Applicant(s)/Patent Under Reexamination SWENSON ET AL.	
	Examiner Christopher Biagini		Art Unit 2445	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-2005/0165941 A1	07-2005	Eytchison, Edward	H04N7/17318	709/231
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/846,647
				Filing Date	September 4, 2015
				First Named Inventor	Erik R. Swenson
				Applicant	Opera Software Ireland Limited
				Art Unit	2447
				Confirmation Number	8052
				Examiner Name	Not yet known
Sheet	1	of	2	Attorney Docket Number	25253-30675/US

U.S. PATENT DOCUMENTS				
		Document No.		
Examiner Initials*	Cite No. ¹	Number – Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document

FOREIGN PATENT DOCUMENTS					
		Foreign Patent Document			
Examiner Initials*	Cite No. ¹	Country Code ³ – Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶
	B1	JP 2010-273298 A (with English abstract)	12-02-2010	Broad Earth Inc.	

OTHER REFERENCES – 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 ⁶	
	C1	Japanese First Office Action, Japanese Application No. P2015-523261, January 19, 2016, 4 pages.	X	

EXAMINER SIGNATURE	
Examiner Signature	/Christopher Biagini/
Date Considered	06/08/2017
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	
¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.	
⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/846,647
				Filing Date	September 4, 2015
				First Named Inventor	Erik R. Swenson
				Applicant	Opera Software Ireland Limited
				Art Unit	2447
				Confirmation Number	8052
				Examiner Name	Not yet known
Sheet	2	of	2	Attorney Docket Number	25253-30675/US

CERTIFICATION STATEMENT

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

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

OR

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

☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Rajiv P. Patel/	Date (YYYY-MM-DD)	2016-08-17
Name/Print	Rajiv P. Patel	Registration Number	39,327

25253/30675/DOCS/3911122.1

Search Notes 	Application/Control No. 14846647	Applicant(s)/Patent Under Reexamination SWENSON ET AL.
	Examiner CHRISTOPHER BIAGINI	Art Unit 2445

CPC- SEARCHED		
Symbol	Date	Examiner
G06F 17/30097	6/8/2017	CDB
G06F 17/30132	6/8/2017	CDB
G06F 17/30781	6/8/2017	CDB
G06F 17/30902	6/8/2017	CDB
H04L 12/5895	6/8/2017	CDB
H04L 29/06027	6/8/2017	CDB
H04L 29/08729	6/8/2017	CDB
H04L 29/08756	6/8/2017	CDB
H04L 29/08801	6/8/2017	CDB
H04L 65/1059	6/8/2017	CDB
H04L 65/4084	6/8/2017	CDB
H04L 65/605	6/8/2017	CDB
H04L 65/607	6/8/2017	CDB
H04L 65/80	6/8/2017	CDB
H04L 67/02	6/8/2017	CDB
H04L 67/04	6/8/2017	CDB
H04L 67/28	6/8/2017	CDB
H04L 67/2828	6/8/2017	CDB
H04L 67/2842	6/8/2017	CDB
H04L 67/2852	6/8/2017	CDB
H04N 21/222	6/8/2017	CDB
H04N 21/23103	6/8/2017	CDB
H04N 21/23106	6/8/2017	CDB
H04N 21/23439	6/8/2017	CDB
H04N 21/2396	6/8/2017	CDB
H04N 21/64784	6/8/2017	CDB
H04W 4/18	6/8/2017	CDB

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

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US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES

Search Notes	Date	Examiner
Full-text search: US Patents, US Pubs., EPO, JPO, Derwent, IBM-TDB.	6/8/2017	CDB
Text-limited CPC search of symbols identified above.	6/8/2017	CDB
Inventor and assignee searches.	6/8/2017	CDB

INTERFERENCE SEARCH

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

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<i>Index of Claims</i> 	Application/Control No. 14846647	Applicant(s)/Patent Under Reexamination SWENSON ET AL.
	Examiner CHRISTOPHER BIAGINI	Art Unit 2445

✓	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	06/08/2017							
	1	✓							
	2	✓							
	3	✓							
	4	✓							
	5	✓							
	6	✓							
	7	✓							
	8	✓							
	9	✓							
	10	✓							
	11	✓							
	12	✓							
	13	✓							
	14	✓							
	15	✓							
	16	✓							
	17	✓							
	18	✓							
	19	✓							

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/846,647
				Filing Date	September 4, 2015
				First Named Inventor	Erik R. Swenson
				Art Unit	2447
				Confirmation Number	8052
				Examiner Name	Not yet known
Sheet	1	of	3	Attorney Docket Number	25253-30675/US

U.S. PATENT DOCUMENTS				
Examiner Initials*	Cite No. ¹	Document No. Number – Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	US-8639718	01-28-2014	Bhupalam et al.
	A2	US-8145779	03-27-2012	Zhang
	A3	US-7636792	12-22-2009	Ho
	A4	US-7188216	03-06-2007	Rajkumar et al.
	A5	US-6954456	10-11-2005	Cranor et al.
	A6	US-2012/0203861 A1	08-09-2012	Flack et al.
	A7	US-2012/0131138 A1	05-24-2012	Swenson et al.
	A8	US-2012/0030212 A1	02-02-2012	Koopmans et al.
	A9	US-2011/0280216 A1	11-17-2011	Li et al.
	A10	US-2011/0131298 A1	06-02-2011	Courtemanche et al.
	A11	US-2010/0281042 A1	11-04-2010	Windes et al.
	A12	US-2010/0106770 A1	04-29-2010	Taylor et al.
	A13	US-2009/0310668 A1	12-17-2009	Sackstein et al.
	A14	US-2009/0119322 A1	05-07-2009	Mills et al.
	A15	US-2009/0006643 A1	01-01-2009	Lee
	A16	US-2008/0288722 A1	11-20-2008	Lecoq et al.
	A17	US-2008/0139191 A1	06-12-2008	Melnyk et al.
	A18	US-2007/0174471 A1	07-26-2007	Van Rossum
	A19	US-2006/0190616 A1	08-24-2006	Mayerhofer et al.
	A20	US-2004/0098463 A1	05-20-2004	Shen et al.
	A21	US-2003/0217169 A1	11-20-2003	James et al.

EXAMINER SIGNATURE	
Examiner Signature	
Date Considered	
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	
¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.	
⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Complete if Known

Application Number	14/846,647
Filing Date	September 4, 2015
First Named Inventor	Erik R. Swenson
Art Unit	2447
Confirmation Number	8052
Examiner Name	Not yet known
Attorney Docket Number	25253-30675/US

Sheet 2 of 3

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ - Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶
	B1	WO 2011/106009	09-01-2011	Mobovivo, Inc.	

OTHER REFERENCES - 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 ⁶
	C1	BIHARDKAR et al. "Collaborative Caching for Efficient Dissemination of Personalized Video Streams in Resource Constrained Environments." MMSys'12 Feb. 22-24, 2012, Chapel Hill, North Carolina, USA. pp. 185-190.	
	C2	SINGH et al. "PTC: Proxies that Transcode and Cache in Heterogeneous Web Client Environments." World Wide Web: Internet and Web Information Systems, vol. 7. 2004. pp. 7-28.	
	C3	U.S. Appl. No. 61/334,548, filed May 13, 2010, Inventors S. Li et al.	
	C4	LI, Y. et al., "Optimized Cache Management for Scalable Video Streaming," Proceedings of the 15th International Conference on Multimedia, ACM, 2007, 4 pages, [Online] [Retrieved on Dec. 30, 2013] Retrieved from the Internet<URL:http://dl.acm.org/citation.cfm?id=1291414>.	
	C5	PCT International Search Report and Written Opinion, PCT Application No. PCT/US13/51126, Jan. 24, 2014, 14 pages.	
	C6	United States Office Action, U.S. Application No. 13/945,747, February 20, 2015, 10 pages.	
	C7	Korean Office Action, Korean Application No. 10-2015-7004371, November 4, 2015, 5 pages (with concise explanation of relevance).	
	C8	European Extended Search Report, European Application No. 13819265.3, December 23, 2015, 13 pages.	
	C9	Chinese Office Action, Chinese Application No. 201380046871.0, January 6, 2016, 7 pages (with concise explanation of relevance).	

EXAMINER SIGNATURE

Examiner Signature	/Christopher Biagini/
Date Considered	06/08/2017

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

¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.

⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.

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				Examiner Name	Not yet known
Sheet	3	of	3	Attorney Docket Number	25253-30675/US

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OR

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

☒ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. 13/945,747, filed July 18, 2013, and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d), except C6-C9.

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Rajiv P. Patel/	Date (YYYY-MM-DD)	2016-02-01
Name/Print	Rajiv P. Patel	Registration Number	39,327

25253/30675/DOCS/3847286.1

**IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE**

INVENTOR(S): Erik R. Swenson et al.
SERIAL NO.: 14/846,647
FILING DATE: September 4, 2015
TITLE: Just-in-Time Distributed Video Cache
EXAMINER: Christopher D. Biagini
GROUP ART UNIT: 2445
CONFIRMATION NO.: 8052
ATTY. DKT. NO.: 25253-30675/US

CERTIFICATE OF EFS-WEB TRANSMISSION			
Pursuant to 240 OG 45 and the Legal Framework For EFS-Web, I hereby certify that this follow-on correspondence is being officially submitted through the USPTO EFS-Web system on the local date shown below.			
Signature:	/Rajiv P. Patel/		
Typed or Printed Name:	Rajiv P. Patel, Reg. No. 39,327	Dated:	14 June 2017

COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

AMENDMENT A AND RESPONSE UNDER 37 CFR § 1.111

This amendment is in response to the Non-Final Office action dated June 13, 2017
which set a shortened statutory period for response that expires on September 13, 2017.

Amendments to the claims begin on page 2 of this paper.

Remarks begin on page 10 of this paper.

IN THE CLAIMS:

All pending claims, along with current status, are produced below.

