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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/836,418	07/14/2010	Ted Middleton	0370-US-U1	2155

83579 7590 08/07/2017

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

EXAMINER
TANG, KAREN C

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
08/07/2017	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):

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MICROSOFT-1041
Microsoft Corp. v. Sandpiper CDN, LLC
IPR2026-00180

Notice of Abandonment	Application No.	Applicant(s)
	12/836,418	MIDDLETON, TED
	Examiner	Art Unit
	KAREN TANG	2447

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

This application is abandoned in view of:

1. ☐ Applicant's failure to timely file a proper reply to the Office letter mailed on _____.
   (a) ☐ A reply was received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the period for reply (including a total extension of time of _____ month(s)) which expired on _____.
   (b) ☐ A proposed reply was received on _____, but it does not constitute a proper reply under 37 CFR 1.113 to the final rejection.
   (A proper reply under 37 CFR 1.113 to a final rejection consists only of: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) if this is utility or plant application, a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. Note that RCEs are not permitted in design applications.)
   (c) ☐ A reply was received on _____ but it does not constitute a proper reply, or a bona fide attempt at a proper reply, to the non-final rejection. See 37 CFR 1.85(a) and 1.111. (See explanation in box 7 below).
   (d) ☐ No reply has been received.

2. ☐ Applicant's failure to timely pay the required issue fee and publication fee, if applicable, within the statutory period of three months from the mailing date of the Notice of Allowance (PTOL-85).
   (a) ☐ The issue fee and publication fee, if applicable, was received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the statutory period for payment of the issue fee (and publication fee) set in the Notice of Allowance (PTOL-85).
   (b) ☐ The submitted fee of $_____ is insufficient. A balance of $_____ is due.
   The issue fee required by 37 CFR 1.18 is $_____. The publication fee, if required by 37 CFR 1.18(d), is $_____.
   (c) ☐ The issue fee and publication fee, if applicable, has not been received.

3. ☐ Applicant's failure to timely file corrected drawings as required by, and within the three-month period set in, the Notice of Allowability (PTO-37).
   (a) ☐ Proposed corrected drawings were received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the period for reply.
   (b) ☐ No corrected drawings have been received.

4. ☐ The letter of express abandonment which is signed by the attorney or agent of record or other party authorized under 37 CFR 1.33(b). See 37 CFR 1.138(b).

5. ☐ The letter of express abandonment which is signed by an attorney or agent (acting in a representative capacity under 37 CFR 1.34) upon the filing of a continuing application.

6. ☒ The decision by the Board of Patent Appeals and Interference rendered on *30 May 2017* and because the period for seeking court review of the decision has expired and there are no allowed claims.

7. ☐ The reason(s) below:

/KAREN TANG/
Primary Examiner, Art Unit 2447

Petitions to revive under 37 CFR 1.137, or requests to withdraw the holding of abandonment under 37 CFR 1.181, should be promptly filed to minimize any negative effects on patent term.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TED MIDDLETON

Appeal 2016-007850
Application 12/836,418[1]
Technology Center 2400

Before KRISTEN L. DROESCH, TERRENCE W. McMILLIN, and SCOTT E. BAIN, *Administrative Patent Judges*.

BAIN, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 1–7 and 10–19, which constitute all claims pending in the application. Claims 8 and 9 have been cancelled. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

---

[1] Appellant identifies the real party in interest as Level 3 Communications, LLC. App. Br. 2.

STATEMENT OF THE CASE

The Claimed Invention

The claimed invention relates to an "extensible content delivery platform." Abstract. Claims 1, 6, and 16 are independent. Claim 1 is illustrative of the invention and the subject matter of the appeal, and reads as follows (with the disputed limitations emphasized):

> 1. A method of providing an extensible content delivery platform, the method comprising:
>
> identifying, by a computer system, receipt of a discrete event at a core engine of a content delivery network, the core engine including a structured object model having a plurality of objects instantiated and available to process a plurality of event types;
>
> *selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types;*
>
> *selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event*, wherein the selected module processes the discrete event using *at least one of the plurality of objects of the core engine.*

App. Br. 16 (Claims App.).

The Rejection on Appeal

Claims 1–7 and 10–19 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Lewin et al. (US 2009/0150518 A1; June 11, 2009) ("Lewin"), Doyle et al. (US 2006/0235738 A1; Oct. 19, 2006) ("Doyle"), and Warila et al. (US 2008/0313282 A1; Dec. 18, 2008) ("Warila"). Final Act. 3–6.

ANALYSIS

We have reviewed the Examiner's rejections in light of Appellant's arguments presented in this appeal. Arguments which Appellant could have made but did not make in the Briefs are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(iv). On the record before us, we are not persuaded the Examiner erred. We adopt as our own the findings and reasons set forth in the rejections from which the appeal is taken and in the Examiner's Answer, and provide the following for highlighting and emphasis.

Appellant argues the Examiner erred in finding the prior art teaches "selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types," as recited in claim 1. App. Br. 6–7. Specifically, Appellant asserts the Examiner interprets Lewin's teaching of "metadata" to "read on discrete event" as recited in claim 1 and Lewin's teaching of a "processor" to read on "selecting a rule." App. Br. 6. Appellant contends metadata cannot constitute a "discreet event" and "selecting a processor is not the same as selecting a rule, as recited in claim 1." App. Br. 6–7. Appellant, however, has misconstrued the Examiner's findings on the record before us, and we are not persuaded of error.

The Examiner finds Lewin teaches the use of metadata corresponding to "a rule," not a discreet event as Appellant argues. Ans. 7–8 (citing Lewin ¶¶ 36, 54). For example, Lewin teaches "metadata may . . . state that any request ending with an .xml extension is processed with the XSLT processor." Lewin ¶ 54. We agree with the Examiner's finding that this is a rule. As the Examiner further finds, it is not the "processor" in Lewin that is the discreet event selecting a rule, but rather, the "discreet event" is the

"request" for content as taught in Lewin. Ans. 8; Lewin Fig. 3, ¶¶ 36–37, 43. Appellant has not identified any error in this finding.

Appellant also disputes a second limitation in claim 1, "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discreet event using at least one of the plurality of objects of the core engine." App. Br. 7–9. Appellant's arguments regarding the "discreet event" and "rule" are redundant to the arguments discussed above, and we are not persuaded of error for the same reasons. Appellant further argues the prior art lacks any teaching of "objects of the core engine," "selecting a module," and selection based on "identity of a user" as recited in the claim. We, however, agree with the Examiner's findings on the record before us.

The terms "module" (defined as a functional unit, Spec. ¶¶ 17–18) and "core engine" (defined essentially as "code," Spec. ¶ 105) are not meaningfully limited by the Specification. Using the broadest reasonable interpretation of these terms, as we must, *see In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004), we discern no error in the Examiner's finding of the disputed elements taught in Lewin and (redundantly) Doyle. As the Examiner further finds, Lewin teaches delivery of content based on "personalization" (i.e., the identity of user),[2] where the "module" is a particular processor selected based upon the rules (metadata)

[2] The Examiner's additional citation of Doyle for this element, Final Act. 3, appears redundant with the teachings of Lewin, but in any event we discern no error in the Examiner's finding that Doyle teaches processing the discreet event based on, among other things, identity of the "user." *Id.*; *see also* Doyle ¶¶ 38, 41.

regarding format of content delivery. Ans. 9–10; *see also* Lewin ¶¶ 35, 44, 48. The processor processes a request for content using "objects" in the core engine (code managing an object cache). Ans. 9; Lewin ¶ 47.

For the foregoing reasons, we are not persuaded the Examiner erred in rejecting claim 1. Appellant argues the remaining independent claims (claims 6 and 16) recite similar limitations and are patentable "for the [same] reasons" as claim 1. App. Br. 14. The dependent claims are not argued separately. For the foregoing reasons, we discern no error in the Examiner's rejection of any of these remaining claims.

Accordingly, we sustain the rejection of claims 1–7 and 10–19 as unpatentable over Lewin, Doyle, and Warila.

DECISION

We affirm the Examiner's rejections of claims 1–7 and 10–19.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1). *See* 37 C.F.R. § 41.50(f).

AFFIRMED

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

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

Examiner Initial *	Cite No	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear
		20020049841	Apr 25, 2002	Johnson, Scott C.	
		20040073596	Apr 15, 2004	Kloninger, John J., et al.	

FOREIGN PATENT DOCUMENTS

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

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Extended European Search Report, dated November 25, 2016, Application No. 10816184.5, filed September 10, 2010; Dkt. No. 0370-EP-01 , 6 pgs.	

EXAMINER **DATE CONSIDERED**

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

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Kathleen McInnish
Attorney Docket Number:	0370-US-U1

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:	27723678
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	07-DEC-2016
Filing Date:	14-JUL-2010
Time Stamp:	15:24:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$180
RAM confirmation Number	120816INTEFSW15250900
Deposit Account	505063
Authorized User	Kathleen McInnish

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

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370USU1_IDS.pdf	37542 92a6b8ae48c27d54129e2c1d5b960e27c5c96062	no	5
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	370USU1_sb08.pdf	29038 d74d0c65558b6be86d0e366013171357267743eb	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	EP_108161845_EESR_25Nov16_370EP01.pdf	375945 ec30a2624a72427e957667b64783fe7596095686	no	6
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30898 04bcc976d13e0031c86c9c14b82596ee6346b7e4	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	473423		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	MIDDLETON, Ted	Art Unit	:	2447
Filed	:	July 14, 2010	Examiner	:	Karen C. Tang
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			

Submitted Via EFS-Web

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

Sir:

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

Copies of all of the cited documents:

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant on __April 17, 2015__.

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

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

II
FEES

Any required fee is being paid as indicated below:

☐ No fee is due.

☒ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☒ This fee is paid by credit card.

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

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

III

CERTIFICATION

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

☐ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

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

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

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

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

V
REMARKS

It is respectfully requested that:

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

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted,

Date: December 7, 2016

/JCS/

Jonathan C. Siekmann, Reg. No. 58,259
USPTO Customer No. 83579
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-2140

UNITED STATES PATENT AND TRADEMARK OFFICE

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83579 7590 08/29/2016

LEVEL 3 COMMUNICATIONS, LLC
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EXAMINER
TANG, KAREN C

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
08/29/2016	ELECTRONIC

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Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

United States Patent and Trademark Office

Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

LEVEL 3 COMMUNICATIONS, LLC
ATTN: PATENT DOCKETING
1025 ELDORADO BLVD.
BROOMFIELD, CO 80021

Appeal No: 2016-007850
Application: 12/836,418
Appellant: Ted Middleton et al.

Patent Trial and Appeal Board Docketing Notice

Application 12/836,418 was received from the Technology Center at the Board on August 23, 2016 and has been assigned Appeal No: 2016-007850.

In all future communications regarding this appeal, please include both the application number and the appeal number.

The mailing address for the Board is:

PATENT TRIAL and APPEAL BOARD
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. BOX 1450
ALEXANDRIA, VIRGINIA 22313-1450

Telephone inquiries can be made by calling 571-272-9797 and referencing the appeal number listed above.

By order of the Patent Trial and Appeal Board.

BAE

Doc code: WFEE.APPEAL
Doc Description: Certification and Transmittal of Appeal Forwarding Fee

PTO/AIA/34 (06-14)

CERTIFICATION AND TRANSMITTAL OF APPEAL FORWARDING FEE	Docket Number (Optional) 0370-US-U1

I hereby certify that this correspondence is being facsimile transmitted to the USPTO, EFS-Web transmitted to the USPTO, or deposited with the United States Postal Service with sufficient postage in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on _____. Signature _____ Typed or printed name _____	In re Application of Ted Middleton	
	Application Number 12/836,418	Filed July 14, 2010
	For CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK	
	Art Unit 2447	Examiner Karen C. TANG

37 CFR 41.45 specifies that, in order to avoid dismissal of the appeal, appellant must pay the fee set in 37 CFR 41.20(b)(4) within two months of the later of the date of either the examiner's answer, or a decision refusing to grant a petition under 37 CFR 1.181 to designate a new ground of rejection in an examiner's answer.

The undersigned certifies that the appropriate fee accompanies this transmittal.

The fee for forwarding this appeal is (37 CFR 41.20(b)(4)) $ 2000

☐ Appellant asserts small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by 50%, and the resulting fee is: $ _____

☐ Appellant certifies micro entity status. See 37 CFR 1.29. Therefore, the fee shown above is reduced by 75%, and the resulting fee is: $ _____
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

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

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 505063.

☑ Payment made via EFS-Web.

Extensions of time under 37 CFR 1.136(a) for patent applications are not applicable to the time period set forth in 37 CFR 41.45. See 37 CFR 1.136(b) for extensions of time to reply for patent applications and 37 CFR 1.550(c) for extensions of time to reply for *ex parte* reexamination proceedings.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ appellant ☑ attorney or agent of record Registration number 58,259 ☐ attorney or agent acting under 37 CFR 1.34 Registration number _____

Signature /JCS/

Typed or printed name Jonathan C. Siekmann

Telephone Number 720-888-2140

Date August 9, 2016

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

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

Privacy Act Statement

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0370-US-U1

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:				
Appeal Forwarding Fee	1413	1	2000	2000
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**2000**

Electronic Acknowledgement Receipt

EFS ID:	26589757
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	09-AUG-2016
Filing Date:	14-JUL-2010
Time Stamp:	14:30:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2000
RAM confirmation Number	081016INTEFSW14311900
Deposit Account	2496
Authorized User	Jonathan Siekmann

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	aia0034.pdf	222189 c46606dbb4b3ff1860ba86f571f0f77c7a107144	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30749 16eaf96805c6a36df16b60d955c4de0cb74047b3	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	252938		

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.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

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

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Canadian Examination Report, dated June 29, 2016, Application No. 2,773,318, filed September 10, 2010; Dkt. No. 0370-CA-01, 3 pgs.	