1. (Currently Amended) A method for streaming optimized video to a client device, the method comprising:

receiving a request to optimize an original source file from a client device, the

original source file stored on an origin server and the request including a key

specifying parameters for optimizing the original source file and uniquely

identifying the original source file;

identifying, based on the key, a preview of an optimized version of the original source

file in a local cache of a video optimization server, the preview corresponding

to a first portion of the optimized version of the original source file;

generating a query, based on the key, to a cache database maintaining a plurality of

reference keys corresponding to a plurality of optimized versions of source

files stored on a plurality of other video optimization servers, each reference

key specifying parameters of an optimized version of a source file and

uniquely identifying the source file;

receiving, from the cache database, a response indicating whether the key matches a

reference key maintained in the database;

receiving from the cache database, in response to a reference key matching the key,

the address of another video optimizer storing a segment of the ~~requested~~

optimized version of the original source file;

stitching the ~~generated segment~~ first portion of the optimized version of the original

source file with the segment of the optimized version of the original source file stored on the other video optimizer to generate a stitched optimized version of the original source file; and
streaming the stitched optimized version of the original source file for playback on the client device.

2. (Original) The method of claim 1, further comprising:
storing a segment of the stitched optimized version of the original source file in the cache of the video optimizer; and
transmitting, to the cache database, instructions for updating the cache database in response to storing the segment of the stitched optimized version of the original source file stored in the video optimizer.
3. (Original) The method of claim 1, wherein the received response indicates that different segments of the optimized version of the same original source file are stored on a plurality of different video optimizers.
4. (Original) The method of claim 3, further comprising:
transmitting, to the plurality of different video optimizers, a request for the segment of the optimized version of the original source file stored on each video optimizer; and
stitching the different segments of the optimized version of the same original source file with the generated segment of the original source file.

5. (Original) The method of claim 1, wherein the key comprises a source content signature, the source content signature being a hash of the original source file.
6. (Original) The method of claim 1, wherein the cache database comprising data entries identifying a plurality of optimization server storing an optimized version of the original source file, the entries being modified through instructions transmitted to the cache database to update a location where the optimized version of the original source file is stored.
7. (Original) The method of claim 1, further comprising:
determining a second segment of the optimized version of the original source file is
not stored by the plurality of other video optimization servers;
responsive to the determination, transcoding the second segment of the original
source file;
storing the transcoded second segment in the local cache of the video optimization
server; and
stitching the transcoded second segment with the stitched optimized version of the
original source file.
8. (Original) The method of claim 7, further comprising transmitting to the cache database, instructions for updating the cache database with a reference key

corresponding to the transcoded second segment of the optimized version of the source file stored at the video optimization server.

9. (Original) The method of claim 7, wherein transcoding the second segment of the original source file comprises:
identifying a third segment of the optimized version of the original source file,
subsequent to the second segment, that is stored by one of the plurality of other video optimization servers; and
transcoding the original source file from a start of the second segment to a start of the third segment.
10. (Original) The method of claim 1, wherein the preview is maintained in the local cache of the video optimization server after one or more purges of the local cache.
11. (Currently Amended) A system for streaming optimized video to a client device, comprising:
at least one processor; and
a non-transitory computer-readable storage medium storing executable computer program instructions that when executed by the processor, cause the processor to:
receive a request to optimize an original source file from a client device, the

original source file stored on an origin server and the request including a key specifying parameters for optimizing the original source file and uniquely identifying the original source file;

identify, based on the key, a preview of an optimized version of the original source file in a local cache of a video optimization server, the preview corresponding to a first portion of the optimized version of the original source file;

generate a query, based on the key, to a cache database maintaining a plurality of reference keys corresponding to a plurality of optimized versions of source files stored on a plurality of other video optimization servers, each reference key specifying parameters of an optimized version of a source file and uniquely identifying the source file;

receive, from the cache database, a response indicating whether the key matches a reference key maintained in the database;

receive from the cache database, in response to a reference key matching the key, the address of another video optimizer storing a segment of the ~~requested~~ optimized version of the original source file;

stitch the ~~generated segment~~ first portion of the optimized version of the original source file with the segment of the optimized version of the original source file stored on the other video optimizer to generate a stitched optimized version of the original source file; and

stream the stitched optimized version of the original source file for playback

on the client device.

12. (Original) The system of claim 11, wherein the storage medium further comprises instructions that when executed cause the processor to:

store a segment of the stitched optimized version of the original source file in the

cache of the video optimizer; and

transmit, to the cache database, instructions for updating the cache database in

response to storing the segment of the stitched optimized version of the

original source file stored in the video optimizer.
13. (Original) The system of claim 11, wherein the received response indicates that

different segments of the optimized version of the same original source file are stored

on a plurality of different video optimizers, and wherein the storage medium further

comprises instructions that when executed cause the processor to:

transmit, to the plurality of different video optimizers, a request for the segment of the

optimized version of the original source file stored on each video optimizer;

and

stitch the different segments of the optimized version of the same original source file

with the generated segment of the original source file.
14. (Original) The system of claim 11, wherein the key comprises a source content

signature, the source content signature being a hash of the original source file.

15. (Original) The system of claim 11, wherein the cache database comprises data entries to identify a plurality of optimization servers storing an optimized version of the original source file, the entries being modified through instructions transmitted to the cache database to update a location where the optimized version of the original source file is stored.
16. (Original) The system of claim 11, wherein the storage medium further comprises instructions that when executed cause the processor to:
- determine a second segment of the optimized version of the original source file is not stored by the plurality of other video optimization servers;
- transcode, responsive to the determination, the second segment of the original source file;
- store the transcoded second segment in the local cache of the video optimization server; and
- stitch the transcoded second segment with the stitched optimized version of the original source file.
17. (Original) The system of claim 16, wherein the storage medium further comprises instructions that when executed cause the processor to transmit to the cache database, instructions for updating the cache database with a reference key corresponding to the transcoded second segment of the optimized version of the source file stored at the video optimization server.

18. (Original) The system of claim 16, wherein the instructions on the computer readable storage medium to transcode the second medium further comprises instructions that when executed cause the processor to:
- identify a third segment of the optimized version of the original source file,
- subsequent to the second segment, that is stored by one of the plurality of other video optimization servers; and
- transcode the original source file from a start of the second segment to a start of the third segment.
19. (Original) The system of claim 11, wherein the preview is maintained in the local cache of the video optimization server after one or more purges of the local cache.

REMARKS

Claims 1-19 were pending and presented for examination. In an Office action dated June 13, 2017 claims 1-19 were rejected. Claims 1-19 were considered allowable if rewritten to overcome the rejection under 35 U.S.C. § 112(b). Claims 1 and 11 are amended herein. No claims are added or canceled.

Information Disclosure Statement

In the Office action, the Examiner indicated that the IDS filed February 1, 2016 failed to comply with 37 CFR 1.98(a)(2) because no copy of documents C1, C2, and C4 were submitted. Assignee is submitting copies of these documents with this Response.

Response to Rejection Under 35 U.S.C. § 112

Claims 1-19 stand rejected under 35 U.S.C. § 112(b) as allegedly lacking antecedent basis. Assignee has amended claims 1 and 11 to provide antecedent basis for the terms identified in the Office Action. Thus, the rejection has been overcome.

Conclusion

In sum, claims 1-19 are allowable.

The examiner is invited to contact Assignee's representative at the number provided below if he believes that it will help expedite furtherance of this application.

Respectfully submitted,

Dated: June 14, 2017

/Rajiv P. Patel/

Rajiv P. Patel, Reg. No. 39,327
Fenwick & West LLP
Silicon Valley Center
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Mountain View, CA 94041
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Electronic Acknowledgement Receipt

EFS ID:	29501853
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	14-JUN-2017
Filing Date:	04-SEP-2015
Time Stamp:	20:45:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		30675_US_Amendment.pdf	91826	yes	11
			a8b91fb73433d46bb65363d51edf347929c ba24a		

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Amendment/Req. Reconsideration-After Non-Final Reject	1	1	
Claims	2	9	
Applicant Arguments/Remarks Made in an Amendment	10	11	
Warnings:			
Information:			
Total Files Size (in bytes):		91826	
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.			

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Complete if Known

Application Number	14/846,647
Filing Date	September 4, 2015
First Named Inventor	Erik R. Swenson
Applicant	Opera Software Ireland Limited
Art Unit	2445
Confirmation Number	8052
Examiner Name	Christopher D. Biagini
Attorney Docket Number	25253-30675/US

Sheet 1 of 2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document No. Number – Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ – Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶
	B1	WO 00/02128 A1	01-13-2000	Ericsson Telefon AB	

OTHER REFERENCES – 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 ⁶
	C1	Chinese Second Office Action, Chinese Application No. 201380046871.0, August 3, 2016, 14 pages.	X
	C2	Chinese Third Office Action, Chinese Application No. 201380046871.0, December 30, 2016, 6 pages.	X
	C3	European Examination Report, European Application No. 13819265.3, October 24, 2016, 7 pages.	
	C4	European Examination Report, European Application No. 13819265.3, May 18, 2017, 10 pages.	
	C5	GADDE, S. et al., "A Taste of Crispy Squid," Proceedings of the Workshop on Internet Service Performance," June 1998, pp. 1-8.	
	C6	Chinese Fourth Office Action, Chinese Application No. 201380046871.0, May 26, 2017, 4 pages (with concise explanation of relevance).	