EXAMINER **DATE CONSIDERED**

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

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Kathleen McInnish
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

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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:	26576120
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	08-AUG-2016
Filing Date:	14-JUL-2010
Time Stamp:	15:00:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$180
RAM confirmation Number	080916INTEFSW15050101
Deposit Account	2496
Authorized User	Kathleen McInnish

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

37 CFR 1.17 (Patent application and reexamination processing fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370USU1_IDS.pdf	37545 78ee68db5e3270beee24cc27c1bef76121b8ba94	no	5
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	370USU1_sb08.pdf	28538 d24494193ecb61b7ed7a73915d8630e89266cc6c	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	CA_2773318_ExRpt_29Jun16_370CA01.pdf	447781 843b0fb31fc119c58119f31ea2f0b7527ae7ef3f	no	4
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30898 f50542b0a8ccf7f40b266ece678e43e47453d6cb	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	544762		

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	MIDDLETON, Ted	Art Unit	:	2447
Filed	:	July 14, 2010	Examiner	:	Karen C. Tang
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			

Submitted Via EFS-Web

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

Sir:

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

Copies of all of the cited documents:

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant on __April 17, 2015__.

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

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

II
FEES

Any required fee is being paid as indicated below:

☐ No fee is due.

☒ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☒ This fee is paid by credit card.

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

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

III

CERTIFICATION

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

☐ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

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

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

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

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

V
REMARKS

It is respectfully requested that:

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

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted,

Date: August 8, 2016

/JCS/

Jonathan C. Siekmann, Reg. No. 58,259
USPTO Customer No. 83579
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-2140

Electronic Acknowledgement Receipt

EFS ID:	26576120
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	08-AUG-2016
Filing Date:	14-JUL-2010
Time Stamp:	15:00:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$180
RAM confirmation Number	080916INTEFSW15050101
Deposit Account	505063
Authorized User	Kathleen McInnish

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

37 CFR 1.17 (Patent application and reexamination processing fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370USU1_IDS.pdf	37545 78ee68db5e3270beee24cc27c1bef76121b8ba94	no	5
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	370USU1_sb08.pdf	28538 d24494193ecb61b7ed7a73915d8630e89266cc6c	no	1
Warnings:					
This is not an USPTO supplied IDS fillable form					
Information:					
3	Other Reference-Patent/App/Search documents	CA_2773318_ExRpt_29Jun16_370CA01.pdf	447781 843b0fb31fc119c58119f31ea2f0b7527ae7ef3f	no	4
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30898 f50542b0a8ccf7f40b266ece678e43e47453d6cb	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	544762		

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

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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.
12/836,418	07/14/2010	Ted Middleton	0370-US-U1	2155

83579 7590 06/17/2016

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

EXAMINER
TANG, KAREN C

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
06/17/2016	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):

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
12/836,418	14 July, 2010	MIDDLETON, TED	0370-US-U1

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

EXAMINER	
KAREN TANG	
ART UNIT	PAPER
2447	20160614

DATE MAILED:

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

Commissioner for Patents

The Examiner Answer filed is in response to the appeal brief filed 11/17/2015. The appeal brief filed on 11/17/2015 is addressed to the Final Rejection filed on 4/17/2015.

/KAREN TANG/
Primary Examiner, Art Unit 2447

PTO-90C (Rev.04-03)

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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/836,418	07/14/2010	Ted Middleton	0370-US-U1	2155

83579 7590 06/09/2016

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

EXAMINER
TANG, KAREN C

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
06/09/2016	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.

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UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Application Number: 12/836,418
Filing Date: July 14, 2010
Appellant(s): MIDDLETON, TED

Jonathan C Siekmann (Reg 58,259)
For Appellant

EXAMINER'S ANSWER

(1) Grounds of Rejection to be Reviewed on Appeal

Every ground of rejection set forth in the Office action dated 4/17/2015 from which the appeal is taken is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

The following ground(s) of rejection are applicable to the appealed claims.

Claims 1-7, 10-19 are rejected under 35 USC 103.

The rejection is reproduced below:

Claim Rejections - 35 USC § 103

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

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

Claims 1-7, 10-19 are are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewin et al hereinafter Lewin (US 2009/0150518) in view of Doyle et al hereinafter Doyle (US 20060235738) in further view of Warila et al hereinafter Warila (US 20080313282)

1. Referring to Claim 1. Lewin discloses a method of providing an extensible content delivery platform, the method comprising: receipt of a discrete event at a core engine of a content delivery network, the core engine (edge server, refer to par 0049) comprising a structured object model having a plurality of objects (e.g., DCA containers, JVM containers, XSL objects, refer to par 0052, 0048) instantiated and available to process a plurality of event types (e.g., choose a selected particular module/processor, refer to par 0054); selecting a rule based on the discrete event (based on the metadata, refer to par 0049, 0054), the rule from a set of rules defining the plurality of event types; selecting a module (select/instantiate a processor, refer to par 0049) to process the discrete event based on the selected rule and identify of user requesting processing of the discrete event (refer to par 0049); wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine (refer to par 0049, 0052).

Doyle, in analogous art, further discloses process the event also based on the roles of the users, (refer to par 0041).

It would have been obvious for one of ordinary skill in the art to combine the teaching of Lewin with Doyle because Doyle's teaching would allow Lewin's system to automatically providing more or less content as the situation requires and further allows multiple plans from the same plan type to be designated as actively enrolled in or sharing benefits program content across different program to realize efficiencies of scales (as supported by Warila, refer to Fig 9).

2. Referring to Claim 2. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein the discrete event is an event of a content delivery process of a content delivery network (refer to par 0054).

3. Referring to Claim 3. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein identifying the discrete event further comprises identifying the discrete event using the set of rules (refer to par 0049).

4. Referring to Claim 4. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed at a plurality of discrete events comprising the identified discrete event (refer to par 0056).

5. Referring to Claim 5. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed upon the plurality of objects (refer to par 0056).

6. Referring to Claim 6. Claim is rejected under similar rational as claim 1.

7. Referring to Claim 7. Lewin, Doyle and Warila disclosed the cache server as recited in claim 6. Lewin further discloses wherein the selected module is one of a plurality of user definable modules (refer to par 0056).

8. Referring to Claim 10. Lewin, Doyle and Warila disclosed the method as recited in claim 1. Lewin further discloses wherein selecting the rule further comprises selecting the rule based on an event type of the identified discrete event (refer to par 0049).

9. Referring to Claim 11. Lewin, Doyle and Warila disclosed the method of claim 1. Lewin further discloses adding a rule to the set of rules (metadata is a user defined rules), the rule specifying a module to process a new event type (refer to par 0054); and identifying receipt of an event of the new event type and processing the event using the specified module (refer to par 0054);

10. Referring to Claim 12. Lewin, Doyle and Warila disclosed the method as recited in claim 1. Lewin further wherein the selected module processes the discrete event without altering logic of the core engine (refer to abstract).

11. Referring to Claim 13. Lewin, Doyle and Warila disclosed the method as recited in claim 1, Wherein the module selected is one of a plurality of user- definable modules (all modules are user definable since its programmable modules by users).

12. Referring to claims 15-19, claims are rejected under similar rational as claims 1-7, 10-13.

(2) Response to Argument

35 USC 103: on Claims 1-7 and 10-19: specifically, Claims 1

Appellant argues the following:

1) Lewin fails to disclose "selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types."

2) Lewin fails to disclose "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event"

Examiner respectfully disagrees.

1) Lewin discloses "selecting a rule based on the discrete event (Ghost will uses the metadata which contains rules to identity a rule in order to process a discrete event, where in par 0036, indicates the rules are provided in the form of object "metadata"), the rule (rule stated in par 0054, "any request ending with an .xml extension is processed with the XSLT processor") from a set of rules (par 0054 and par 0061: at least two rules: "any request ends with .xml extension processed with XSLT processor", "..extension ends with .html extension processes by ESI processor".) defining the plurality of event type (processors that processor different file extension type, par 0061: another example: ESI processor process the .html extension,)."

Lewin discloses a system that is capable to handle multiple discrete events (e.g., multiple types of content requests, refer to par 0047, 0049), where the discrete events (requests) were being handled by the core engine (ghost software 808, refer to par 0047) which is within the content delivery network (see Fig 3 shown the content delivery network,

and ghost software is within this network). The core engine (e.g., ghost 808) includes structure models (e.g., pluggable architecture, refer to par 0048, 0049) having plurality of objects instantiated (Ghost's pluggable architecture created/instantiated the containers to, refer to par 0049) and available to process a plurality of event type (capable to process different type of file extension request or type, refer to 0049).

As the client requests (e.g. discrete event) being processed against the metadata (set of rules refer to par 0036, 0054), where the metadata contains rules that allows the Ghost (core engine) to identify (e.g., select) the type of discrete event is received (e.g., discrete event received), and how it should be processed. For examples, one of metadata (one of the rules) states: "any request ending with an .xml extension is processed with the XSLT processor" In another words, Lewin discloses selecting one of the rules based on the discrete event, and the rules defines the plurality of event types ("any request ending with an .xml extension is processed with the XSLT processor": based on filename extension, content type refer to par 0054).

Regarding with definitions on modules, rules and processor:

Appellant's specification fail to provide definitions for the following terms at issue: "a module", " a discrete event" and "rules". At most, Appellant provides only examples of what modules, discrete events could be, but examples should not be limiting on the interpretation of terms. Thus, it is fair to apply the broadest interpretation on the above terms at issue so long as the terms operates the functions required in the limitations.

For example: based on the Appellant's limitation, a module is required to process the discrete event using the one of the plurality of objects of the core engine: "wherein the

selected module processes the discrete event using at least one of the plurality of objects of the core engine". The explanation above have already demonstrate how Lewin having a "module" which performs the functions of "processes the discrete event using at least one of the plurality of objects of the core engine".

Similarly, the metadata (software object, or file, refer to par 0036) in Lewin contains plurality of rules (rules within the metadata, in par 0036), for example: one of the rules in metadata of Lewin stated "any request ending with an .xml extension is processed with the XSLT processor", this rule would have been selected based on the discrete event (e.g., request sent: an individual distinct (discrete) things that happened (event): as per request is individually distinct, and sending the request is a type of things that happened, hence, request sent is a discrete event), where the rules defining the plurality of event type (i.e., type of file extension: .xml extension). In another words, in the broadest interpretation in light of specification, the "discrete event" in the limitation is mapped to Lewin's "request sent", the plurality of rules is mapped to the regulations and rules stored within the "metadata" in Lewin, and "modules" in the limitation is mapped to the processors in Lewin.

In summary, Lewin discloses "identifying, by a computer system, receipt of a discrete event at a core engine of a content delivery network, the core engine including a structure object model having a plurality of objects instantiated and available process a plurality of event type", and "selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types" and Appellant's arguments are not persuasive.

Therefore the Appellant's arguments are not persuasive and the rejection is maintained.

2) Lewin discloses "selecting a module (processor) to process the discrete event based on the selected rule ("any request ending with an .xml extension is processed with the XSLT processor", par 0054) and identity of a user requesting processing of the discrete event (in par 0036, lines 8-12, indicates the metadata contains rules, the rules is derived for a particular customer/an identity of customer, hence, the identity of the customer is considered in selecting the module/processor, in order to personalized request), wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine"

To further explain the above statement and mapping:

Lewin discloses the selected rule (e.g., any request ends with certain extension, par 0054), is used to control the choice of module (selecting a processor out of plurality of processors, refer to par 0048) and identify of a user requesting processing of the discrete event (the rules in the metadata which determines the selection of the module is derived for that customer: par 0036 and also, the header that always contain the source address of the requestor/client: an identify of the user is provided, par 0043, 0055, furthermore, par 0035 indicates the information such as headers, a cookie value, user location, and user's connection is used to personalized the content, par 0035 and the cookie value is username in par 0044: hence an identity of user is provided). Lewin further discloses wherein the selected module (e.g., selected processor) processes the discrete event (e.g., request, refer to

par 0061) using at least one of the plurality of objects (XML container or XML container page (e.g., /my.xyz.xml), refer to par 0052, 0054, 0055, 0056, 0063, 0065).

Further Explanations:

An attention is required to note that Applicant's specification did not have supports for the limitation of "the selected step is based on both the selected rules and identity of a user requesting of the discrete event:" because (1) the limitation at issue is not an original filed limitation, (2) nowhere in the instant specification (not even within Fig 11 as mapped by Appellant to the support of the teaching of limitation on the appeal filed on 11/17/2015) discloses the selected steps required both the selected rules and identify of a user.

At most, the limitation at issue can be reasonable interpret in the light of specification as: the selection module step is initiated due to the request of a user. At most, the limitation at issue should only be obvious for one of ordinary skill in the art since the specification fails to provide written description on the limitation.

However, to expertise the prosecution, the reference Lewin is teaches the obvious limitation, "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event" and "…wherein the selected module processes the discrete event using at least one of the plurality objects of the core engines".

To even expertise the prosecution, a secondary reference is introduced (Doyle reference) in order to show "selecting a module is based on the selected rule and identity of a user" is well known, even when the specification fail to provide written supports.

Doyle, in analogous art, discloses that the identity of the users and the rules affects the selection of a module 103a (refer to par 0043: different features assigned to different roles of the users in the system, par 0041 and par 0043: for examples: only CSS user can access a module 103a, refer to par 0038, 0041).

In another words, Doyle discloses the alleged missing limitation of "...selecting a module to ..based on the selected rule and identity of a user.." and Doyle demonstrate such limitation is well known in the art.

Therefore, Appellant's arguments were not persuasive and the rejection is maintained.

35 USC 103: on Claims 1-7 and 10-19: specifically, Claim 6

Appellant argues the similar issues as Claim 1 above on the similar limitations.

Examiner respectfully disagrees.

For reasons discussed above with respect to claim 1 on how the references disclose the alleged missing limitation. Claim 6 and its dependent claims are not allowable over the cited references.

35 USC 103: on Claims 1-7 and 10-19: specifically, Claim 16

Appellant argues the similar issues as Claim 1 above on the similar limitations.

Examiner respectfully disagrees.

For reasons discussed above with respect to claim 1 on how the references disclose the alleged missing limitation. Claim 16 and its dependent claims are not allowable over the cited references.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/KAREN TANG/

Primary Examiner, Art Unit 2447

Conferees:

/Liangche A Wang/

Primary Examiner, Art Unit 2447

/Suraj Joshi/

Primary Examiner, Art Unit 2447

Requirement to pay appeal forwarding fee. In order to avoid dismissal of the instant appeal in any application or ex parte reexamination proceeding, 37 CFR 41.45 requires payment of an appeal forwarding fee within the time permitted by 37 CFR 41.45(a), unless appellant had timely paid the fee for filing a brief required by 37 CFR 41.20(b) in effect on March 18, 2013.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	**Art Unit**
	KAREN TANG	2447

✓	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	11/14/2012	07/22/2013	11/07/2014	04/06/2015	06/03/2016				
	1	✓	✓	✓	✓	A				
	2	✓	✓	✓	✓	A				
	3	✓	✓	✓	✓	A				
	4	✓	✓	✓	✓	A				
	5	✓	✓	✓	✓	A				
	6	✓	✓	✓	✓	A				
	7	✓	✓	✓	✓	A				
	8	✓	✓	-	-	-				
	9	✓	✓	-	-	-				
	10			✓	✓	A				
	11			✓	✓	A				
	12			✓	✓	A				
	13			✓	✓	A				
	14			✓	✓	A				
	15			✓	✓	A				
	16			✓	✓	A				
	17			✓	✓	A				
	18			✓	✓	A				
	19			✓	✓	A				

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	Art Unit
	KAREN TANG	2447

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	217,222,224	11/14/2012	KT

SEARCH NOTES		
Search Notes	Date	Examiner
East Search with Keyword and Class Search	11/14/2012	KT
Google Search	11/14/2012	KT
ACM Search	11/14/2012	KT
IEEE Search	11/14/2012	KT
Inventor Search	11/14/2012	KT
Double Patenting Search	11/14/2012	KT
Search Updates	7/22/2013	KT
Search Updates	11/7/2014	KT
Appeal Conf with Primary Alex Wang and Suraj Joshi	6/3/2016	KT

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
709	217,222,224	7/14/2012	KT

PTO/SB/08a (01-08)
Approved for use through 07/31/2012. OMB 0651-0031
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

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

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Japanese Decision of Rejection, dated April 7, 2015, Application No. 2012-528936, filed September 10, 2010, Dkt. No. 0370-JP-01, 3 pgs.	

EXAMINER	/KAREN C TANG/	DATE CONSIDERED	06/03/2016

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.C.T/

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Kathleen McInnish
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 2 months with $0 paid	1252	1	600	600
Miscellaneous:				
			Total in USD ($)	**600**

Electronic Acknowledgement Receipt

EFS ID:	24131192
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	19-NOV-2015
Filing Date:	14-JUL-2010
Time Stamp:	12:34:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$600
RAM confirmation Number	20925
Deposit Account	505063
Authorized User	WIER, DAVID D

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 1.17 (Patent application and reexamination processing fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Fee Worksheet (SB06)	fee-info.pdf	31162 a56db142f4614070ddd9e02f4d9e8263cabddfa6	no	2

Warnings:

Information:

Total Files Size (in bytes):	31162

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Applicant	:	Ted Middleton	Confirmation No: 2155
Serial No.	:	12/836,418	Group Art Unit: 2447
Filed	:	14 July 2010	Examiner: TANG, Karen C.
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK	Docket No. 0370-US-U1

APPELLANT'S APPEAL BRIEF UNDER 37 C.F.R. §41.37

Via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Pursuant to 37 C.F.R. § 41.37(a), this brief is filed within the allotted time period subsequent to the Notice of Appeal which was filed in this case on 17 July 2015.

This brief contains items under the following headings and is in compliance with 37 C.F.R. § 41.37 and M.P.E.P. § 1205.

I. Real Party In Interest.....page 2
II. Related Appeals, Interferences, and Judicial Proceedings.....page 2
III. Status of Claims.....page 2
IV. Status of Amendments.....page 2
V. Summary of Claimed Subject Matter.....page 2
VI. Grounds of Rejection to be Reviewed on Appeal.....page 5
VII. Argument.....page 5
VIII. Claims Appendix.....page 16
IX. Evidence Appendix.....page 20
X. Related Proceedings Appendix.....page 21

I. REAL PARTY IN INTEREST (37 C.F.R. § 41.37(c)(1)(i))

The real party in interest in this Appeal is:

Level 3 Communications, LLC.

II. RELATED APPEALS AND INTERFERENCES (37 C.F.R. § 41.37(c)(1)(ii))

No appeals or interferences are currently known to the Appellant that will directly affect, be directly affected by, or have a bearing on the decision to be rendered by the Patent Trial and Appeal Board in the present Appeal.

III. STATUS OF CLAIMS

In view of the Final Office Action issued 17 April 2015, claims 1-7 and 10-19 are pending in the application. Claims 1-7 and 10-19 stand rejected and are the subject of this appeal. Claims 1, 6, and 16 are independent claims.

IV. STATUS OF AMENDMENTS

The Appellant did not file an Amendment After Final Rejection. No amendments have been filed since the Amendment filed 11 March 2015. All amendments have been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER (37 C.F.R. § 41.37(c)(1)(iii))

The following provides a concise explanation of the subject matter defined in each of the separately argued independent claims involved in the Appeal, referring to the specification by paragraph number and to the drawings by reference characters, as noted by 37 C.F.R. § 41.37(c)(1)(v).

Each element of the independent claims is identified by a corresponding reference to the specification and drawings where applicable. It should be noted that the citation to passages in the specification and drawings for each claim element does not imply that the limitations from

the specification and drawings should be read into the corresponding claim element. Examples in the specification are not intended to limit the scope of the claims in any way. Moreover, the claims do not stand or fall together.

Claim 1:

Claim 1 relates to a method of providing an extensible content delivery platform, the method comprising:

identifying (*see, e.g.,* Application Specification, paragraph [0118]), by a computer system, receipt of a discrete event at a core engine (*see, e.g.,* Application Specification, 1002) of a content delivery network (*see, e.g.,* Application Specification, 905), the core engine including a structured object model having a plurality of objects (*see, e.g.,* Application Specification, FIG. 11) instantiated and available to process a plurality of event types;

selecting (*see, e.g.,* Application Specification, paragraph [0111]) a rule based on the discrete event, the rule from a set of rules (*see, e.g.,* Application Specification, paragraph [0112]) defining the plurality of event types;

selecting (*see, e.g.,* Application Specification, paragraph [0110]) a module (*see, e.g.,* Application Specification, 1006, 1008, 1010) to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine (*see, e.g.,* Application Specification, FIG. 11).

Claim 6:

Claim 6 relates to a cache server comprising:

a core engine (*see, e.g.,* Application Specification, 1002) executing on a processor of the cache server, the core engine including a structured object module having a plurality of objects (*see, e.g.,* Application Specification, FIG. 11) instantiated and available to process a plurality of event types in a content delivery network (*see, e.g.,* Application Specification, 905), the core engine being configured to:

identify (*see, e.g.,* Application Specification, paragraph [0118]) receipt of a discrete event of a content delivery process;

select (*see, e.g.,* Application Specification, paragraph [0111]) a rule based on the identified discrete event, the rule being from a set of rules (*see, e.g.,* Application Specification, paragraph [0112]) defining the plurality of event types; and

select (*see, e.g.,* Application Specification, paragraph [0110]) a module (*see, e.g.,* Application Specification, 1006, 1008, 1010) to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine (*see, e.g.,* Application Specification, FIG. 11).

Claim 16:

Claim 16 relates to a system comprising:

a core engine (*see, e.g.,* Application Specification, 1002) executing on a processor of a cache server of a content delivery network (*see, e.g.,* Application Specification, 905), the core engine including a structured object model having a plurality of objects (*see, e.g.,* Application Specification, FIG. 11) instantiated and available to process a plurality of event types in a content delivery network, the core engine being configured to identify (*see, e.g.,*

Application Specification, paragraph [0118])receipt of a discrete event of a content delivery process; and

a plurality of modules (*see, e.g.,* Application Specification, 1006, 1008, 1010) to process the plurality of event types, wherein the core engine selects (*see, e.g.,* Application Specification, paragraph [0110]) one of the plurality of modules to process the identified discrete event based on identity of a user requesting processing of the discrete event, the module being configured to process the discrete event using at least one of the plurality of objects of the core engine (*see, e.g.,* Application Specification, FIG. 11).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

(1) Whether the Office erred in rejecting claims 1-7 and 10-19 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Publication No. 2009/0150518 to Lewin et al. (hereinafter "Lewin") in view of U.S. Publication No. 2006/0235738 to Doyle et al. (hereinafter "Doyle") in further view of U.S. Publication No. 2008/0313282 to Warila et al. (hereinafter "Warila").

VII. ARGUMENT (37 C.F.R. § 41.37(c)(1)(iv))

(1) Whether the Office erred in rejecting claims 1-7 and 10-19 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Publication No. 2009/0150518 to Lewin et al. (hereinafter "Lewin") in view of U.S. Publication No. 2006/0235738 to Doyle et al. (hereinafter "Doyle") in further view of U.S. Publication No. 2008/0313282 to Warila et al. (hereinafter "Warila"). The Appellants respectfully disagree for the following reasons:

Claim 1

To establish prima facie obviousness of a claimed invention, two basic criteria must be met. First, all of the claim elements must be shown by the prior art. *In re Royka*, 490 F.2d 981,

180 U.S.P.Q. 580 (C.C.P.A. 1974). Second, there must be some rationale or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the references or to combine reference teaching. In other words, there should be an explicit analysis regarding whether there was an apparent reason to combine the known elements in the fashion claimed in the application at issue. *KSR Int'l Co. v. Teleflex, Inc.*, 127 S, Ct. 1727, 1741 (2007). Without conceding the second criteria, the Appellant respectfully asserts that the rejection of claim 1 does not satisfy the first criteria, as discussed below.

A. Claim 1 recites, *inter alia*, "selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types."

Lewin, Warila, and Doyle, alone or in any combination, do not disclose at least "selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types." The Office has relied on paragraphs [0049 and 0054] of Lewin as disclosing such limitation. Specifically, the Office suggests that paragraph [0054] which discloses that "metadata can be used to control the choice of a processor" discloses "selecting a rule based on the discrete event." *See* Office Action, page 3. Thus, the Office seems to be interpreting *metadata* to read on *discrete event* and selecting a *processor* to read on selecting a *rule*. However, the metadata referred to by the cited paragraph is content provider (CP) *metadata* and it cannot be considered to be a *discrete event* recited in claim 1. Examples of the *discrete event* recited in claim 1 are provided, for example, in FIG. 11 of the Application Specification, and the related disclosure. [1] Specifically, FIG. 11 discloses an event model 1100 wherein an example discrete event may be a cache hit 1106, a cache hit 1108, etc. On the other hand, the "CP metadata may simply state that any request ending with an .xml extension is processed with the XSLT processor." *See* Lewin,

[1] Examples in the specification are not intended to limit the scope of the claims in any way.

paragraph [0054]. Clearly, the Office in incorrect in interpreting that *metadata* disclosed in Lewin reads on the *discrete event* recited in claim 1.

Furthermore, "selecting a processor" is not the same as "selecting a rule," as recited in claim 1. Specifically, a rule as recited in claim 1 is a "rule from a set of rules defining the plurality of event types." On the other hand, a processor, as disclosed in Lewin is merely a processor, such as for example, an ESI processor, an XSLT processor, a WML processor, etc. *See* Lewin, paragraph [0049]. As further defined in Lewin, "a 'processor' is any mechanism that algorithmically processes a formal language to generate output that differs from the input." *Id.*, paragraph [0048], *emphasis added*. The Office has not provided any rationale as to how such a mechanism reads on a "rule from a set of rules defining the plurality of event types," as recited in claim 1.

As discussed above, because the *metadata* cannot read on *discrete event* and because *processor* cannot read on a *rule*, "selecting a processor based on metadata" as disclosed in Lewin cannot disclose or suggest "selecting a rule based on the discrete event," let alone "selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types," as recited in claim 1.

B. Claim 1 recites, *inter alia*, "the core engine including a structured object model having a plurality of objects instantiated and available to process a plurality of event types" and "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event," (*emphasis added*).

Lewin, Warila, and Doyle, alone or in any combination, do not disclose at least "selecting a module to process the discrete event based on the selected rule and identity of a user requesting

processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine."