EXAMINER SIGNATURE

Examiner Signature	
Date Considered	

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⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Complete if Known

Application Number	14/846,647
Filing Date	September 4, 2015
First Named Inventor	Erik R. Swenson
Applicant	Opera Software Ireland Limited
Art Unit	2445
Confirmation Number	8052
Examiner Name	Christopher D. Biagini
Attorney Docket Number	25253-30675/US

Sheet

2

of

2

CERTIFICATION STATEMENT

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

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

OR

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☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature /Rajiv P. Patel/

Date (YYYY-MM-DD) 2017-06-14

Name/Print Rajiv P. Patel

Registration Number 39,327

25253/30675/FW/4139966.1



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G06F 12/08	A1	(11) International Publication Number: WO 00/02128 (43) International Publication Date: 13 January 2000 (13.01.00)
(21) International Application Number: PCT/SE99/01050 (22) International Filing Date: 14 June 1999 (14.06.99) (30) Priority Data: 9802400-3 3 July 1998 (03.07.98) SE (71) Applicant (for all designated States except US): TELEFON- AKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): HULTGREN, Anders [SE/SE]; Rättarens väg 16, S-182 34 Danderyd (SE). (74) Agents: SANDSTRÖM, Staffan et al.; Bergenstråhle & Lind- vall AB, P.O. Box 17704, S-118 93 Stockholm (SE).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>
(54) Title: A CACHE SERVER NETWORK The diagram illustrates a network architecture. At the center is a cloud labeled 'INTERNET'. Four lines radiate from this central cloud to four distinct nodes: 1. Top-left: A node labeled 'LAN' (103) with a computer icon. 2. Bottom-left: A node labeled 'HOME' (105) with a computer icon. 3. Bottom: A node labeled 'ROUTER' (101) which is connected to a 'CS' (Cache Server, 101). 4. Top-right: A node labeled 'FCC' (Forecast Caching Server, 107) which is also connected to a 'CS' (Cache Server, 101).		
(57) Abstract In a data system comprising cache servers (101) a forecast function is implemented in a particular forecast caching server (107). The addition of such a function enables the cache system to cache data that have a higher probability of being demanded than is the case for conventional cache servers/cache server systems. Thus, the forecast function instructs cache servers to which it is connected to pre-fetch data or to store or not to store data that is fetched from original source servers to serve customers in each area of caching servers served by the forecast caching server, via a certain protocol. The forecast caching server keeps a database of all the addresses of all stored pages in all caching servers that it controls, as well as historic data.		

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A CACHE SERVER NETWORK

TECHNICAL FIELD

The present invention relates to a method and a device for a cache server system. In particular the invention relates to a method for predicting information flow on the internet and other data networks comprising cache servers, and to a network implementing the method.

BACKGROUND OF THE INVENTION AND PRIOR ART

Data traffic in existing networks is constantly increasing. This is particularly the case for internet traffic, mainly due to the rapid increase in the number of users and the increase of information available on the internet. As a result of this increase in data traffic it is unavoidable that data traffic and server capacity sometimes hits bottlenecks.

A straightforward way of avoiding or reducing bottlenecks is to increase the capacity of servers and transmission lines. This, however, is very costly, since the capacity then must be adapted to an expected maximum throughput of data traffic.

Another way of lowering the requirement on servers and transmission lines is to cache information closer to the user. In other words caching, i.e. storing of replicated data in several locations and thereby closer to the users, increases the total network response capacity.

Thus, if data requested by a user can be found at a location which in some meaning is closer to the user than the location at which the original data is stored, time and capacity will be saved in the overall network. This will in turn result in lower costs for the overall system.

There are many different ways of configuring cache servers in a global data network, such as the Internet. For example, in a simple cache system, a cache server is connected to a user or to a group of users and data demanded by the user(s) is stored for

further demand for a fixed period of time, or until the cache memory is filled, when the data is replaced according to some suitable algorithm, such as first in first out (FIFO).

In another configuration, a meta server is connected to a number of such cache servers. The meta server then keeps track of what data is stored in the different cache servers. Thus, when a user demands some particular data, the cache server to which it is connected is first searched for the data.

If the data cannot be found in that cache server, it is checked if the data is available in any of the cache servers connected to the meta server. If that is the case, i.e. the data is available in any of the servers constituting the group of servers connected to the meta server, the data is fetched from that server, instead of from the location where the data originally is stored.

Thus, when data not can be found in any of the cache servers, it must be requested from the original source. This is of course not desired, and in particular not if the request is issued when the network over which data is to be retrieved has a high load.

SUMMARY

It is an object of the present invention to provide a method and a system by means of which data can be cached in a more efficient manner and by means of which hit rates can be increased.

This object and others are obtained by means of providing a forecast function, which can be implemented in a particular forecast caching server. The addition of such a function enables the cache system to cache data that have a higher probability of being demanded than is the case for conventional cache servers/cache server systems.

Thus, the forecast function instructs cache servers to which it is connected to pre-fetch data or to store or not to store data that is fetched from original source servers to serve customers

in each area of caching servers served by the forecast caching server, via a certain protocol. The forecast caching server in a preferred embodiment keeps a database of all the addresses of all stored pages in all caching servers that it controls, as well as historic data.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in more detail by way of non-limiting examples and with reference to the accompanying drawings, in which:

- Fig. 1 is general view of a data system comprising caching servers.
- Fig. 2 is a view illustrating the configuration and functionality of a forecast caching server.

DESCRIPTION OF PREFERRED EMBODIMENTS

In Fig. 1 a data system is shown. The system comprises $n_1, n_2, \dots, n_k$ cache servers 101 with storage memory of $m_2, \dots, m_k$ megabyte, and network traffic throughput capacity of $t_1, t_2, \dots, t_k$ megabyte/second, and transaction capacities of $tr_1, tr_2, \dots, tr_k$ transactions per second. A transaction being defined as certain instructions being processed with certain data. They all serve defined connections, e.g. transmission lines from companies 103 and from modem pools 105 for private customers.

The ultimate performance and lowest traffic costs in such a system are found when all data that are demanded more than once is cached in the cache servers. To get closer to this goal, forecasting is used. This is illustrated by the forecast cache control function located in a server 107.

The server 107, is thus connected to a number of caching servers 101 and has means for keeping a record of which information is stored in the different servers 101. For each caching server and cache address a probability function can be constructed, which in a preferred embodiment can be composed of the following factors of which the server 107 has knowledge:

- * caching server identity
- * address
- * address level
- * time
- * date
- * historic demand (when was the address asked for)
- * historic update frequency (and update information from original sources)
- * what other addresses where demanded a time period before and after the address was demanded (demand correlation)
- * other correlated data (here data about e.g. football games can be stored such that during and after matches certain sports addresses/webpages are usually more demanded, and can be pre-fetched)

In Fig. 2 the functionality of the forecast server 107 is illustrated more in detail. Thus, since all data have names/addresses, e.g. for internet web pages <http://www.cnn.com/>, all addresses can be seen as branches on a tree, where the address gets longer as the tree is explored from the stem, to main branch to smaller branches etc. The branches, in difference from real trees, also have links to totally different addresses.

The control function in the server 107 can therefore have means for labelling all addresses with a level and give different levels different priorities. Below is an example of how the levels can be given.

http://www.cnn.com/	LEVEL 1,1
http://customnews.cnn.com/cnews/pna-auth.welcome	LEVEL 2,3
http://www.cnn.com/WORLD/	LEVEL 2,2
http://www.cnn.com/WORLD/europe/	LEVEL 3,3
http://www.cnn.com/WORLD/europe/9803/21/AP000638.ap.html	LEVEL 4,6
http://www.cnn.com/interactive - legal.html#AP	LEVEL 5,2
http://www.lexis-nexis.com/lnccl/about/terms.html	LEVEL 6,4
http://www.cnn.com/US/	
http://www.cnn.com/LOCAL/	

<http://www.cnn.com/WEATHER/>

<http://www.cnn.com/WEATHER/allergy/>

LEVEL x,y means how many links that are passed from the starting page before the page (=x) is reached, and how many / there are (=y; excluding http://)

Based on this and the other parameters listed above a demand forecast is made using some suitable statistical method, and this is then compared to the existing stored data and the traffic, i.e. the existing demand capacity and the free capacity. The free traffic capacity is then used to pre-fetch pages/addresses based on the demand forecast.

Thus, for example, if there is a very high hit frequency on a particular address during the last 2 minutes and one or several addresses of that particular high frequency address has an (x)-value that is low, e.g. 1 or 2, it is likely that such an address will be demanded soon and the data on that address is pre-fetched and stored in one of the servers 101 and some data that has a lower probability of being demanded is discarded.

The forecast caching server 107 controls the caching servers (CS) 101 via a forecast control protocol, which can consist of at e.g. the following instructions.

- * Address info (CS id, address)
- * Store question (CS id, address)
- * Store answer (CS id, address, yes/no)
- * Fetch (CS id, address, levels) (i.e. the forecast cache server 107 can order a certain cache server 101 to fetch a main address and a number of levels down from the main address)
- * Traffic question/answer (CS id, capacity, Mbyte traffic last period, period)
- * Storage question/answer (CS id, capacity, Mbyte last period, period)

An important feature of the forecast caching system as described

herein is that the forecast caching server 107 always knows all addresses for which the web pages are stored in each caching server 101, the storage size and capacity, the traffic size and capacity.

Because it may be impossible or too expensive to store a demand function for all data that has been demanded, demand forecasts can be limited to addresses in number of x or y levels as described above. Because it may be impossible or too expensive to calculate a demand function for all data, decision rules for the forecast caching server for addresses without a demand function can be generalized from a limited set of data, such as:

- fill memory
- never store data the first time it is demanded unless there is free memory
- always store data the second time it is demanded
- first in first out if memory is filled

This function can also be delegated to and implemented in the caching servers 101.

Furthermore, in order to make it possible for the different cache servers 101 to inform each other about the currentness of web pages, an Update protocol can be defined, that can be used between any cooperating servers. This will result in that each source server, i.e. the server on which the original data is stored, has a log which states when every stored page and/or object of a page (e.g. picture, table, etc) was last updated.

Other servers can interrogate the source server (or his replicants), and compare to its own log when the web page was stored to see if it has been updated. In this way, it is possible to make sure that a page is current without transferring all page data, only if any part of the page has been updated it has to be fetched again, or only the updated part/object. This saves capacity. Such exchange of information can be implemented with a protocol comprising the following instructions:

- * Update question (Server id, page address)
- * Update info (Server id, page address_1 , last updated, page object 1x, 1x last updated, page object 1y, 1y last updated, page address_2, last updated, page object 2x, 2x last updated, page object 2y, 2y last updated)

The update answer can of course be sent without a previous question, such as by agreement beforehand every minute/hour/etc.

In the network described above only one single forecast server controlling a plurality of cache servers is described. However, in a large network several forecast servers can be used. The forecast servers then controls a group of cache servers each and are interconnected with each other in a distributed manner.