1. The Office again relies on paragraph [0049] of Lewin as disclosing "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine (*emphasis added*)." *See* Office Action, page 3. The Appellants respectfully disagree. Paragraph [0049] of Lewin is reproduced below:

> [0049] A particular advantage of the present invention is the ability to handle multiple types of content using an integrated pluggable architecture having an underlying dynamic content assembly mechanism. Multiple processors (for processing different content types) can be instantiated to handle a specific request for a given container page, as will be seen. In particular, preferably a given content request received at the edge server is mapped, e.g., by content provider-specific metadata, to instantiate a given base processor, and one or more additional processors may then be instantiated as necessary to assemble given content fragments into the container to produce an assembled document that is then returned to the requesting end user. Multiple processors may also be daisy-chained together to sequentially process a request (e.g., ESI.fwdarw.XSLT.fwdarw.WML). (*Emphasis added*).

While this paragraph discloses initiating one of multiple "processors" to handle specific request, there is no disclosure of "selecting a module … wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine." For example, there is no disclosure of either of the "base processor" or any of the "additional processors" "process[ing] the discrete event using at least one of the plurality of objects of the core engine." In fact, there is no disclosure of the "processors" discussed in paragraph [0049] using at least one of a "plurality of objects of the core engine" to process a discrete event.

The Office has cursorily cited paragraph [0052] as disclosing "at least one of the plurality of objects," the objects disclosed in paragraph [0052] are objects associated with a request. Paragraph [0052] of Lewin is reproduced below:

> [0052] FIG. 10 illustrates the dynamic content assembly process for an XML container that requires an XSL transformation after the edge server has been selected. At step (1), the end user request for the XML container (e.g., . . . /my.xyz.xml) is directed to the optimal server for the user. The XML object associated with the request may already be cached at the edge server. If the XML source is not cached, it is fetched from the origin server and then cached. This is step (2). The edge server then parses through the XML page. The XML page typically includes an XSL style sheet. At step (3), the server checks to see if the XSL style sheet is already cached. If not, the server fetches the XSL object from its referenced location and, if appropriate, caches it. At step (4), the server transforms the XML per the instructions in the XSL, creating a page that the server then delivers to the end user. An example of this page is set forth below. (*Emphasis added*).

However, as shown above in paragraph [0052], there is no disclosure of these objects being "objects of the core engine," as recited in claim 1. Furthermore, paragraph [0052] merely discloses caching such objects (the "XML object" and the "XSL object"). There is no disclosure of the "processors" disclosed in paragraph [0049] processing the discrete events using the "objects" disclosed in paragraph [0052]. Furthermore, the remaining disclosure of Lewin also does not disclose or suggest "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine." At least for these reasons, Lewin fails to disclose each and every limitation of claim 1.

2. The Office also seems to rely on Doyle as disclosing "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event," (*emphasis added*). *See* Office Action, page 3. Specifically, the Office cites to paragraph [0041] of Doyle as disclosing "selecting a module … based on identity of a user." The Appellants respectfully disagree. Paragraph [0041] of Doyle is reproduced below:

> [0041] The roles of users 141a and 141b are as content authors, generally referred to as the authors 141. The authors 141 are generally employees of the service provider. The authors 141 have direct access to the content management module 103a so that they can generate and maintain the content of the benefits programs stored in the repository 103b. The authors 141 also generate and maintain templates that can include both static content and logic to generate dynamic content. The

> authors 141 also generate and maintain logic to incorporate business rules that can trigger specific content based on client, participant, or benefits program data (e.g., variables). (*Emphasis added*).

While this paragraph discloses authors (users) performing specific tasks (such as "generating and maintaining templates," "generating and maintaining logic to incorporate business rules), there is no disclosure or suggestion of "selecting a module to process a discrete event based on … identity of a user," as recited in claim 1. As a matter of fact, there is no disclosure of the selecting "any module" based on "identity of a user," let alone "selecting a module to process events … based in identity of a user." The Appellants invite the Office to point out what it considers as a "module" in paragraph [0041] that is selected based on identity of the author 141 ("user"). Furthermore, the Appellants do not see any "module to process [[a]] discrete event" being disclosed in paragraph [0041]. If the Office disagrees, again, the Appellants invite the Office to point out such disclosure of a "module to process the discrete event."

Furthermore, the remaining disclosure of Doyle, or any part of Lewin and Warila, also do not disclose or suggest "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine." Thus, the combination of Lewin, Warila, and Doyle fails to disclose each and every element of claim 1. The Appellant respectfully asserts that claim 1 is patentable over the 35 U.S.C. § 103(a) rejection of record. The Appellant respectfully requests allowance of claim 1 and each of the dependent claims 2-5 and 10-13 as being dependent from an allowable base claim.

Response to Arguments

In the Response to Arguments section of the Final Office Action, the Office first argues that "Lewin[] disclose that [] each containers (e.g., XML containers which contain XML objects, DCA

containers contain objects, 0054) is being used by the selected processor (e.g., selected module) to process request(s) (e.g., discrete event)." *Id.*, page 2.

Essentially, the Office is relying on paragraph [0054] of Lewin as disclosing the above recited limitation of claim 1. The cited section is reproduced below:

> [0054] The dynamic content assembly processes illustrated above are implemented by a dynamic content assembly (DCA) mechanism in cooperation with GHost operative in an edge server. FIG. 11 illustrates the basic processing. When the GHost software 1100 initializes, it starts a DCA worker thread 1102, which then loops, looking for work that may be performed by the mechanism. As described above, it is assumed that GHost receives requests for page resources, typically DCA container documents (e.g., index.html, index.xml, index.jsp, etc.) that may contain ESI-based or other server side scripting markup. (XML and JSP pages typically may not have ESI tags in them but still may use other "include" functionality that permits combining fragments and containers). Although not part of the present invention, the GHost software preferably includes the ability to process a given request according to content provider-specified "metadata" that may be provided to GHost in the request directly, in a request header, or via an out-of-band delivery mechanism (e.g., using the CDN). Thus, a given request received by GHost preferably is processed against content provider (CP) metadata to determine how the request is to be processed by GHost. As an example, given CP metadata may simply state that any request ending with an .xml extension is processed with the XSLT processor. More generally, metadata can be used to control the choice of processor, irrespective on content type or filename extension.
>
> *Id., emphasis added.*

Based on the comments by the Office and the reading of paragraph [0054], it seems that the Office is reading the "processor" disclosed in Lewin as the "module to process a discrete event" recited in claim 1. However, such interpretation is incorrect for a number of reasons.

First of all, claim 1 recites that "wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine." (*Emphasis added*). There is no disclosure in Lewin that the "processor" disclosed in paragraph [0054] processes any discrete event using at least one of the plurality of objects of the core engine, in the manner recited in claim 1. In fact, the example of the "processor" selected in Lewin is an XSLT processor. *See Id.* While Lewin does not define an XSLT processor, as one of skill in the art would recognize, an XSLT processor is

a processor that transforms an XML documents into other XML documents, or other formats such as HTML for web pages, plain text or into XSL formatting objects, which may subsequently be converted to other formats, such as ODF, PostScript, and PNG. *See* https://en.wikipedia.org/wiki/XSLT.

Thus, the "processor" referred to by the cited sections of Lewin is merely a processor that transforms documents. Therefore, the "processor" of Lewin cannot be the "selected module [that] processes the discrete event using at least one of the plurality of objects of the core engine."

Furthermore, the rules of the PTO require that application claims must conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.[2] Thus, during examination claim terms are given their broadest reasonable interpretation consistent with the specification,[3] giving weight to all of the terms in the claim.[4] The "broadest reasonable interpretation" is the meaning that the skilled artisan would give to the claim term in view of the associated usage provided in the specification.[5] A construction that is inconsistent with the written description would not be arrived at by the skilled artisan, and is therefore not a "reasonable interpretation."[6]

Accordingly, the broadest reasonable interpretation of *module* consistent with that that term's explicitly defined meaning and consistent with the entire usage limited to that explicitly defined meaning has to be in line with the modules 1006, 1008, 1010 defined in FIG. 10. As

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[2] *Phillips v. AWH Corp.*, 75 USPQ2d 1321 (Fed. Cir. 2005)(en Banc), quoting 37 C.F.R. § 1.75(d)(1).
[3] *Phillips, supra;* MPEP 2111
[4] *Ex Parte Givens*, Appeal 2009-003414 (BPAI, August 6, 2009).
[5] *In re American Academy of Science Technical Center*, 70 USPQ2d 1827 (Fed. Cir. 2004); *In re Cortright*, 49 USPQ2d 1463, 1468 (Fed. Cir. 1999); *In re Morris*, 44 USPQ2d 1023 (Fed. Cir. 1997)
[6] *Phillips, supra*; *In re Morris, supra*; *In re Zletz*, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)

disclosed in the Application Specification with respect to the modules disclosed in FIG. 10, "the modules 1006, 1008 and 1010 provide various customizable features or services without requiring added complexity in the core engine 1002." *See Id.*, paragraph [0105]. Compared to that there is no disclosure in Lewin that the "processor" provides any such features or services. Therefore, the Appellants respectfully submit that paragraph [0054] does not disclose the "selected module [that] processes the discrete event using at least one of the plurality of objects of the core engine," as recited in claim 1.

The Office goes on to argue that "[t]he system using metadata (software) to determine a way (selecting a rule) to process the request (e.g., event) based on the request type (a match between how to the event type) which defines the request and select a module based on the selected rule (refer to par 0054)." *Id.*, page 2.

Here the Office has compared *metadata* to *software*. However, as one of skill in the art knows, metadata is simply a type of data and not software. This is further supported by Lewin paragraph [0054], which states that "CP metadata may simply state that any request ending with an .xml extension is processed with the XSLT processor." Furthermore, while the Office suggests that paragraph [0054] discloses "request type [which defines the request]," there is no disclosure of any "request type" anywhere in Lewin, let alone in paragraph [0054]. Thus, the Office's assertion is both false and unsupported.

For the reasons discussed above, the Appellants respectfully submit that the Response to Arguments as per the Office Action fails to respond to the Appellants' arguments. Therefore, claim 1 is allowable over the cited references. Furthermore, each of claims 2-5 includes each and every limitation of claim 1. Therefore, each of the claims 2-5 is allowable at least for the reasons discussed above with respect to claim 1.

Claim 6

Claim 6 recites one or more limitations similar to the limitations discussed above with respect to claim 1. Specifically, claim 6 recites, *inter alia*, "select a rule based on the identified discrete event, the rule being from a set of rules defining the plurality of event types" and "select a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine."

Therefore, at least for the reasons discussed above with respect to claim 1, claim 6 and its dependent claims are allowable over the cited references.

Claim 16

Claim 16 recites one or more limitations similar to the limitations discussed above with respect to claim 1. Specifically, claim 16 recites, *inter alia*, "a plurality of modules to process the plurality of event types, wherein the core engine selects one of the plurality of modules to process the identified discrete event based on identity of a user requesting processing of the discrete event, the module being configured to process the discrete event using at least one of the plurality of objects of the core engine."

Therefore, at least for the reasons discussed above with respect to claim 1, claim 16 and its dependent claims are allowable over the cited references.

CONCLUSION

In view of the law and facts stated herein, the Appellant respectfully submits that the reasoning and the references cited by the Office are insufficient to maintain obviousness and rejection of the claims. The Appellant respectfully urges that the rejections of Claims 1-7 and 10-19 be withdrawn. Reversal of the rejections and allowance of the claims in this application is respectfully requested.

The Appellant hereby petitions for a TWO-month extension of time and are electronically submitting the required fee with this response. The Appellant believes no other petitions or fees are necessary, but if this is incorrect, please consider this a petition and authorization of payment thereof. The Commissioner is authorized to deduct any additional fees from or credit any overpayment to the undersigned's account no. 50-5063.

A representative from the U.S. Patent and Trademark Office is invited to contact the undersigned at the below-listed telephone number regarding any matters relating to the present application.

Respectfully submitted,

Date: November 17, 2015

/JCS/

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VIII. CLAIMS APPENDIX (37 C.F.R. §41.37(c)(v)

Listing of Claims:

1. (Previously Presented) A method of providing an extensible content delivery platform, the method comprising:

identifying, by a computer system, receipt of a discrete event at a core engine of a content delivery network, the core engine including a structured object model having a plurality of objects instantiated and available to process a plurality of event types;

selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types;

selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine.

2. (Previously Presented) The method as recited in claim 1 wherein the discrete event is an event of a content delivery process of a content delivery network.

3. (Previously Presented) The method as recited in claim 1 wherein identifying the discrete event further comprises identifying the discrete event using the set of rules.

4. (Previously Presented) The method as recited in claim 1 further comprising a set of base functions to be performed at a plurality of discrete events including the identified discrete event.

5. (Previously presented) The method as recited in claim 1 further comprising a set of base functions to be performed upon the plurality of objects.

6. (Previously Presented) A cache server comprising:

a core engine executing on a processor of the cache server, the core engine including a structured object module having a plurality of objects instantiated and available to process a plurality of event types in a content delivery network, the core engine being configured to:

identify receipt of a discrete event of a content delivery process;

select a rule based on the identified discrete event, the rule being from a set of rules defining the plurality of event types; and

select a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine.

7. (Previously Presented) A cache server as recited in claim 6 wherein the selected module is one of a plurality of user definable modules.

8. (Canceled)

9. (Canceled)

10. (Previously Presented) The method as recited in claim 1, wherein selecting the rule further comprises:

selecting the rule based on an event type of the identified discrete event.

11. (Previously Presented) The method as recited in claim 1, further comprising:

adding a rule to the set of rules, the rule specifying a module to process a new event type; and

identifying receipt of an event of the new event type and processing the event using the specified module.

12. (Previously Presented) The method as recited in claim 1, wherein the selected

module processes the discrete event without altering logic of the core engine.

13. (Previously Presented) The method as recited in claim 1, wherein the module selected is one of a plurality of_user definable modules.

14. (Previously Presented) The cache server as recited in claim 6, wherein the core engine is further configured to select the rule based on an event type of the discrete event.

15. (Previously Presented) The cache server as recited in claim 6, wherein the selected module processes the discrete event without altering logic of the core engine.

16. (Previously Presented) A system comprising:

a core engine executing on a processor of a cache server of a content delivery network, the core engine including a structured object model having a plurality of objects instantiated and available to process a plurality of event types in a content delivery network, the core engine being configured to identify receipt of a discrete event of a content delivery process; and

a plurality of modules to process the plurality of event types, wherein the core engine selects one of the plurality of modules to process the identified discrete event based on identity of a user requesting processing of the discrete event, the module being configured to process the discrete event using at least one of the plurality of objects of the core engine.

17. (Previously Presented) The system of claim 16, wherein the core engine selects the one of the plurality of modules based on a rule defining an event type of the discrete event.

18. (Previously Presented) The system of claim 16, wherein the selected module processes the discrete event without altering logic of the core engine.

19. (Previously Presented) The system of claim 16, wherein the plurality of modules are

user-definable modules.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

No decisions have been rendered by a court or the Board in any proceeding identified pursuant to paragraph 37 C.F.R. §41.37 (c)(1)(ii).

PTO/SB/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 0370-US-U1

Application Number: 12/836,418

Filed: July 14, 2010

For: CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

Art Unit: 2447

Examiner: Karen C. TANG

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☑ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$ 600
☐ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

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

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration number 58,259.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/JCS/ — Signature

November 17, 2015 — Date

Jonathan C. Siekmann — Typed or printed name

720-888-2140 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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.

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 2 months with $0 paid	1252	1	600	600
Miscellaneous:				
			Total in USD ($)	**600**

Electronic Acknowledgement Receipt

EFS ID:	24111332
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	17-NOV-2015
Filing Date:	14-JUL-2010
Time Stamp:	16:58:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Appeal Brief Filed	0370_US_U1_AppealBrief.pdf	112111 5df25ac7198091dba0ce9057f0fd7bb90e231417	no	21

Warnings:	
Information:	

2	Extension of Time	0370_US_U1_EOT.pdf	186418 27290e6058d7a2d38f09938d316c2a8cdf07d997	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31147 756854255e080b55539e7d2f4306a7be0ad4603e	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	329676	

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

PTO/SB/31 (02-14)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD

Docket Number (Optional): 0370-US-U1

I hereby certify that this correspondence is being facsimile transmitted to the USPTO EFS-Web transmitted to the USPTO, or or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)]

on _____

Signature _____

Typed or printed name _____

In re Application of: Ted Middleton

Application Number	Filed
12/836,418	07-14-2010

For: CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

Art Unit	Examiner
2447	TANG, KAREN C

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 800.00

☐ Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by half, and the resulting fee is: $ _____

☐ A check in the amount of the fee is enclosed.

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

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 50-5063 .

☐ A petition for an extension of time under 37 CFR 1.136(a) (PTO/SB/22) is enclosed.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

☑ attorney or agent of record. Registration number 48,229.

☐ attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34. _____

/David D. Wier/
Signature

David D. Wier
Typed or printed name

720-888-3539
Telephone number

July 17, 2015
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 41.31. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Privacy Act Statement

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Notice of Appeal	1401	1	800	800
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**800**

Electronic Acknowledgement Receipt

EFS ID:	22950428
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier
Filer Authorized By:	
Attorney Docket Number:	0370-US-U1
Receipt Date:	17-JUL-2015
Filing Date:	14-JUL-2010
Time Stamp:	14:45:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$800
RAM confirmation Number	945
Deposit Account	505063
Authorized User	WIER, DAVID D

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)

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

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	Notice of Appeal Filed	20150717NoticeofAppeal.pdf	217490 06db5f309a423b813600976a557e85423f0687d3	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30697 05ea4be227449a607bd40fded44de351bbd19536	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	248187		

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.

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

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

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

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Japanese Decision of Rejection, dated April 7, 2015, Application No. 2012-528936, filed September 10, 2010, Dkt. No. 0370-JP-01, 3 pgs.	

EXAMINER **DATE CONSIDERED**

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

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Kathleen McInnish
Attorney Docket Number:	0370-US-U1

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:	22111743
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	20-APR-2015
Filing Date:	14-JUL-2010
Time Stamp:	16:15:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$180
RAM confirmation Number	3271
Deposit Account	505063
Authorized User	SIEKMANN, JONATHAN

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 1.17 (Patent application and reexamination processing fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370USU1_IDS.pdf	37598 26da9b1d02a064a97f37251f9ff66d20273dbe0e	no	5
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	370USU1_sb08.pdf	28598 d28cd2970d664f749d16699ebca8c09ea14ba179	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	JP_2012528936_Rejection_7Apr15_370JP.pdf	948730 4b8ac14bafd32d4f58b95ab471556ce9a72e7bef	no	3
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30898 daac3d895e3b215d40c8ff689c27e73799cdf4a1	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1045824		

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

New Applications Under 35 U.S.C. 111

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New International Application Filed with the USPTO as a Receiving Office

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	MIDDLETON, Ted	Art Unit	:	2447
Filed	:	July 14, 2010	Examiner	:	Karen C. Tang
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			

Submitted Via EFS-Web

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

Sir:

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

Copies of all of the cited documents:

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant on __April 17, 2015__.

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

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

II
FEES

Any required fee is being paid as indicated below:

☐ No fee is due.

☒ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☒ This fee is paid by credit card.

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

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

III

CERTIFICATION

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

☐ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

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

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

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

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

V
REMARKS

It is respectfully requested that:

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

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted,

Date: April 20, 2015

/JCS/

Jonathan C. Siekmann, Reg. No. 58,259
USPTO Customer No. 83579
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-2140

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.
12/836,418	07/14/2010	Ted Middleton	0370-US-U1	2155

83579 7590 04/17/2015

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

EXAMINER
TANG, KAREN C

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
04/17/2015	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No. 12/836,418	Applicant(s) MIDDLETON, TED	
	Examiner KAREN TANG	Art Unit 2447	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 *3/11/2015*.

☐ 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) *1-7 and 10-19* 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) *1-7, 10-19* 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 _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *3/19/2015*.

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

4) ☐ Other: _____.

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

- Claims 1-7, 10-19 are presented for further examination.
- This action is responsive to the amendment and remarks file on 3/11/2015

Response to Arguments

Applicant's arguments filed 3/11/2015 have been fully considered but they are not persuasive.

Applicant argues that the references fail to teach "selecting a module….using at least one of plurality of objects of the core engine"

Examiner respectfully disagrees.

Lewin, discloses that that each containers (e.g., XML containers which contain XML objects, DCA containers contains objects, 0054) is being used by the selected processor (e.g., selected module) to process request(s) (e.g., discrete event).

The system using metadata (software) to determine a way (selecting a rule) to process the request (e.g., event) based on the request type (a match between how to the event type) which defines the request and select a module based on the selected rule (refer to par 0054).

Therefore, the arguments are not persuasive. The rejection is therefore maintained.

Claim Rejections - 35 USC § 103

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

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

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-7, 10-19 are are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewin et al hereinafter Lewin (US 2009/0150518) in view of Doyle et al hereinafter Doyle (US 20060235738) in further view of Warila et al hereinafter Warila (US 20080313282)

1. Referring to Claim 1. Lewin discloses a method of providing an extensible content delivery platform, the method comprising: receipt of a discrete event at a core engine of a content delivery network, the core engine (edge server, refer to par 0049) comprising a structured object model having a plurality of objects (e.g., DCA containers, JVM containers, XSL objects, refer to par 0052, 0048) instantiated and available to process a plurality of event types (e.g., choose a selected particular module/processor, refer to par 0054); selecting a rule based on the discrete event (based on the metadata, refer to par 0049, 0054), the rule from a set of rules defining the plurality of event types; selecting a module (select/instantiate a processor, refer to par 0049) to process the discrete event based on the selected rule and identify of user requesting processing of the discrete event (refer to par 0049); wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine (refer to par 0049, 0052).

Doyle, in analogous art, further discloses process the event also based on the roles of the users, (refer to par 0041).

It would have been obvious for one of ordinary skill in the art to combine the teaching of Lewin with Doyle because Doyle's teaching would allow Lewin's system to automatically providing more or less content as the situation requires and further allows multiple plans from

the same plan type to be designated as actively enrolled in or sharing benefits program content across different program to realize efficiencies of scales (as supported by Warila, refer to Fig 9).

2. Referring to Claim 2. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein the discrete event is an event of a content delivery process of a content delivery network (refer to par 0054).

3. Referring to Claim 3. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein identifying the discrete event further comprises identifying the discrete event using the set of rules (refer to par 0049).

4. Referring to Claim 4. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed at a plurality of discrete events comprising the identified discrete event (refer to par 0056).

5. Referring to Claim 5. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed upon the plurality of objects (refer to par 0056).

6. Referring to Claim 6. Claim is rejected under similar rational as claim 1.

7. Referring to Claim 7. Lewin, Doyle and Warila disclosed the cache server as recited in claim 6. Lewin further discloses wherein the selected module is one of a plurality of user definable modules (refer to par 0056).

8. Referring to Claim 10. Lewin, Doyle and Warila disclosed the method as recited in claim 1. Lewin further discloses wherein selecting the rule further comprises selecting the rule based on an event type of the identified discrete event (refer to par 0049).

9. Referring to Claim 11. Lewin, Doyle and Warila disclosed the method of claim 1. Lewin further discloses adding a rule to the set of rules (metadata is a user defined rules), the rule specifying a module to process a new event type (refer to par 0054); and identifying receipt of an event of the new event type and processing the event using the specified module (refer to par 0054);

10. Referring to Claim 12. Lewin, Doyle and Warila disclosed the method as recited in claim 1. Lewin further wherein the selected module processes the discrete event without altering logic of the core engine (refer to abstract).

11. Referring to Claim 13. Lewin, Doyle and Warila disclosed the method as recited in claim 1, Wherein the module selected is one of a plurality of user- definable modules (all modules are user definable since its programmable modules by users).

12. Referring to claims 15-19, claims are rejected under similar rational as claims 1-7, 10-13.

Conclusion

Examiner's Notes: Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. In the case of amending the claimed invention, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on for proper interpretation and also to verify and ascertain the metes and bounds of the claimed invention.

Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAREN TANG whose telephone number is (571)272-3116. The examiner can normally be reached on M-F 7 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOON H. HWANG can be reached on (571)272-4036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Karen C Tang/
Primary Examiner, Art Unit 2447.

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

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

	Complete if Known
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

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

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Chinese Second Examination Report, dated January 30, 2015, Application No. 20108004026.7, filed September 10, 2010; Dkt. No. 0370-CN-01, 9 pgs.	

EXAMINER /Karen Tang/ **DATE CONSIDERED** 04/14/2015

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.T./

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	**Art Unit**
	KAREN TANG	2447

✓	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	11/14/2012	07/22/2013	11/07/2014	04/06/2015					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	✓					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	-	-					
	9	✓	✓	-	-					
	10			✓	✓					
	11			✓	✓					
	12			✓	✓					
	13			✓	✓					
	14			✓	✓					
	15			✓	✓					
	16			✓	✓					
	17			✓	✓					
	18			✓	✓					
	19			✓	✓					

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	Art Unit
	KAREN TANG	2447

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	217,222,224	11/14/2012	KT

SEARCH NOTES		
Search Notes	Date	Examiner
East Search with Keyword and Class Search	11/14/2012	KT
Google Search	11/14/2012	KT
ACM Search	11/14/2012	KT
IEEE Search	11/14/2012	KT
Inventor Search	11/14/2012	KT
Double Patenting Search	11/14/2012	KT
Search Updates	7/22/2013	KT
Search Updates	11/7/2014	KT

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
709	217,222,224	7/14/2012	KT

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

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

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Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

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

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Chinese Second Examination Report, dated January 30, 2015, Application No. 20108004026.7, filed September 10, 2010; Dkt. No. 0370-CN-01, 9 pgs.	

EXAMINER **DATE CONSIDERED**

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

Electronic Acknowledgement Receipt

EFS ID:	21821448
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	19-MAR-2015
Filing Date:	14-JUL-2010
Time Stamp:	14:54:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370USU1_IDS.pdf	37516 e600c439b385446c1457d06455a591198e58edb1	no	5

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Form (SB08)	370USU1_sb08.pdf	28579 7dafa86d8bf1b76e0129c506f30121376fa987e9	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	CN_2010800402067_2dExRpt_30Jan15_370CN01.pdf	832500 1717d2a36d176661f17d6eae037bade06c93e666	no	9
Warnings:					
Information:					
		Total Files Size (in bytes):	898595		

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	MIDDLETON, Ted	Art Unit	:	2447
Filed	:	July 14, 2010	Examiner	:	Karen C. Tang
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			

Submitted Via EFS-Web

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

Sir:

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

Copies of all of the cited documents:

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant on _____.