In such a network solution a special protocol for exchange of information between the different forecast servers is used. Thus, by using such a protocol each forecast server has knowledge about or can ask for information on what data are stored in each cache server or cache server group.

The special protocol can also be used to send orders between the different forecast servers on which group of cache servers that is to store which data, or in another embodiment a negotiation is performed between the different forecast servers on which data that is to be stored in which cache server or group of cache servers.

In another preferred embodiment one in the multitude of forecast servers, which can be termed the main forecast server, is arranged to control the others, preferably by means of a special protocol similar to the one used for controlling the different cache servers. Such an arrangement will eliminate the need for a negotiation between the different forecast servers, since the main forecast server now will decide which data that will be stored at which location.

The use of a forecast caching function in a caching server system as described herein will thus lower traffic costs and

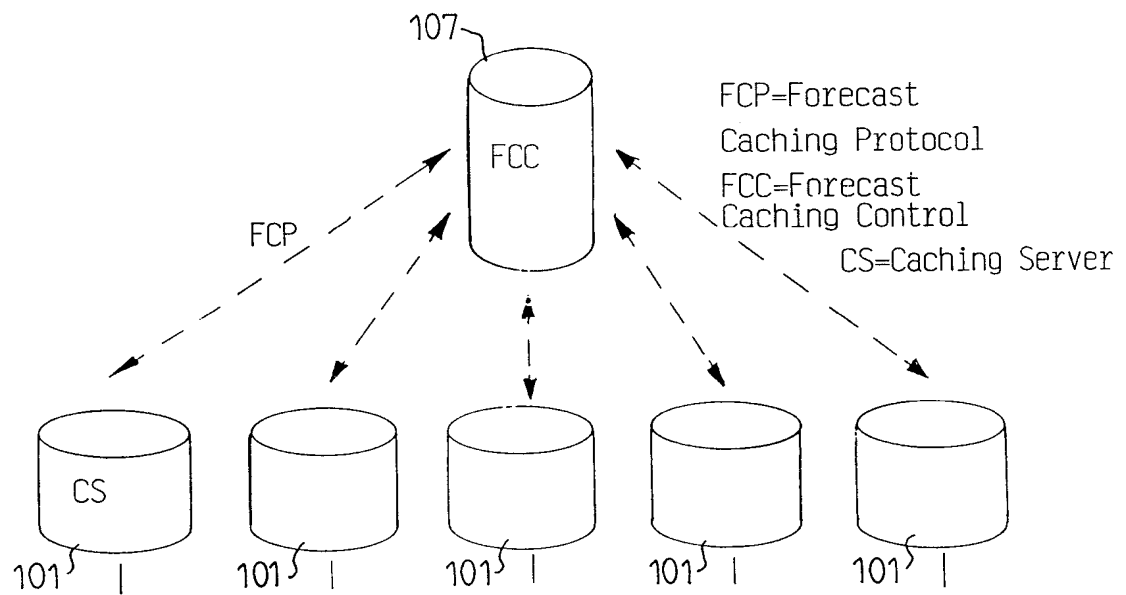
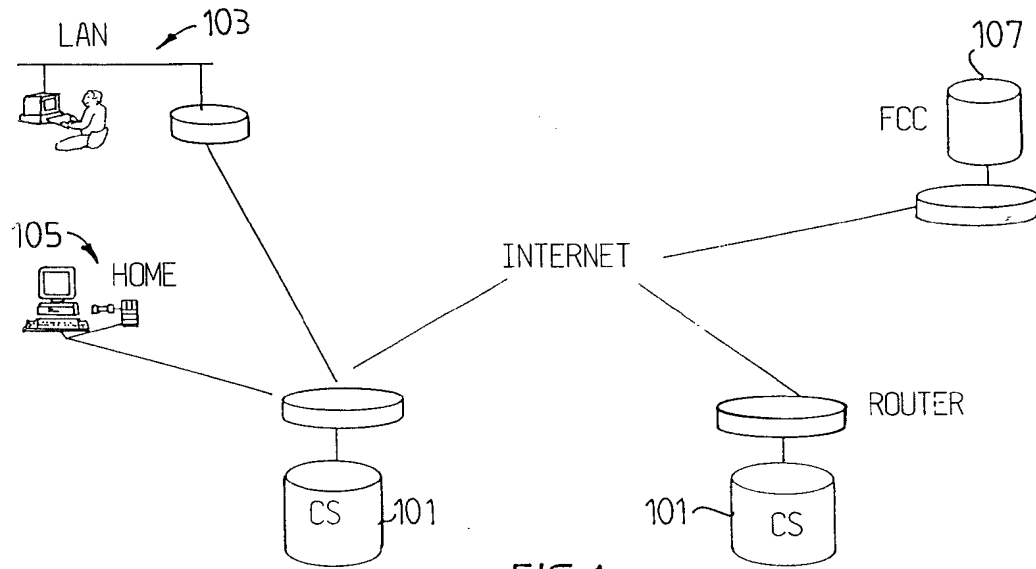
increases response times. This is due to the fact that the memory capacity of the caching servers in the system will be utilized more efficiently in terms of hit rate and that transmission capacity can be better utilized, since transmission capacity not currently used can be used for pre-fetching data having a high probability of soon being requested.

CLAIMS

1. A data communication network comprising at least two cache servers to which users are connected, **characterized by** a forecast server connected to said at least two cache servers for issuing a forecast on which data in said at least two cache server that should be replaced with other data in order to increase the hit rate in said at least two cache servers.
2. A network according to claim 1, **characterized in** that the forecast server periodically is updated on which data that currently is stored in said at least two cache server.
3. A network according to claim 1 or 2, **characterized in** that the forecast server comprises means for ordering one particular cache server of said at least two cache servers to pre-fetch data having a higher probability of being requested than the data that is currently stored in that particular cache server.
4. A network according to any of claims 1 - 3, **characterized in** that the forecast server is connected to a group of cache servers, which it controls via a control protocol.
5. A network according to any of claims 1 - 4, **characterized in** that the forecast server has means for establishing a probability function for an address based on what other addresses where demanded a time period before and after the address was demanded.
6. A network according to any of claims 1 - 5, **characterized in** that the forecast server is co-located with one of said at least two cache servers.
7. A network according to any of claims 1 - 6, **characterized in** that several forecast servers are connected to each other.
8. A network according to claim 7, **characterized in** that the forecast servers are arranged to exchange information on which data that is stored in the cache servers to which the forecast servers are connected.

9. A network according to claim 7 or 8, **characterized in** that one of the forecast servers is arranged to control the others.
10. A method of pre-fetching data in a network comprising a plurality of cache servers each connected to a common forecast server, and where the forecast server is arranged to, via a protocol keep a record of which data that is stored in the different servers, **characterized in** that the forecast server issues a forecast on which data in the plurality of cache server that should be replaced with other data in order to increase the hit rate for the plurality of cache servers.
11. A method according to claim 10, **characterized in** that the plurality of cache servers periodically is updates the forecast server on which data that currently is stored in the plurality of cache server.
12. A method according to claim 10 or 11, **characterized in** that the forecast server orders one particular cache server of the plurality of cache server to pre-fetch data having a higher probability of being requested than the data that is currently stored in that particular cache server.
13. A method according to any of claims 10 - 12, **characterized in** that the forecast is made based on probability function for an address, which in turn is based on what other addresses where demanded a time period before and after the address was demanded.
14. A method according to any of claims 10 - 12, when the network comprises several forecast servers to which different cache servers or groups of cache servers are connected, **characterized in** that the forecast servers can exchange information on which data that is stored in the different cache servers or groups of cache servers.
15. A method according to claim 14, **characterized in** that one of the several servers is arranged to control the others.

1 / 1



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/01050

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G06F 12/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IBM Technical Disclosure Bulletin, Volume 25, No 1, June 1982, B.T. Bennet et al, "PREFETCHING IN A MULTILEVEL MEMORY HIERARCHY", page 88, see the whole document --	1-15
A	GB 2317723 A (VIEWINN PLC), 1 April 1998 (01.04.98), see the whole document --	1-15
A	US 5305389 A (MARK L. PALMER), 19 April 1994 (19.04.94), see the whole document -- -----	1-15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

18 November 1999

Date of mailing of the international search report

02-12-1999

Name and mailing address of the ISA/

Swedish Patent Office

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/11/99

International application No.

PCT/SE 99/01050

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
GB	2317723	A	01/04/98	AU	4563597 A	24/04/98
				GB	9620665 D	00/00/00
				WO	9814894 A	09/04/98

US	5305389	A	19/04/94	NONE		

Electronic Patent Application Fee Transmittal				
Application Number:		14846647		
Filing Date:		04-Sep-2015		
Title of Invention:		Just-in-Time Distributed Video Cache		
First Named Inventor/Applicant Name:		Erik R. Swenson		
Filer:		Rajiv P. Patel/Sarah Glenn		
Attorney Docket Number:		25253-30675/US		
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	180	180
Total in USD (\$)				180

Electronic Acknowledgement Receipt

EFS ID:	29500948
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	14-JUN-2017
Filing Date:	04-SEP-2015
Time Stamp:	20:46:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 180
RAM confirmation Number	061517INTEFSW00006594192555
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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			9f32762afc6e908cc4a6902441c516483bbe9674		
Warnings:					
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2	Foreign Reference	WO-00-02128A1.pdf	592992	no	15
			aa956b412d5c1651876bfe1565c787fb34ef2ae7		
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4	Non Patent Literature	CN_3rd_Office_Action_Dec_30_2016.pdf	359731	no	6
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			1ed8ef08fb8eb96296d9d0622c8b0c12c62cd01b		
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Warnings:					
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9	Fee Worksheet (SB06)	fee-info.pdf	30506	no	2
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Warnings:					
Information:					
Total Files Size (in bytes):			4087829		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.					

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/846,647	Filing Date 09/04/2015	☐ 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)

AMENDMENT	06/14/2017	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X \$420 =	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	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
TOTAL ADD'L FEE						

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
Tina J. Barden

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.

**IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE**

INVENTOR(S): Erik R. Swenson et al.
SERIAL NO.: 14/846,647
FILING DATE: September 4, 2015
TITLE: Just-in-Time Distributed Video Cache
EXAMINER: Christopher D. Biagini
GROUP ART UNIT: 2445
CONFIRMATION NO.: 8052
ATTY. DKT. NO.: 25253-30675/US

CERTIFICATE OF EFS-WEB TRANSMISSION			
Pursuant to 240 OG 45 and the Legal Framework For EFS-Web, I hereby certify that this follow-on correspondence is being officially submitted through the USPTO EFS-Web system on the local date shown below.			
Signature:	/Rajiv P. Patel/		
Typed or Printed Name:	Rajiv P. Patel, Reg. No. 39,327	Dated:	June 19, 2017

COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

TRANSMITTAL OF REFERENCES

An amendment in response to the Non-Final Office action dated June 13, 2017 was filed in the subject application on June 14, 2017. The amendment noted that copies of documents C1, C2, and C4 were being submitted along with the Response. However, Assignee inadvertently omitted copies of the documents when uploading the Response. Assignee is submitting copies of these documents herewith.

The examiner is invited to contact Assignee's representative at the number provided below if he believes that it will help expedite furtherance of this application.

Respectfully submitted,

Dated: June 19, 2017

/Rajiv P. Patel/

Rajiv P. Patel, Reg. No. 39,327
Fenwick & West LLP
Silicon Valley Center
801 California Street
Mountain View, CA 94041
Tel. (650) 335- 7607
Fax (650) 938-5200

Electronic Acknowledgement Receipt

EFS ID:	29541575
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	19-JUN-2017
Filing Date:	04-SEP-2015
Time Stamp:	18:33:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	30675_Transmittal.pdf	66609	no	2
			0826224319dab60b73e892e6478c46abf126f6cd		

Warnings:

Information:					
2	Non Patent Literature	Bhandarkar.pdf	606432	no	6
			cf1d82244c657148ae9907390d0d7592563e36bf		
Warnings:					
Information:					
3	Non Patent Literature	Li.pdf	338341	no	4
			be1920d6f2257bc13d37be7ebad54be2fb5bc3ad		
Warnings:					
Information:					
4	Non Patent Literature	Singh.pdf	1077952	no	22
			75d35fe8e12cb29f6cbd41c869016d31fc9034c6		
Warnings:					
Information:					
Total Files Size (in bytes):			2089334		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

758 7590 06/29/2017
FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

EXAMINER

BIAGINI, CHRISTOPHER D

ART UNIT

PAPER NUMBER

2445

DATE MAILED: 06/29/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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14/846,647

09/04/2015

Erik R. Swenson

25253-30675/US

8052

TITLE OF INVENTION: Just-in-Time Distributed Video Cache

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	09/29/2017

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

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

PART B - FEE(S) TRANSMITTAL

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

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

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

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.

758 7590 06/29/2017
FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/846,647	09/04/2015	Erik R. Swenson	25253-30675/US	8052

TITLE OF INVENTION: Just-in-Time Distributed Video Cache

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	09/29/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
BIAGINI, CHRISTOPHER D	2445	709-219000

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

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (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. 2 _____
- 3 _____

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

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

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

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

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

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

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

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

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

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/846,647	09/04/2015	Erik R. Swenson	25253-30675/US	8052

758 7590 06/29/2017
FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

EXAMINER

BIAGINI, CHRISTOPHER D

ART UNIT	PAPER NUMBER
----------	--------------

2445

DATE MAILED: 06/29/2017

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 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

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

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

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

Notice of Allowability	Application No. 14/846,647	Applicant(s) SWENSON ET AL.	
	Examiner Christopher Biagini	Art Unit 2445	AIA (First Inventor to File) Status No

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

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

1. ☒ This communication is responsive to the amendment filed June 14, 2017.
☐ 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 1-19. 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) | 5. ☐ Examiner's Amendment/Comment |
| 2. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 6. ☒ Examiner's Statement of Reasons for Allowance |
| 3. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. ☐ Other _____. |
| 4. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/Christopher Biagini/
Primary Examiner, Art Unit 2445

NOTICE OF ALLOWABILITY

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

Allowable Subject Matter

Claims 1-19 are allowed.

No statement setting forth the reasons for allowance is deemed necessary because the reasons for allowance are made evident by the record as a whole. See 37 CFR 1.104(e) and MPEP 1302.14.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHRISTOPHER BIAGINI whose telephone number is (571)272-9743. The examiner can normally be reached on weekdays from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Oscar Louie can be reached on business days at (571) 270-1684. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2445

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

/Christopher Biagini/
Primary Examiner, Art Unit 2445



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BIB DATA SHEET

CONFIRMATION NO. 8052

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/846,647	09/04/2015	709	2445	25253-30675/US
APPLICANTS Opera Software Ireland Limited, Dublin, IRELAND;				
INVENTORS Erik R. Swenson, San Jose, CA; Jaime Heilpern, San Francisco, CA; Sandeep Pombra, Los Altos, CA; Ron Earley, Dublin, CA; Vadim Arshanskiy, Santa Clara, CA;				
** CONTINUING DATA ***** This application is a DIV of 13/945,747 07/18/2013 PAT 9154361 which claims benefit of 61/673,188 07/18/2012				
** FOREIGN APPLICATIONS *****				
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 09/18/2015				
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /CHRISTOPHER D BIAGINI/ Acknowledged Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 7	TOTAL CLAIMS 19
INDEPENDENT CLAIMS 2				
ADDRESS FENWICK & WEST LLP SILICON VALLEY CENTER 801 CALIFORNIA STREET MOUNTAIN VIEW, CA 94041 UNITED STATES				
TITLE Just-in-Time Distributed Video Cache				
FILING FEE RECEIVED 1600	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit	

Issue Classification 	Application/Control No. 14846647	Applicant(s)/Patent Under Reexamination SWENSON ET AL.	
	Examiner CHRISTOPHER BIAGINI	Art Unit 2445	

CPC						
Symbol					Type	Version
H04L		65	/	4084	F	2013-01-01
H04L		29	/	06027	I	2013-01-01
H04L		65	/	80	I	2013-01-01
H04W		4	/	18	A	2013-01-01
H04L		67	/	2842	I	2013-01-01
G06F		17	/	30781	I	2013-01-01
H04N		21	/	23103	I	2013-01-01
H04N		21	/	23106	I	2013-01-01
H04N		21	/	23439	I	2013-01-01
H04N		21	/	2396	I	2013-01-01
H04N		21	/	222	I	2013-01-01
H04N		21	/	64784	I	2013-01-01
H04L		65	/	1059	I	2013-01-01
H04L		65	/	605	I	2013-01-01
H04L		65	/	607	I	2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
(Assistant Examiner)		19	
(Date)			
/CHRISTOPHER BIAGINI/		O.G. Print Claim(s)	O.G. Print Figure
Primary Examiner.Art Unit 2445		1	1
(Primary Examiner)		(Date)	

Issue Classification 	Application/Control No. 14846647	Applicant(s)/Patent Under Reexamination SWENSON ET AL.
	Examiner CHRISTOPHER BIAGINI	Art Unit 2445

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION										
CLASS			SUBCLASS			CLAIMED					NON-CLAIMED					
709			219			G	0	6	F	15 / 16 (2006.01.01)						
CROSS REFERENCE(S)																
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)															

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 19	
/CHRISTOPHER BIAGINI/ Primary Examiner.Art Unit 2445 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 1	O.G. Print Figure 1

Search Notes 	Application/Control No. 14846647	Applicant(s)/Patent Under Reexamination SWENSON ET AL.
	Examiner CHRISTOPHER BIAGINI	Art Unit 2445

CPC- SEARCHED		
Symbol	Date	Examiner
G06F 17/30097	6/23/2017	CDB
G06F 17/30132	6/23/2017	CDB
G06F 17/30781	6/23/2017	CDB
G06F 17/30902	6/23/2017	CDB
H04L 12/5895	6/23/2017	CDB
H04L 29/06027	6/23/2017	CDB
H04L 29/08729	6/23/2017	CDB
H04L 29/08756	6/23/2017	CDB
H04L 29/08801	6/23/2017	CDB
H04L 65/1059	6/23/2017	CDB
H04L 65/4084	6/23/2017	CDB
H04L 65/605	6/23/2017	CDB
H04L 65/607	6/23/2017	CDB
H04L 65/80	6/23/2017	CDB
H04L 67/02	6/23/2017	CDB
H04L 67/04	6/23/2017	CDB
H04L 67/28	6/23/2017	CDB
H04L 67/2828	6/23/2017	CDB
H04L 67/2842	6/23/2017	CDB
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H04N 21/23106	6/23/2017	CDB
H04N 21/23439	6/23/2017	CDB
H04N 21/2396	6/23/2017	CDB
H04N 21/64784	6/23/2017	CDB
H04W 4/18		CDB

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

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US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES

Search Notes	Date	Examiner
Full-text search: US Patents, US Pubs., EPO, JPO, Derwent, IBM-TDB.	6/8/2017	CDB
Text-limited CPC search of symbols identified above.	6/8/2017	CDB
Inventor and assignee searches.	6/8/2017	CDB
Updated full-text, text-limited CPC, inventor, and assignee searches.	6/23/2017	CDB

INTERFERENCE SEARCH

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	See attached interference search history.	6/23/2017	CDB

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)				Complete if Known	
				Application Number	14/846,647
				Filing Date	September 4, 2015
				First Named Inventor	Erik R. Swenson
				Art Unit	2447
				Confirmation Number	8052
				Examiner Name	Not yet known
Sheet	1	of	3	Attorney Docket Number	25253-30675/US

U.S. PATENT DOCUMENTS				
Examiner Initials*	Cite No. ¹	Document No. Number – Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	US-8639718	01-28-2014	Bhupalam et al.
	A2	US-8145779	03-27-2012	Zhang
	A3	US-7636792	12-22-2009	Ho
	A4	US-7188216	03-06-2007	Rajkumar et al.
	A5	US-6954456	10-11-2005	Cranor et al.
	A6	US-2012/0203861 A1	08-09-2012	Flack et al.
	A7	US-2012/0131138 A1	05-24-2012	Swenson et al.
	A8	US-2012/0030212 A1	02-02-2012	Koopmans et al.
	A9	US-2011/0280216 A1	11-17-2011	Li et al.
	A10	US-2011/0131298 A1	06-02-2011	Courtemanche et al.
	A11	US-2010/0281042 A1	11-04-2010	Windes et al.
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	A14	US-2009/0119322 A1	05-07-2009	Mills et al.
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	A16	US-2008/0288722 A1	11-20-2008	Lecoq et al.
	A17	US-2008/0139191 A1	06-12-2008	Melnyk et al.
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	A19	US-2006/0190616 A1	08-24-2006	Mayerhofer et al.
	A20	US-2004/0098463 A1	05-20-2004	Shen et al.
	A21	US-2003/0217169 A1	11-20-2003	James et al.

EXAMINER SIGNATURE	
Examiner Signature	
Date Considered	
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	
¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.	
⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.	

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				First Named Inventor	Erik R. Swenson
				Art Unit	2447
				Confirmation Number	8052
				Examiner Name	Not yet known
Sheet	2	of	3	Attorney Docket Number	25253-30675/US

FOREIGN PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ – Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶
	B1	WO 2011/106009	09-01-2011	Mobovivo, Inc.	

OTHER REFERENCES – 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 ⁶	
	C1	BHANDARKAR et al. "Collaborative Caching for Efficient Dissemination of Personalized Video Streams in Resource Constrained Environments." MMSys'12 Feb. 22-24, 2012, Chapel Hill, North Carolina, USA. pp. 185-190.		
	C2	SINGH et al. "PTC: Proxies that Transcode and Cache in Heterogeneous Web Client Environments." World Wide Web: Internet and Web Information Systems, vol. 7. 2004. pp. 7-28.		
	C3	U.S. Appl. No. 61/334,548, filed May 13, 2010, Inventors S. Li et al.		
	C4	LI, Y. et al., "Optimized Cache Management for Scalable Video Streaming," Proceedings of the 15th International Conference on Multimedia, ACM, 2007, 4 pages, [Online] [Retrieved on Dec. 30, 2013] Retrieved from the Internet<URL: http://dl.acm.org/citation.cfm?id=1291414 >.		
	C5	PCT International Search Report and Written Opinion, PCT Application No. PCT/US13/51126, Jan. 24, 2014, 14 pages.		
	C6	United States Office Action, U.S. Application No. 13/945,747, February 20, 2015, 10 pages.		
	C7	Korean Office Action, Korean Application No. 10-2015-7004371, November 4, 2015, 5 pages (with concise explanation of relevance).		
	C8	European Extended Search Report, European Application No. 13819265.3, December 23, 2015, 13 pages.		
	C9	Chinese Office Action, Chinese Application No. 201380046871.0, January 6, 2016, 7 pages (with concise explanation of relevance).		

EXAMINER SIGNATURE	
Examiner Signature	/Christopher Biagini/
Date Considered	06/23/2017
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	
¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.	
⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language translation is attached.	

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				Filing Date	September 4, 2015
				First Named Inventor	Erik R. Swenson
				Art Unit	2447
				Confirmation Number	8052
				Examiner Name	Not yet known
Sheet	3	of	3	Attorney Docket Number	25253-30675/US

CERTIFICATION STATEMENT

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

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

OR

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

☒ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. 13/945,747, filed July 18, 2013, and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d), except C6-C9.

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Rajiv P. Patel/	Date (YYYY-MM-DD)	2016-02-01
Name/Print	Rajiv P. Patel	Registration Number	39,327

25253/30675/DOCS/3847286.1

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Complete if Known

Application Number	14/846,647
Filing Date	September 4, 2015
First Named Inventor	Erik R. Swenson
Applicant	Opera Software Ireland Limited
Art Unit	2445
Confirmation Number	8052
Examiner Name	Christopher D. Biagini
Attorney Docket Number	25253-30675/US

Sheet

1

of

2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document No. Number – Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ – Number ⁴ Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶
	B1	WO 00/02128 A1	01-13-2000	Ericsson Telefon AB	

OTHER REFERENCES – 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 ⁶
	C1	Chinese Second Office Action, Chinese Application No. 201380046871.0, August 3, 2016, 14 pages.	X
	C2	Chinese Third Office Action, Chinese Application No. 201380046871.0, December 30, 2016, 6 pages.	X
	C3	European Examination Report, European Application No. 13819265.3, October 24, 2016, 7 pages.	
	C4	European Examination Report, European Application No. 13819265.3, May 18, 2017, 10 pages.	
	C5	GADDE, S. et al., "A Taste of Crispy Squid," Proceedings of the Workshop on Internet Service Performance," June 1998, pp. 1-8.	
	C6	Chinese Fourth Office Action, Chinese Application No. 201380046871.0, May 26, 2017, 4 pages (with concise explanation of relevance).	

EXAMINER SIGNATURE

Examiner Signature	/Christopher Biagini/
Date Considered	06/23/2017
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	
¹ Applicant's unique citation designation number (option). ² See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ³ Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.	
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				Application Number	14/846,647
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				Applicant	Opera Software Ireland Limited
				Art Unit	2445
				Confirmation Number	8052
				Examiner Name	Christopher D. Biagini
Sheet	2	of	2	Attorney Docket Number	25253-30675/US

CERTIFICATION STATEMENT

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OR

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

☐ This application relies, under 35 U.S.C. § 120, on the earlier filing date of prior application No. _____, filed _____ and the references cited therein are hereby referenced, but are not required to be provided in this application under 37 CFR § 1.98(d).

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Rajiv P. Patel/	Date (YYYY-MM-DD)	2017-06-14
Name/Print	Rajiv P. Patel	Registration Number	39,327

25253/30675/FW/4139966.1

EAST Search History

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	3	(key NEAR5 parameter NEAR5 optimiz\$5 NEAR5 (source ADJ file)).CLM.	US-PGPUB; USPAT	OR	ON	2017/06/23 10:54
L3	7	((key NEAR5 parameter) AND (cache ADJ database)).CLM.	US-PGPUB; USPAT	OR	ON	2017/06/23 10:54
L4	8	((key NEAR5 parameter) AND (match\$3 NEAR5 reference NEAR5 key)).CLM.	US-PGPUB; USPAT	OR	ON	2017/06/23 10:54
L5	5	(video ADJ optimization ADJ server).CLM.	US-PGPUB; USPAT	OR	ON	2017/06/23 10:54
L6	3	(cache NEAR5 plurality NEAR5 (optimized ADJ version)).CLM.	US-PGPUB; USPAT	OR	ON	2017/06/23 10:54
L7	1	(stitch\$3 NEAR5 optimized NEAR5 source).CLM.	US-PGPUB; USPAT	OR	ON	2017/06/23 10:55
L8	1	(preview\$3 NEAR5 optimized NEAR5 source).CLM.	US-PGPUB; USPAT	OR	ON	2017/06/23 10:55

6/ 23/ 2017 10:55:45 AM
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S154	9	S152 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:47
S153	0	S152 AND (stitch\$3.CLM.) AND (optimiz\$5.CLM.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:47
S152	300	skyfire.AS. OR opera.AS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:47
S157	3	S156 AND stitch\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:48
S156	13	S155 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:48
S155	110	(swenson NEAR2 erik).IN. OR (heilpern NEAR2 jaime).IN. OR (pombra NEAR2 sandeep).IN. OR (earley NEAR2 ron\$3).IN. OR (ashanskiy NEAR2 vadim).IN.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:48
S161	195	S158 AND S160	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:49
S160	679	S159 SAME ((preview\$3 OR initial OR first OR beginning) NEAR5 (cach\$3 OR local))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:49
S159	303169	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:49
S158	114581	(G06F17/30097.CPC. OR G06F17/30132.CPC. OR G06F17/30781.CPC. OR G06F17/30902.CPC. OR H04L12/5895.CPC. OR	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:49

		H04L29/06027.CPC. OR H04L29/08729.CPC. OR H04L29/08756.CPC. OR H04L29/08801.CPC. OR H04L65/1059.CPC. OR H04L65/4084.CPC. OR H04L65/605.CPC. OR H04L65/607.CPC. OR H04L65/80.CPC. OR H04L67/02.CPC. OR H04L67/04.CPC. OR H04L67/28.CPC. OR H04L67/2828.CPC. OR H04L67/2842.CPC. OR H04L67/2852.CPC. OR H04N21/222.CPC. OR H04N21/23103.CPC. OR H04N21/23106.CPC. OR H04N21/23439.CPC. OR H04N21/2396.CPC. OR H04N21/64784.CPC. OR H04W4/18.CPC.)				
S162	4	S161 AND ((stitch\$3 OR join\$3 OR transition\$3 OR splic\$3) NEAR5 (segment OR portion))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/23 10:51

6/ 23/ 2017 10:53:03 AM
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	24	skyfire.AS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/23 11:57
S2	3	S1 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/23 11:57
S3	83	(swenson NEAR2 erik).IN. OR (heilpern NEAR2 jaime).IN. OR (pombra NEAR2 sandeep).IN. OR (earley NEAR2 ron\$3).IN. OR (ashanskiy NEAR2 vadim).IN.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/23 11:59
S4	6	S3 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/23 12:00
S5	7645	709/231.CCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/01/23 12:01
S6	24	skyfire.AS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/06 13:54
S7	3	S6 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/06 13:54
S8	83	(swenson NEAR2 erik).IN. OR (heilpern NEAR2 jaime).IN. OR (pombra NEAR2 sandeep).IN. OR (earley NEAR2 ron\$3).IN. OR (ashanskiy NEAR2 vadim).IN.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/06 13:54
S9	6	S8 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/06 13:54
S10	40	709/231.CCLS. AND (@pd >= "20140123")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/06 13:54