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

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

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

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

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

III

CERTIFICATION

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

☐ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

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

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

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

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

V
REMARKS

It is respectfully requested that:

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

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted,

Date: March 19, 2015

/JCS/

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Tel: 720-888-2140

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Applicant:	Ted Middleton	Confirmation No:	2155
Serial No.:	12/836,418	Group Art Unit:	2447
Filed:	14 July 2010	Examiner:	TANG, Karen C.
Title:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK	Customer No.	83579

RESPONSE TO NON-FINAL OFFICE ACTION

Via EFS-Web
MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the final Office Action dated 14 November 2014 please amend the above-identified application as follows:

Extension of Time Request begins on page **2** of this paper.

Amendments to the Claims begin on page **3** of this paper.

Remarks/Arguments begin on page **7** of this paper.

Extension of Time

Applicant hereby petitions for a **ONE-**month extension of time and is electronically submitting the required fee with this response. Applicant believes no other Petitions or fees are necessary, but if this is incorrect, please consider this a Petition and authorization of payment therefor. The Commissioner is authorized to deduct any additional fees from or credit any overpayment to the account no. 50-5063.

Amendments to the Claims:

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

Listing of Claims:

1. (Previously Presented) A method of providing an extensible content delivery platform, the method comprising:

identifying, by a computer system, receipt of a discrete event at a core engine of a content delivery network, the core engine including a structured object model having a plurality of objects instantiated and available to process a plurality of event types;

selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types;

selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine.

2. (Previously Presented) The method as recited in claim 1 wherein the discrete event is an event of a content delivery process of a content delivery network.

3. (Previously Presented) The method as recited in claim 1 wherein identifying the discrete event further comprises identifying the discrete event using the set of rules.

4. (Previously Presented) The method as recited in claim 1 further comprising a set of base functions to be performed at a plurality of discrete events including the identified discrete event.

5. (Previously presented) The method as recited in claim 1 further comprising a set of base functions to be performed upon the plurality of objects.

6. (Previously Presented) A cache server comprising:

a core engine executing on a processor of the cache server, the core engine including a structured object module having a plurality of objects instantiated and available to process a plurality of event types in a content delivery network, the core engine being configured to:

identify receipt of a discrete event of a content delivery process;

select a rule based on the identified discrete event, the rule being from a set of rules defining the plurality of event types; and

select a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine.

7. (Previously Presented) A cache server as recited in claim 6 wherein the selected module is one of a plurality of user definable modules.

8. (Canceled)

9. (Canceled)

10. (Previously Presented) The method as recited in claim 1, wherein selecting the rule further comprises:

selecting the rule based on an event type of the identified discrete event.

11. (Previously Presented) The method as recited in claim 1, further comprising:

adding a rule to the set of rules, the rule specifying a module to process a new event type; and

identifying receipt of an event of the new event type and processing the event using the specified module.

12. (Previously Presented) The method as recited in claim 1, wherein the selected module processes the discrete event without altering logic of the core engine.

13. (Previously Presented) The method as recited in claim 1, wherein the module selected is one of a plurality of user definable modules.

14. (Previously Presented) The cache server as recited in claim 6, wherein the core engine is further configured to select the rule based on an event type of the discrete event.

15. (Previously Presented) The cache server as recited in claim 6, wherein the selected module processes the discrete event without altering logic of the core engine.

16. (Previously Presented) A system comprising:

a core engine executing on a processor of a cache server of a content delivery network, the core engine including a structured object model having a plurality of objects instantiated and available to process a plurality of event types in a content delivery network, the core engine being configured to identify receipt of a discrete event of a content delivery process; and

a plurality of modules to process the plurality of event types, wherein the core engine selects one of the plurality of modules to process the identified discrete event based on identity of a user requesting processing of the discrete event, the module being configured to process the discrete event using at least one of the plurality of objects of the core engine.

17. (Previously Presented) The system of claim 16, wherein the core engine selects the one of the plurality of modules based on a rule defining an event type of the discrete event.

18. (Previously Presented) The system of claim 16, wherein the selected module processes the discrete event without altering logic of the core engine.

19. (Previously Presented) The system of claim 16, wherein the plurality of modules are user-definable modules.

Remarks

This Response is considered fully responsive to the final Office Action mailed November 11, 2014. Claims 1-7 and 10-19 were pending in the application. Claims 1-7 and 10-19 stand rejected. In this Response, no claims are amended, added or canceled.

Reexamination and reconsideration are respectfully requested.

Rejections Under 35 U.S.C. § 103

The Office has rejected claims 1-7 and 10-199 under 35 U.S.C. § 103(a) as purportedly being unpatentable over US Application Publication No. 2009/0150518 A1 to Lewin et al. ("Lewin") in view of U.S. Patent Application Publication No. 2006/0235738 to Doyle et al. ("Doyle"), and further in view of U.S. Patent Application Publication No. 2008/0313282 A1 to Warila et al. ("Warila").

The Applicant respectfully traverses these rejections for at least the following reasons:

To establish prima facie obviousness of a claimed invention, two basic criteria must be met. First, all of the claim elements must be shown by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Second, there must be some rationale or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the references or to combine reference teaching. In other words, there should be an explicit analysis regarding whether there was an apparent reason to combine the known elements in the fashion claimed in the application at issue. *KSR Int'l Co. v. Teleflex, Inc.*, 127 S, Ct. 1727, 1741 (2007). Without conceding the second criteria, the Applicant respectfully asserts that the rejection does not satisfy the first criteria, as discussed below.

Claim 1

Claim 1 recites, *inter alia*, "the core engine including a structured object model having a plurality of objects instantiated and available to process a plurality of event types" and "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event," (*emphasis added*).

Lewin, Warila, and Doyle, alone or in any combination, do not disclose at least

"selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine."

1. The Office relies on paragraph [0049] of Lewin as disclosing "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine (*emphasis added*)." *See* Office Action, page 3. The Applicants respectfully disagree. Paragraph [0049] of Lewin is reproduced below:

> [0049] A particular advantage of the present invention is the ability to handle multiple types of content using an integrated pluggable architecture having an underlying dynamic content assembly mechanism. Multiple processors (for processing different content types) can be instantiated to handle a specific request for a given container page, as will be seen. In particular, preferably a given content request received at the edge server is mapped, e.g., by content provider-specific metadata, to instantiate a given base processor, and one or more additional processors may then be instantiated as necessary to assemble given content fragments into the container to produce an assembled document that is then returned to the requesting end user. Multiple processors may also be daisy-chained together to sequentially process a request (e.g., ESI.fwdarw.XSLT.fwdarw.WML). (*Emphasis added*).

While this paragraph discloses initiating one of multiple "processors" to handle specific request, there is no disclosure of "selecting a module … wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine." For example, there is no disclosure of either of the "base processor" or any of the "additional processors" "process[ing] the discrete event using at least one of the plurality of objects of the core engine." In fact, there is no disclosure of the "processors" discussed in paragraph [0049] using at least one of a "plurality of objects of the core engine" to process a discrete event.

The Office has cursorily cited paragraph [0052] as disclosing "at least one of the plurality of objects," the objects disclosed in paragraph [0052] are objects associated with a request. Paragraph [0052] of Lewin is reproduced below:

> [0052] FIG. 10 illustrates the dynamic content assembly process for an XML container that requires an XSL transformation after the edge server has been selected. At step (1), the end user request for the XML container (e.g., . . . /my.xyz.xml) is directed to the optimal server for the user. The XML object associated with the request may already be cached at the edge server. If the XML source is not cached, it is fetched from the origin server and then cached. This is step (2). The edge server then parses through the XML page. The XML page

> typically includes an XSL style sheet. At step (3), the server checks to see if the XSL style sheet is already cached. If not, the server fetches the XSL object from its referenced location and, if appropriate, caches it. At step (4), the server transforms the XML per the instructions in the XSL, creating a page that the server then delivers to the end user. An example of this page is set forth below. (*Emphasis added*).

However, as shown above in paragraph [0052], there is no disclosure of these objects being "objects of the core engine," as recited in claim 1. Furthermore, paragraph [0052] merely discloses caching such objects (the "XML object" and the "XSL object"). There is no disclosure of the "processors" disclosed in paragraph [0049] processing the discrete events using the "objects" disclosed in paragraph [0052]. Furthermore, the remaining disclosure of Lewin also does not disclose or suggest "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine." At least for these reasons, Lewin fails to disclose each and every limitation of claim 1.

2. The Office also seems to rely on Doyle as disclosing "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event," (*emphasis added*). *See* Office Action, page 3. Specifically, the Office cites to paragraph [0041] of Doyle as disclosing "selecting a module … based on identity of a user." The Applicants respectfully disagree. Paragraph [0041] of Doyle is reproduced below:

> [0041] The roles of users 141a and 141b are as content authors, generally referred to as the authors 141. The authors 141 are generally employees of the service provider. The authors 141 have direct access to the content management module 103a so that they can generate and maintain the content of the benefits programs stored in the repository 103b. The authors 141 also generate and maintain templates that can include both static content and logic to generate dynamic content. The authors 141 also generate and maintain logic to incorporate business rules that can trigger specific content based on client, participant, or benefits program data (e.g., variables). (*Emphasis added*).

While this paragraph discloses authors (users) performing specific tasks (such as "generating and maintaining templates," "generating and maintaining logic to incorporate business rules), there is no disclosure or suggestion of "selecting a module to process a discrete

event based on … identity of a user," as recited in claim 1. As a matter of fact, there is no disclosure of the selecting "any module" based on "identity of a user," let alone "selecting a module to process events … based in identity of a user." The Applicants invite the Office to point out what it considers as a "module" in paragraph [0041] that is selected based on identity of the author 141 ("user"). Furthermore, the Applicants do not see any "module to process [[a]] discrete event" being disclosed in paragraph [0041]. If the Office disagrees, again, the Applicants invite the Office to point out such disclosure of a "module to process the discrete event."

Furthermore, the remaining disclosure of Doyle, or any part of Lewin and Warila, also do not disclose or suggest "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine." Thus, the combination of Lewin, Warila, and Doyle fails to disclose each and every element of claim 1. The Applicant respectfully asserts that claim 1 is patentable over the 35 U.S.C. § 103(a) rejection of record. The Applicant respectfully requests allowance of claim 1 and each of the dependent claims 2-5 and 10-13 as being dependent from an allowable base claim.

Claims 6 and 16

Furthermore, each of the independent claims 6 and 16 also recite one or more of the limitations of the claim 1 discussed above. Therefore, the Applicants request allowance of each of the claims 6 and 16 for the reasons discussed above with respect to claim 1. Furthermore, each of the dependent claims 7, 14, and 15 is allowable for being dependent from allowable base claim 6 and each of the dependent claims 17-19 is allowable for being dependent from allowable base claim 16.

Conclusion

Claims 1-7 and 10-19 are currently pending in the application. Applicant has fully responded to each and every objection and rejection in the final Office Action dated November 14, 2014, and believes that claims 1-7 and 10-19 are in a condition for allowance. Applicant therefore requests that a timely Notice of Allowance be issued in this case.

If the Examiner believes any issues could be resolved via a telephone interview, the Examiner is invited to contact the undersigned at the telephone number listed below.

If the Examiner believes any issues could be resolved via a telephone interview, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: March 11, 2015

/JCS/

Jonathan C. Siekmann, Reg. No. 58,259
Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
Tel: 720-888-2140
Fax: 720-888-5619

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
			Total in USD ($)	**200**

Electronic Acknowledgement Receipt

EFS ID:	21743605
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	11-MAR-2015
Filing Date:	14-JUL-2010
Time Stamp:	18:38:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$200
RAM confirmation Number	5022
Deposit Account	505063
Authorized User	SIEKMANN, JONATHAN

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)

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

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		0370_US_U1_ResponseNFOA.pdf	67641 32088713957ef178f03d9d5438f4ac4df53a5123	yes	11

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Extension of Time	2	2
Claims	3	6
Applicant Arguments/Remarks Made in an Amendment	7	11

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	31098 6acbd7dbc95ed31629f5ea094eb3bc2b72cbae28	no	2

Warnings:

Information:

Total Files Size (in bytes):	98739

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/836,418	Filing Date 07/14/2010	☐ 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	**330**
☐ 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	**330**

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)		
AMENDMENT	**03/11/2015**	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 3	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		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
/GLORIA J. TRAMMELL/

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

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/836,418	07/14/2010	Ted Middleton	0370-US-U1	2155

83579 7590 11/14/2014

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

EXAMINER
TANG, KAREN C

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
11/14/2014	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No. 12/836,418	Applicant(s) MIDDLETON, TED	
	Examiner KAREN TANG	Art Unit 2447	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 *6/10/2014*.

☐ 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) *1-7 and 10-19* 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) *1-7 and 10-19* 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 _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *9/2/2014, 6/10/2014*.

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

4) ☐ Other: _____.

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

- A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.1 14, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.1 14. Applicant's submission filed on 5/23/2014 has been entered.
- Claims 1-7, 10-19 are presented for further examination.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1-7, 10-19 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Claim Rejections - 35 USC § 103

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

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

Claims 1-7, 10-19 are are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewin et al hereinafter Lewin (US 2009/0150518) in view of Doyle et al hereinafter Doyle (US 20060235738) in further view of Warila et al hereinafter Warila (US 20080313282)

1. Referring to Claim 1. Lewin discloses a method of providing an extensible content delivery platform, the method comprising: receipt of a discrete event at a core engine of a content delivery network, the core engine (edge server, refer to par 0049) comprising a structured object model having a plurality of objects (e.g., DCA containers, JVM containers, XSL objects, refer to par 0052, 0048) instantiated and available to process a plurality of event types (e.g., choose a selected particular module/processor, refer to par 0054); selecting a rule based on the discrete event (based on the metadata, refer to par 0049, 0054), the rule from a set of rules defining the plurality of event types; selecting a module (select/instantiate a processor, refer to par 0049) to process the discrete event based on the selected rule and identify of user requesting processing of the discrete event (refer to par 0049); wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine (refer to par 0049, 0052).