S11	2	"20110280216"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/06 13:55
S12	1	("7529852").PN.	US-PGPUB; USPAT; EPO; JPO	OR	OFF	2014/02/06 14:14
S39	0	cach\$3 SAME ((key OR hash\$3) NEAR5 (parameter) NEAR5 (quality OR transcod\$3))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 11:50
S40	3884	cach\$3 SAME (key OR hash\$3) SAME (media OR multimedia OR video)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 11:50
S41	163	cach\$3 SAME (key OR hash\$3) SAME (media OR multimedia OR video) SAME (transcod\$3 OR optimiz\$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 11:51
S42	1	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video)) SAME ((key OR hash\$3) NEAR5 parameter)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 11:56
S43	8	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video)) SAME ((key OR hash\$3))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 11:56
S44	8	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video)) SAME (key OR hash\$3 OR signature)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 11:58
S45	22	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video OR content)) SAME (key OR hash\$3 OR signature)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 12:01
S46	25	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video OR content)) SAME (key OR hash\$3 OR signature OR etag OR fingerprint\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 12:04
S47	392	cach\$3 SAME (transcod\$3 OR optimiz\$5) SAME (media OR multimedia OR video OR content) SAME (key OR hash\$3 OR signature OR etag OR fingerprint\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 12:05
S48	100	S47 AND ((G06F17/30902 OR G06F17/30097 OR G06F17/30132 OR H04L67/28 OR H04L67/2842 OR H04L67/2852 OR H04L65/4084 OR H04L67/02 OR H04L67/04 OR H04L67/2828 OR H04L12/5895).CPC.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 12:07

S49	819	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video OR content))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 12:59
S50	35173	(G06F17/30902.CPC. OR G06F17/30097.CPC. OR G06F17/30132.CPC. OR H04L29/08729.CPC. OR H04L29/08756.CPC. OR H04L29/08801.CPC. OR H04L67/28.CPC. OR H04L67/2842.CPC. OR H04L67/2852.CPC. OR H04L65/4084.CPC. OR H04L67/02.CPC. OR H04L67/04.CPC. OR H04L67/2828.CPC. OR H04L12/5895.CPC.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:07
S51	25	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video OR content)) SAME (key OR hash\$3 OR signature OR etag OR fingerprint\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:08
S52	249	S49 AND S50	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:09
S53	28796	(cach\$3) SAME (key OR hash\$3 OR signature OR etag OR fingerprint\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:21
S54	57	S52 AND S53	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:22
S55	49	((transcod\$3 OR optimiz\$5) NEAR5 parameter) WITH (url OR uri)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:34
S56	6530	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content)) SAME cach\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:39
S57	189	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content)) SAME cach\$3 SAME (url OR uri)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:39
S58	76	S50 AND S57	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:39
S59	9	("20020073238" "20030050973" "20030177269" "20040003117" "20070101061" "7024452"	US-PGPUB; USPAT; USOCR	OR	ON	2014/02/10 14:15

		"7155681" "7360025" "RE39184").PN. OR ("8275940").URPN.				
S60	7	(distributed ADJ cache) SAME (redirect\$3 NEAR5 (client OR browser OR http))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 14:42
S61	355	(redirect\$3 NEAR5 (client OR browser OR http) NEAR5 cache)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 15:00
S62	168	S60 AND S61	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 15:00
S63	1	(redirect\$3 NEAR5 (client OR browser OR http) NEAR5 cache) SAME ((key OR hash\$3) NEAR5 (url OR uri))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 15:02
S64	104	(redirect\$3 NEAR5 (client OR browser OR http) NEAR5 cache) SAME (url OR uri)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 15:02
S65	100469	709/201-203,217-219,227-231,238- 247.OCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 15:03
S66	62	S64 AND S65	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 15:04
S67	16	(redirect\$3 NEAR5 cache) SAME (lookup OR (look\$3 ADJ up) OR key OR quer\$4) NEAR5 (url OR uri)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 15:07
S68	25	("20030110234" "20040039820" "20050136942" "20050223248" "20050246278" "20050251848" "20060010226" "20060218301" "20100226428" "20100281042" "20100325674" "20110154477" "20110203006" "20110289108" "20110299606" "20120054664" "20120203861" "20120265901" "20130144979" "6345294" "6449647" "6850982" "7680755" "7707300" "7890586").PN. OR ("8639718").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/02/10 15:13
S69	1	("7047033").PN.	US-PGPUB; USPAT; EPO; JPO	OR	OFF	2014/02/10 15:16
S70	50	(distributed NEAR5 cache) SAME ((transcod\$3 OR optimiz\$5) NEAR5	US-PGPUB; USPAT;	OR	ON	2014/02/10 16:11

		(video OR content OR media OR multimedia))	EPO; JPO; DERWENT; IBM_TDB			
S71	106	(distributed NEAR5 cache) SAME (cdn)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:17
S72	2	(distributed NEAR5 cache) SAME (cdn) SAME (url OR uri)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:17
S73	18	(distributed NEAR5 cache) SAME (cdn) SAME (url OR uri OR redirect\$3 OR forward\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:18
S74	420	(cdn OR (content ADJ delivery ADJ network)) SAME ((transcod\$3 OR optimiz\$5) NEAR5 (video OR media OR multimedia OR content))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:19
S75	236	S74 AND (S50 OR S65)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:20
S76	1	("7024452").PN.	US-PGPUB; USPAT; EPO; JPO	OR	OFF	2014/02/10 16:36
S77	103	quer\$4 SAME (redirect\$3 NEAR5 (edge OR cache))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:51
S78	4	(quer\$4 NEAR5 (key OR url OR uri)) SAME (redirect\$3 NEAR5 (edge OR cache))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:51
S79	35173	(G06F17/30902.CPC. OR G06F17/30097.CPC. OR G06F17/30132.CPC. OR H04L29/08729.CPC. OR H04L29/08756.CPC. OR H04L29/08801.CPC. OR H04L67/28.CPC. OR H04L67/2842.CPC. OR H04L67/2852.CPC. OR H04L65/4084.CPC. OR H04L67/02.CPC. OR H04L67/04.CPC. OR H04L67/2828.CPC. OR H04L12/5895.CPC.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:53
S80	100469	709/201-203,217-219,227-231,238-247.OCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 16:53
S81	61	S77 AND (S79 OR S80)	US-PGPUB; USPAT;	OR	ON	2014/02/10 16:53

			EPO; JPO; DERWENT; IBM_TDB			
S82	25	skyfire.AS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/12 11:01
S83	14	skyfire.AS. AND (cach\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/12 11:02
S84	1	skyfire.AS. AND (cach\$3 SAME key)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/12 11:03
S85	0	skyfire.AS. AND (just ADJ2 time)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/12 11:03
S86	45717	(G06F17/30902.CPC. OR G06F17/30097.CPC. OR G06F17/30132.CPC. OR H04L29/06027.CPC. OR H04L29/08729.CPC. OR H04L29/08756.CPC. OR H04L29/08801.CPC. OR H04L67/28.CPC. OR H04L67/2842.CPC. OR H04L67/2852.CPC. OR H04L65/4084.CPC. OR H04L67/02.CPC. OR H04L67/04.CPC. OR H04L67/2828.CPC. OR H04L12/5895.CPC.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/12 14:20
S87	103	quer\$4 SAME (redirect\$3 NEAR5 (edge OR cache))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/12 14:20
S88	35	S86 AND S87	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/12 14:20
S94	40109	((multipath OR (multi\$3 ADJ path) OR parallel) NEAR5 stream\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/13 09:50
S95	4499	((multipath OR (multi\$3 ADJ path) OR parallel) NEAR5 stream\$3) SAME (chunk OR segment OR portion)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/13 09:51
S96	62	((multipath OR (multi\$3 ADJ path)) NEAR5 stream\$3) SAME (chunk OR segment OR portion)	US-PGPUB; USPAT; EPO; JPO; DERWENT;	OR	ON	2014/02/13 09:51

			IBM_TDB			
S97	4449	(parallel NEAR5 stream\$3) SAME (chunk OR segment OR portion)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/13 09:53
S98	270	(parallel NEAR5 download\$3) SAME (chunk OR segment OR portion)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/13 09:53
S99	48	(parallel NEAR5 stream\$3) SAME ((chunk OR segment OR portion) NEAR5 simultaneous\$2)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/13 09:54
S101	1	("20120030212").PN.	US-PGPUB; USPAT; EPO; JPO	OR	OFF	2015/07/23 17:13
S102	31	skyfire.AS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S103	3	S102 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S104	96	(swenson NEAR2 erik).IN. OR (heilpern NEAR2 jaime).IN. OR (pombra NEAR2 sandeep).IN. OR (earley NEAR2 ron\$3).IN. OR (ashanskiy NEAR2 vadim).IN.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S105	9	S104 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S106	49196	(G06F17/30902.CPC. OR G06F17/30097.CPC. OR G06F17/30132.CPC. OR H04L29/08729.CPC. OR H04L29/08756.CPC. OR H04L29/08801.CPC. OR H04L67/28.CPC. OR H04L67/2842.CPC. OR H04L67/2852.CPC. OR H04L65/4084.CPC. OR H04L67/02.CPC. OR H04L67/04.CPC. OR H04L67/2828.CPC. OR H04L12/5895.CPC.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S107	1130	(cach\$3 NEAR5 (transcod\$3 OR optimiz\$5) NEAR5 (media OR multimedia OR video OR content))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S108	373	S107 AND S106	US-PGPUB; USPAT; EPO; JPO; DERWENT;	OR	ON	2015/07/23 17:27

			IBM_TDB			
S109	35704	(cach\$3) SAME (key OR hash\$3 OR signature OR etag OR fingerprint\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S110	94	S108 AND S109	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:27
S111	242	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content)) SAME cach\$3 SAME (url OR uri)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:28
S112	99	S106 AND S111	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:28
S113	60976	(G06F17/30902.CPC. OR G06F17/30097.CPC. OR G06F17/30132.CPC. OR H04L29/06027.CPC. OR H04L29/08729.CPC. OR H04L29/08756.CPC. OR H04L29/08801.CPC. OR H04L67/28.CPC. OR H04L67/2842.CPC. OR H04L67/2852.CPC. OR H04L65/4084.CPC. OR H04L67/02.CPC. OR H04L67/04.CPC. OR H04L67/2828.CPC. OR H04L12/5895.CPC.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:28
S114	122	quer\$4 SAME (redirect\$3 NEAR5 (edge OR cache))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:28
S115	41	S113 AND S114	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:28
S116	12	(US-20030217169-\$ or US-20040098463-\$ or US-20110131298-\$ or US-20060190616-\$ or US-20080288722-\$ or US-20080139191-\$ or US-20090006643-\$ or US-20100106770-\$ or US-20120203861-\$).did. or (US-7188216-\$ or US-8639718-\$ or US-6954456-\$).did.	US-PGPUB; USPAT	OR	ON	2015/07/23 17:28
S117	6	S116 AND redirect\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:29
S118	33	("20110280216" "20030217169" "20080288722" "20100106770" "20120131138" "20060190616"	US-PGPUB; USPAT; EPO; JPO;	OR	ON	2015/07/23 17:32

		"20080139191" "20120030212" "6954456" "7188216" "20090006643" "8639718" "20040098463" "20120203861" "20110131298" "20070174471").PN.	DERWENT; IBM_TDB			
S119	10	S118 AND redirect\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:32
S120	29	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content)) SAME database SAME redirect\$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:35
S121	176	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content)) SAME (database NEAR5 parameter)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:40
S122	16	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content)) SAME (database NEAR5 parameter NEAR5 (compress\$3 OR optimiz\$5))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:41
S123	125	(redirect\$3 NEAR5 (client OR browser OR http) NEAR5 cache) SAME (url OR uri)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:57
S124	130350	709/201-203,217-219,227-231,238-247.OCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:57
S125	72	S123 AND S124	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:57
S126	3	(database NEAR5 parameter NEAR5 (compress\$3 OR optimiz\$5)) SAME (cach\$3 OR redirect\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/07/23 17:57
S132	299	skyfire.AS. OR opera.AS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 10:58
S133	31	skyfire.AS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 10:59
S134	0	S133 AND (stitch\$3.CLM.) AND (optimiz\$5.CLM.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 10:59

S135	0	S132 AND (stitch\$3.CLM.) AND (optimiz\$5.CLM.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 10:59
S136	9	S132 AND (request\$3 NEAR5 optimiz\$5).CLM.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 10:59
S137	114015	(G06F17/30097.CPC. OR G06F17/30132.CPC. OR G06F17/30781.CPC. OR G06F17/30902.CPC. OR H04L12/5895.CPC. OR H04L29/06027.CPC. OR H04L29/08729.CPC. OR H04L29/08756.CPC. OR H04L29/08801.CPC. OR H04L65/1059.CPC. OR H04L65/4084.CPC. OR H04L65/605.CPC. OR H04L65/607.CPC. OR H04L65/80.CPC. OR H04L67/02.CPC. OR H04L67/04.CPC. OR H04L67/28.CPC. OR H04L67/2828.CPC. OR H04L67/2842.CPC. OR H04L67/2852.CPC. OR H04N21/222.CPC. OR H04N21/23103.CPC. OR H04N21/23106.CPC. OR H04N21/23439.CPC. OR H04N21/2396.CPC. OR H04N21/64784.CPC. OR H04W4/18.CPC.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 11:00
S138	3	((("20120030212") or ("20120131138") or ("20070174471")).PN.	US-PGPUB; USPAT; EPO; JPO	OR	OFF	2017/06/08 11:05
S139	157	("20030040844" "20030041016" "20030078797" "20080243682" "20120128747" "6681156" "7953519" "20110131298" "20110280216" "7188216" "20030036820" "20050065867" "20060293980" "20080243664" "20100121700" "20130325691" "8577778" "6954456" "7636792" "20030014379" "20030040845" "20060036357" "20070011080" "20080051977" "20100049371" "20100256999" "8527389" "20100106770" "20120131138" "20040015428" "20080281663" "20010032029" "20030041017" "20030149672" "20030216971" "20040024483" "20050197875" "20080243719" "20070174471" "20090310668" "20100281042" "20030139939" "20050228553" "20070087756" "20080027639" "20080297113" "20080319893" "20090132360" "20090177591" "20100010939" "7135956"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 11:34

		"20030217169" "20080288722" "20020128747" "20040153330" "20070061248" "6343277" "20040098463" "20060190616" "20080139191" "8145779" "20030093332" "20040065867" "20040133529" "20090195349" "20130325692" "8504463" "20090119322" "20120030212" "8639718" "20050015283" "20080021628" "20090307059" "20100057625" "6633823" "8271345" "20090006643" "20120203861").PN.				
S140	15	(US-20030217169-\$ or US-20040098463-\$ or US-20110131298-\$ or US-20060190616-\$ or US-20080288722-\$ or US-20080139191-\$ or US-20090006643-\$ or US-20100106770-\$ or US-20120203861-\$ or US-20120030212-\$ or US-20120131138-\$ or US-20070174471-\$).did. or (US-7188216-\$ or US-8639718-\$ or US-6954456-\$).did.	US-PGPUB; USPAT	OR	ON	2017/06/08 11:34
S141	157	S139 OR S140	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 11:34
S142	13	S141 AND ((preview\$3 OR initial OR first OR beginning) NEAR5 (cach\$3 OR local))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 11:35
S143	11297	((preview\$3 OR initial OR first OR beginning) NEAR5 (segment OR portion) NEAR5 (cach\$3 OR local))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 12:17
S144	1138	S137 AND S143	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 12:18
S145	1	S143 SAME ((stitch\$3 OR join\$3 OR transition\$3 OR splic\$3) NEAR5 (remote OR alternat\$3 OR remainder))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 12:24
S146	1	S143 SAME ((stitch\$3 OR join\$3 OR transition\$3 OR splic\$3) NEAR5 (seamless\$2))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 12:29
S147	302100	((transcod\$3 OR optimiz\$5 OR adapt\$3) NEAR5 (video OR media OR multimedia OR content))	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 12:42
S148	676	S147 SAME ((preview\$3 OR initial OR first OR beginning) NEAR5 (cach\$3 OR	US-PGPUB; USPAT;	OR	ON	2017/06/08 12:45

		local))	EPO; JPO; DERWENT; IBM_TDB			
S149	194	S137 AND S148	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/06/08 12:45
S150	3	((("2012030212") or ("2012131138") or ("2007174471")).PN.	US-PGPUB; USPAT; EPO; JPO	OR	OFF	2017/06/08 12:48
S151	3	((("20120030212") or ("20120131138") or ("20070174471")).PN.	US-PGPUB; USPAT; EPO; JPO	OR	OFF	2017/06/08 12:49

6/ 8/ 2017 3:20:37 PM
C:\ Users\ cbiagini\ Documents\ EAST\ Workspaces\ 13-945747 - Just-in-time distributed
video cache.wsp

<i>Index of Claims</i> 	Application/Control No. 14846647	Applicant(s)/Patent Under Reexamination SWENSON ET AL.
	Examiner CHRISTOPHER BIAGINI	Art Unit 2445

✓	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	06/08/2017	06/23/2017						
	1	✓	=						
	2	✓	=						
	3	✓	=						
	4	✓	=						
	5	✓	=						
	6	✓	=						
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	14	✓	=						
	15	✓	=						
	16	✓	=						
	17	✓	=						
	18	✓	=						
	19	✓	=						

PART B - FEE(S) TRANSMITTAL

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

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

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

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.

758 7590 06/29/2017
FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/846,647	09/04/2015	Erik R. Swenson	25253-30675/US	8052

TITLE OF INVENTION: Just-in-Time Distributed Video Cache

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	09/29/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
BIAGINI, CHRISTOPHER D	2445	709-219000

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

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

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

1 Fenwick & West LLP

2 _____

3 _____

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

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

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Performance and Privacy Ireland Ltd.

Dublin, Ireland

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

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

- ☒ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

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

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 192555 (enclose an extra copy of this form).

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

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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

Authorized Signature /Rajiv P. Patel/

Date September 18, 2017

Typed or printed name Rajiv P. Patel

Registration No. 39327

Electronic Patent Application Fee Transmittal				
Application Number:		14846647		
Filing Date:		04-Sep-2015		
Title of Invention:		Just-in-Time Distributed Video Cache		
First Named Inventor/Applicant Name:		Erik R. Swenson		
Filer:		Rajiv P. Patel/Terrie Quillin		
Attorney Docket Number:		25253-30675/US		
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:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				960

Electronic Acknowledgement Receipt

EFS ID:	30392369
Application Number:	14846647
International Application Number:	
Confirmation Number:	8052
Title of Invention:	Just-in-Time Distributed Video Cache
First Named Inventor/Applicant Name:	Erik R. Swenson
Customer Number:	758
Filer:	Rajiv P. Patel
Filer Authorized By:	
Attorney Docket Number:	25253-30675/US
Receipt Date:	18-SEP-2017
Filing Date:	04-SEP-2015
Time Stamp:	18:11:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$960
RAM confirmation Number	091917INTEFSW00005580192555
Deposit Account	192555
Authorized User	Rajiv Patel

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

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

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)	30675_US_Part_B_Issue_Fee.pdf	258478	no	1
			8e06c42890f986b85682ecf7f0d46df28f82b9fc		

Warnings:**Information:**

2	Fee Worksheet (SB06)	fee-info.pdf	30799	no	2
			ec9802484e7f29cb5c280d7831b7f35a7a471917		

Warnings:**Information:**

Total Files Size (in bytes):	289277
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/846,647	10/24/2017	9800633	25253-30675/US	8052

758 7590 10/04/2017
FENWICK & WEST LLP
SILICON VALLEY CENTER
801 CALIFORNIA STREET
MOUNTAIN VIEW, CA 94041

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 221 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):

Erik R. Swenson, San Jose, CA;
Opera Software Ireland Limited, Dublin, IRELAND;
Jaime Heilpern, San Francisco, CA;
Sandeep Pombra, Los Altos, CA;
Ron Earley, Dublin, CA;
Vadim Arshanskiy, Santa Clara, CA;

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