Doyle, in analogous art, further discloses process the event also based on the roles of the users, (refer to par 0041).

It would have been obvious for one of ordinary skill in the art to combine the teaching of Lewin with Doyle because Doyle's teaching would allow Lewin's system to automatically providing more or less content as the situation requires and further allows multiple plans from

the same plan type to be designated as actively enrolled in or sharing benefits program content across different program to realize efficiencies of scales (as supported by Warila, refer to Fig 9).

2. Referring to Claim 2. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein the discrete event is an event of a content delivery process of a content delivery network (refer to par 0054).

3. Referring to Claim 3. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein identifying the discrete event further comprises identifying the discrete event using the set of rules (refer to par 0049).

4. Referring to Claim 4. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed at a plurality of discrete events comprising the identified discrete event (refer to par 0056).

5. Referring to Claim 5. Lewin, Doyle and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed upon the plurality of objects (refer to par 0056).

6. Referring to Claim 6. Claim is rejected under similar rational as claim 1.

7. Referring to Claim 7. Lewin, Doyle and Warila disclosed the cache server as recited in claim 6. Lewin further discloses wherein the selected module is one of a plurality of user definable modules (refer to par 0056).

8. Referring to Claim 10. Lewin, Doyle and Warila disclosed the method as recited in claim 1. Lewin further discloses wherein selecting the rule further comprises selecting the rule based on an event type of the identified discrete event (refer to par 0049).

9. Referring to Claim 11. Lewin, Doyle and Warila disclosed the method of claim 1. Lewin further discloses adding a rule to the set of rules (metadata is a user defined rules), the rule specifying a module to process a new event type (refer to par 0054); and identifying receipt of an event of the new event type and processing the event using the specified module (refer to par 0054);

10. Referring to Claim 12. Lewin, Doyle and Warila disclosed the method as recited in claim 1. Lewin further wherein the selected module processes the discrete event without altering logic of the core engine (refer to abstract).

11. Referring to Claim 13. Lewin, Doyle and Warila disclosed the method as recited in claim 1, Wherein the module selected is one of a plurality of user- definable modules (all modules are user definable since its programmable modules by users).

12. Referring to claims 15-19, claims are rejected under similar rational as claims 1-7, 10-13.

Conclusion

Examiner's Notes: Examiner has cited particular Cols and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. In the case of amending the claimed invention, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on for proper interpretation and also to verify and ascertain the metes and bounds of the claimed invention.

A shortened statutory period for reply to this Office action is set to expire THREE MONTHS from the mailing date of this action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karen C. Tang whose telephone number is (571)272-3116. The examiner can normally be reached on M-F 7 - 3.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joon Hwang can be reached on (571)272-3939. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Karen C Tang/
Primary Examiner, Art Unit 2447

Notice of References Cited	Application/Control No. 12/836,418	Applicant(s)/Patent Under Reexamination MIDDLETON, TED	
	Examiner KAREN TANG	Art Unit 2447	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2006/0235738	10-2006	Doyle et al.	705/009
	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	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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"20080313282".pn. "20090150518".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 20:21
S1	21131977	@ad<"20100714" @rlad<"20100714"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 09:41
S2	13289	(cache edge) near2 server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 09:43
S3	21	S2 same (API) same (existing legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 09:45
S4	21	S3 and S1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 09:45
S5	59904	content near2 (stream$3 delivery$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:09
S6	2788331	intermediate$1 gateway$1 prox$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:10
S7	139173	(multimedia content video music) near2 (stream$3 delivery$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:10
S8	13803	(API wrapper$1) same (existing legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:10
S9	1480	S6 and S7 and S8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:11

S10	1441	S9 and S1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:11
S11	2798208	intermediate$1 gateway$1 prox$3 (cach$3 near2 (gateway$1 prox$3 server$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:13
S12	18782	(API wrapper$1) same S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:13
S13	774	S12 and S10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:14
S14	309682	intermediate$1 near2 (node$1 server$1 gateway$1 prox$3) gateway$1 prox$3 (cach$3 near2 (gateway$1 prox$3 server$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:15
S15	746	S13 and S14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:15
S16	746	S15 and S1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:16
S17	2799009	intermediate$1 gateway$1 prox$3 ((cach$3 edge) near2 (gateway$1 prox$3 server$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17
S18	18851	(API wrapper$1) same S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17
S19	10215	S7 same S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17
S20	685	S18 and S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17
S21	167	S20 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17

S22	167	S21 and S8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:21
S23	266	(API wrapper$1 wrapped) same (existing legacy) with (infrastructure saystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 11:16
S24	247	S23 and S1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 11:18
S25	33	S7 and S24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 11:24
S27	21131977	@ad<"20100714" @rlad<"20100714"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:29
S28	139173	(multimedia content video music) near2 (stream$3 delivery$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:29
S29	266	(API wrapper$1 wrapped) same (existing legacy) with (infrastructure saystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:29
S30	247	S29 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:29
S31	33	S28 and S30	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:29
S32	13931	(API wrapper$1 wrapped driver$1 adaptor$1 bridge$1) same (existing legacy) with (infrastructure system)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:30
S33	7338	(extensive extensible) with platform$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:31
S34	202	S33 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:31

S35	1287	S32 and S28	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:31
S36	1244	S35 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:31
S37	199	S34 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:31
S38	147	S37 and (objects attribut$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 15:00
S39	1	"7161616".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 15:10
S40	30695	709/217,222,224.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 15:57
S41	4304	S40 and S28	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 15:57
S42	4	S41 and S29	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 15:57
S43	3	"20090150518".pn. "20080313282".pn. 12/836418	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2013/07/22 11:18
S44	72858175	@ad<"20100714" @rlad<"20100714"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 08:19
S45	1	12/836418	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 08:21
S46	2	"20090150518".pn. "20080313282".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 09:28

S47	0	S45 and (rule$1 and event$1 and event near2 type$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 09:45
S48	1	S45 and (rule$1 and event$1 and type$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 09:46
S49	81	(content near2 deliver$3) near15 based near15 (role identify) near15 (user$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 10:53
S50	72858175	@ad<"20100714" @rlad<"20100714"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 11:00
S51	52	S49 and S50	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 11:17
S52	49	S51 and (allow$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 11:17
S53	7	S51 and (allow$3) near15 (feature$1 function) near15 (user$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2014/11/07 11:18

11/7/2014 8:37:40 PM
C:\Users\ktang4\Documents\EAST\Workspaces\12836418.wsp

PTO/SB/08a (01-08)
Approved for use through 07/31/2012. OMB 0651-0031
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]
		CN-101023627A	Aug 22, 2007	Stirbu et al.		
		CN-101374158A	Feb 25, 2009	Burckhart et al.		
		CN-101421719A	Apr 29, 2009	Volodarsky et al.		

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Chinese Examination Report, dated May 12, 2014, Application No. 20108004026.7, filed September 10, 2010; Dkt. No. 0370-CN-01, 10 pgs.	

EXAMINER /Karen Tang/ **DATE CONSIDERED** 11/07/2014

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.T./

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	Art Unit
	KAREN TANG	2447

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	217,222,224	11/14/2012	KT

SEARCH NOTES		
Search Notes	Date	Examiner
East Search with Keyword and Class Search	11/14/2012	KT
Google Search	11/14/2012	KT
ACM Search	11/14/2012	KT
IEEE Search	11/14/2012	KT
Inventor Search	11/14/2012	KT
Double Patenting Search	11/14/2012	KT
Search Updates	7/22/2013	KT
Search Updates	11/7/2014	KT

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
709	217,222,224	7/14/2012	KT

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

Substitute for form 1449A/PTO

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(Use as many sheets as necessary)

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Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]
		JP-11345164	Dec 14, 1999	Tsunoda, Hiroshi et al.		
		JP-2001265645	Sep 28, 2001	Moussa, Sarah C., et al.		
		JP-2004530176	Sep 30, 2004	Kriegsman, Mark E., et al.		
		JP-2005018773	Jan 20, 2005	Smith, Adam W., et al.		

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Japanese Notice of Reasons for Rejection, dated July 29, 2014, Application No. 2012-528936, filed September 10, 2010; Dkt. 0370-JP-01 , 4 pgs.	

EXAMINER /Karen Tang/ **DATE CONSIDERED** 11/07/2014

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.T./

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	**Art Unit**
	KAREN TANG	2447

✓	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	11/14/2012	07/22/2013	11/07/2014						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	-						
	9	✓	✓	-						
	10			✓						
	11			✓						
	12			✓						
	13			✓						
	14			✓						
	15			✓						
	16			✓						
	17			✓						
	18			✓						
	19			✓						

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]
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Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Japanese Notice of Reasons for Rejection, dated July 29, 2014, Application No. 2012-528936, filed September 10, 2010; Dkt. 0370-JP-01 , 4 pgs.	

EXAMINER **DATE CONSIDERED**

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

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平11－345164

(43)公開日　平成11年(1999)12月14日

(51)Int.Cl.[6]	識別記号	ＦＩ		
G06F 12/00	546	G06F 12/00	546	M
13/00	354	13/00	354	A
H04M 11/00	303	H04M 11/00	303	

審査請求　未請求　請求項の数７　ＯＬ　（全23頁）

(21)出願番号　特願平10－154824

(22)出願日　平成10年(1998)６月３日

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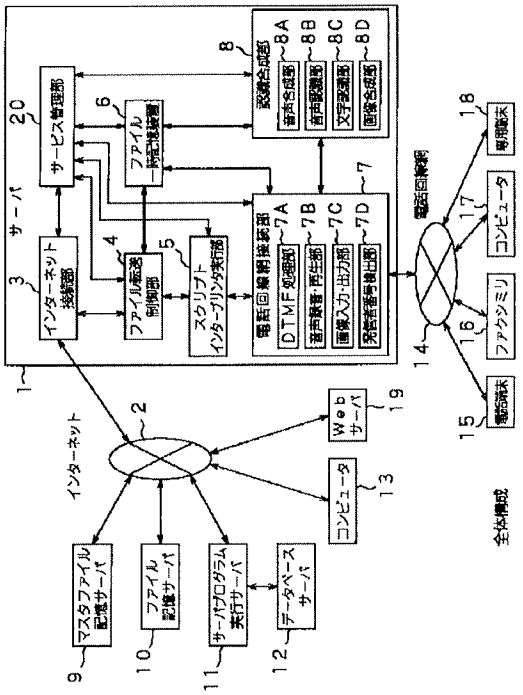
最終頁に続く

(54)【発明の名称】情報処理装置

(57)【要約】
【課題】　インターネット等を介して情報を取得する場合に使用されるキャッシュの機能をユーザに要求に応じて設定可能にする。
【解決手段】　インターネット２に接続されるインターネット接続部３と、少なくともインターネット２を介して取得した情報を記憶するファイル一時記憶装置６と、当該ファイル一時記憶装置６のキャッシュ機能を個別に制御可能にするためのスクリプトインタープリタ実行部５及びファイル転送制御部４とを有する。



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【特許請求の範囲】
【請求項１】　コンピュータネットワークに接続されるネットワーク接続手段と、
少なくとも上記コンピュータネットワークを介して取得した情報を記憶する記憶手段と、
上記コンピュータネットワークを介して取得して上記憶手段に記憶した情報の、当該記憶手段上での記憶状態を個別に制御可能な制御手段と、を有することを特徴とする情報処理装置。
【請求項２】　実行手順ファイルを解釈実行する解釈実行手段を備え、
上記コンピュータネットワーク上の複数のサーバのうちの何れかより上記実行手順ファイルを選択的に取得することを特徴とする請求項１記載の情報処理装置。
【請求項３】　上記制御手段は、上記実行手順ファイルの実行手順に基づいて動作することを特徴とする請求項２記載の情報処理装置。
【請求項４】　上記実行手順ファイルにおける実行手順の制限、変更を個別に制御するためのファイルを取得することを特徴とする請求項２記載の情報処理装置。
【請求項５】　上記解釈実行手段は、上記実行手順ファイルの種類に応じて、実行手順を実行する処理プログラムを選択することを特徴とする請求項２記載の情報処理装置。
【請求項６】　上記実行手順ファイルと共に上記処理プログラムを上記複数のサーバのうちの何れかから取得することを特徴とする請求項５記載の情報処理装置。
【請求項７】　上記実行手順ファイルにリンクするファイルを、予め上記複数のサーバのうちの何れかから取得して上記記憶手段に保存しておくことを特徴とするする請求項２記載の情報処理装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、例えばインターネット等を用いて情報を取得する情報処理装置に関する。
【０００２】
【従来の技術】以前は、一般の人々が不特定多数の人に対して情報を発信し、流通させていくことは困難であったが、近年はインターネットが急速に普及し、その上でいわゆるWWW（World Wide Web）や電子メールを利用することにより、情報を発信することが比較的容易になってきた。特に、WWWについては、情報を受け取る人に取って読み易いよう、情報をレイアウトするソフトウェアが普及してきており、多くの人々が様々な情報（例えば自分の研究成果、プロフィール、趣味の情報など）を公開している。
【０００３】ここで、WWWや電子メールといった情報をネットワーク上から取り出して閲覧するためには、現在のところパーソナルコンピュータ（いわゆるパソコン、以下、適宜ＰＣとする）や専用の端末をネットワークに接続する方法が一般的である。

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【０００４】
【発明が解決しようとする課題】ところで、従来より、パーソナルコンピュータを用い、インターネットを介して情報を取得する場合には、いわゆるWWWブラウザとよばれる専用のソフトウェアが使用されている。このWWWブラウザにおいては、その機能の一つとして、インターネット上のサーバから取得した情報を、ハードディスク上に設けられたキャッシュメモリ領域に保存しておき、後に再び同じ情報を取得しようとした場合に、インターネットを介して再度取り出すようなことはせずに、このハードディスクのキャッシュメモリ領域に保存しておいた情報をあたかもインターネットを介して取得したかのようにして使用する機能が存在する。
【０００５】このキャッシュ機能において、キャッシュとして保存する情報は、インターネットを介して新たな情報を取得した場合にのみ保存され、既にキャッシュメモリ領域に保存されている情報と同じデータについては保存しないようになされている。また、キャッシュ機能では、インターネットを介して取得した情報を、ユーザが設定した任意の期間だけ一律に保存するようになされている。したがって、上記設定された一定の期間が過ぎると、何れのデータであっても一律にキャッシュメモリ領域から自動的に消去されてしまうことになる。
【０００６】しかし、インターネットを介して取得した情報のなかには、一律にキャッシュさせずに、キャッシュしなくてよい情報やできるだけ長くキャッシュしておきたい情報があり、また、特定の時期までキャッシュして欲しい情報などを区別したい場合がある。さらに、インターネット上のサイト側で情報が更新されているような場合、その更新をチェックできればより望ましい。
【０００７】そこで、本発明はこのような状況に鑑みてなされたものであり、インターネット等を介して情報を取得する場合に使用されるキャッシュの機能を、ユーザに要求に応じて設定可能にする情報処理装置を提供することを目的とする。
【０００８】
【課題を解決するための手段】本発明の情報処理装置においては、コンピュータネットワークに接続されるネットワーク接続手段と、少なくともコンピュータネットワークを介して取得した情報を記憶する記憶手段と、コンピュータネットワークを介して取得して記憶した情報の、当該記憶手段上での記憶状態を個別に制御可能な制御手段とを有することにより、上述した課題を解決する。
【０００９】
【発明の実施の形態】本発明の好ましい実施の形態について、図面を参照しながら説明する。
【００１０】本実施の形態では、例えばインターネットや公衆電話回線網等を用いた一般の人々による情報の発

信及び取得を容易に実現可能にするシステムに本発明の情報処理装置を適用した例に挙げている。すなわち、ＷＷＷや電子メールといった情報をネットワーク上から取り出して閲覧するためには、現在のところパーソナルコンピュータ（いわゆるパソコン、以下、適宜ＰＣとする）や専用の端末をネットワークに接続する方法が一般的であり、されにそれら情報を閲覧するためのソフトウェアの操作に習熟していることが必要であるが、本実施の形態では、パーソナルコンピュータや専用の端末を必要とせず、また、閲覧用のソフトウェアの操作に習熟する必要もなく、さらに、利用料金が必要なインターネット接続業者（いわゆるインターネットプロバイダ）を介さずとも、それらの情報を取得できるようなシステムを例に挙げている。また、公衆電話回線網を用いたサービス提供例としては、例えば従来より電話応答サービスやファクシミリサービス等のシステムが存在するが、このシステムでは、応答サービスを提供したい者（個人或いは企業等の団体）が例えば自らがデータを作成し、この応答サービス専用の装置を用意して運営したり、または専門の業者にデータの作成と装置の運用を依託するようになされており、前者においては装置を導入するコストが大きく、後者においては頻繁なデータの更新が難しく、依託のコストも発生し、何れにしてもＷＷＷのように個人が気軽に情報を発信するという目的には不向きであり、さらに、同システムにおいてはインターネット上に数多く存在する種々の情報（ＷＷＷなど）を利用することができず、多くはサービスを運営する個人あるいは団体等が自ら所有している情報にアクセスできるにすぎないのに対し、本実施の形態では、情報の発信や情報の取得を容易且つ低コストにて実現するようなシステムを例に挙げている。

【００１１】以下、

１　概要

２　システム構成

2.1　全体構成

2.2　ファイル

2.2.1　応答手順スクリプト

2.2.2　データ

2.3　応答サービスコード

2.4　基本動作

2.4.1　スクリプトとデータの作成

2.4.2　応答スクリプトの登録

2.4.3　スクリプトの利用

2.5　拡張機能

2.5.1　音声合成

2.5.2　音声入力

2.5.3　外部ファイルの取り込み

2.5.4　ファイル転送制御部

2.5.5　ファイルのキャッシュ

2.5.6　ファイルの先読み

2.5.7　スクリプトの機能制限・機能変更

2.5.8　スクリプトエンジンの自動選択

2.5.9　スクリプト実行関連ファイルの自動ダウンロード

2.5.10 スクリプト記述外ユーザ制御

2.5.11 接続先端末アドレス／種別によるスクリプトの自動選択

2.5.12 サーバプログラム、データベースアクセス

2.6　ダウンロードファイルのキャッシュの詳細

2.6.1　キャッシュイン手順

2.6.2　キャッシュアウト手順

2.7　キャッシュ制御の拡張の詳細

2.7.1　個別キャッシュインチェック

2.7.2　個別キャッシュアウトチェック

2.8　ダウンロードファイルの先読みの詳細

の順に説明を行う。

【００１２】１　概要

本発明の情報処理装置にかかるシステムにおいては、ＷＷＷと同様に、インターネットを用いて情報を管理することにより、従来の電話応答サービスやファクシミリサービス等よりも気軽に情報を作成・管理できる環境を提供すると共に、情報を受け取る手段として電話端末やファクシミリ端末を利用できるようにすることにより、より多くの人々が気軽に情報を受け取ることができるようにしている。

【００１３】図１には、本発明の情報処理装置が適用される代表的な利用形態として、パーソナルコンピュータ（ＰＣ３０）でサービスデータを作成・管理し、電話端末１５にてサービスの提供を受けるような実施の形態のシステム構成を示す。つまり、本実施の形態のシステムは、前述したＷＷＷと電話応答サービス等の双方の長所を兼ね備え、短所を補うようにしたシステムである。

【００１４】ここで、図１に示す本実施の形態のシステムが、従来より存在する電話応答システムと大きく異なる点は、応答サービスを運用する装置（サーバ１）がインターネット２に接続されており、当該インターネット２上に接続された他の端末（ＰＣ３０等）から応答サービスとしてのデータをダウンロードできるということである。

【００１５】すなわち、本実施の形態のシステムによれば、応答サービスのアプリケーション作成側（ＰＣ３０）はサービスの運営に携わらなくても良く、自己の端末（ＰＣ３０）をサービス運営のために使用する必要がない。これは、現在のＷＷＷにおける利点の一つでもある。したがって、従来の電話応答サービスに比べ、より多くの人々が応答サービスアプリケーションの作成に気軽に参加することができるようになり、ＷＷＷに加えてさらに多くの便利な情報が一般の人々によりもたらされることになると期待される。

【００１６】さらに、応答サービスを運用する装置（サ

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ーバ１）がインターネット２に接続されていることを利用し、インターネット２上に存在する既存のWWWの情報をも利用することができるようになされている。これにより、WWWの膨大な既存データを活用した音声応答サービスを提供できるようになる。

【００１７】一方、本実施の形態のシステムが従来のWWWのシステムと大きく異なる点は、サーバ１が電話回線網１４に繋がれており、一般の電話端末１５から接続してサービスを受けられるという点である。これにより、既に世の中に広く普及している電話端末１５を用いてサーバ１上の情報にアクセスすることができるようになる。すなわち、従来のWWWのシステムでは、インタ

```
<HTML>
<TITLE>test page</TITLE>
<BODY bgcolor=white>
  <H1>Test Page</H1>
  <IMG src=ball.gif>This is a test page.<BR>
  For more information, go <A href=detail.html>here</A>.
</BODY></HTML>
```

これに対し、本実施の形態のシステムにおいて、電話端末１５の利用者に提供する情報を記述するためのプログラミング言語は、電話で情報を聴覚的な形式でやり取りすることをも想定し、音声を再生する順番やタイミング、電話端末使用者からのボタン入力の扱いなどをプログラミングできるようになされている。なお、本実施の形態のシステムでは、後述するように電話端末以外の端末（ファクシミリ端末など）からの利用をも想定しているため、それらの端末からも利用可能となるようにプログラミング言語を設計している。

【００２０】したがって、従来のWWWシステムでは「ＨＴＭＬで記述された文書ファイルとそれに付随する画像・音声等のデータ」を蓄積しているが、本実施の形態のシステムでは「専用言語で記述されたファイルとそれに付随する画像・音声等のデータ」を使用する。以下の説明では、この「専用言語で記述されたファイル」を「応答スクリプトファイル」または単に「応答スクリプト」と呼ぶことにする。

【００２１】上記応答スクリプトで記述された応答サービスの簡単な例は、いわゆるテレホンサービスである。すなわち、そのサービスの提供者に電話をかけると特定の案内音声が再生され、利用者に情報の選択を求め、利用者が所望の情報を示すコード番号を電話端末の操作子により入力すると、対応する情報の音声を再生するというものである。このように本実施の形態のシステムでは、電話端末からアクセスしてくる利用者に対しては従来の電話応答サービスと同様のサービスを提供することが可能なようになされており、さらに後述するように従来のサービスには無いサービスをも提供することが可能である。

【００２２】２　システム構成

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ーネット２に接続された端末（ＰＣ）からサーバにアクセスし、情報を視覚的な形で閲覧することが一般的であったが、本実施の形態のシステムによれば、電話端末１５からアクセスし、聴覚的な形で情報を引き出すことができる。

【００１８】上述したようなシステムを実現するため、本実施の形態では、専用のプログラミング言語を定義する。なお、従来のWWWでは情報を記述するために、下記のようないわゆるＨＴＭＬ（Hyper Text Markup Language）と呼ばれる言語を使用している。当該ＨＴＭＬは情報を視覚的に閲覧することを前提としている。

【００１９】

2.1　全体構成

図２には、本発明の実施の形態のシステム全体構成と、当該システムの情報ネットワークに接続されるサーバ１の内部構成を示す。

【００２３】この図２において、サーバ１は、図１の対話プログラム実行部３１を構成するサービス管理部２０，インターネット接続部３，ファイル転送制御部４，スクリプトインタープリタ実行部５，電話回線網接続部７，認識合成部８と、図１の記憶装置３２の一部を構成するファイル一時記憶装置６とを有してなる。このサーバ１は、電話回線網１４を介し、電話端末１５、ファクシミリ端末１６、コンピュータ端末１７、専用端末１８等のユーザ端末と通信し、また必要に応じてインターネット２を介して他のサーバ（後述するマスタファイル記憶サーバ９、ファイル記憶サーバ１０、サーバプログラム実行サーバ１１、データベースサーバ１２、ｗｅｂサーバ１９等）やコンピュータ（例えばパーソナルコンピュータ、以下、ＰＣとする）１３と通信する。これにより、このサーバ１は、ユーザ端末からの要求に応じて、種々のサービスを提供する。

【００２４】すなわち、このサーバ１において、電話回線網接続部７は、電話回線網１４を通じて音声データ、ファクシミリデータ、ＤＴＭＦ（Dual Tone Multi-Frequency）信号等を送受信し、音声録音・再生部７Ｂ、画像入力・出力部７Ｃ、ＤＴＭＦ処理部７Ａにて、それぞれのデータに対し、エンコード、デコード、誤り訂正等の処理を行う。また、発信者番号検出部７Ｄにおいては、このサーバ１に接続したユーザ端末の電話番号を検知可能であれば検出する。このように、サーバ１では、電話端末１５、ファクシミリ端末１６における操作子の操作や入力される音声、ファクシミリデータを検出して

種々のサービスを提供できるようになされている。なお、電話回線網１４に接続するユーザ端末は、上記電話端末１５やファクシミリ端末１６に限らず、コンピュータ端末１７や専用端末１８、携帯電話、いわゆるＰＨＳ（personal handyphone system）等であっても良い。

【００２５】ファイル転送制御部４は、インターネット接続部３からインターネット２を介して得られる音声データ、ファクシミリ端末のイメージデータ、WWW（WorldWide Web）の文書データ、応答手順スクリプトデータ等をサーバ１の内部におけるデータ形式に適宜変換してスクリプトインタープリタ実行部５やファイル一時記憶装置６に出力し、またこれとは逆にスクリプトインタープリタ実行部５やファイル一時記憶装置６から送られてきたデータを適宜適切な形式に変換してインターネット２に出力する。ただし、ここでインターネット２におけるデータ形式とサーバ１の内部におけるデータ形式は、必ずしも異なっている必要はない。

【００２６】上記インターネット２に接続されているマスタファイル記憶サーバ９は、サーバ１の働きを制御するためのマスタファイルを保持している。

【００２７】ファイル記憶サーバ１０は、応答手順スクリプトデータや音声、画像等のデータ（総称してリモートファイルと呼ぶ）を保持している。

【００２８】データベースサーバ１２は、内部にデータベースを保持しており、サーバプログラム実行サーバ１１からの要求により、データベースの内容を適宜サーバプログラム実行サーバ１１に出力し、また逆にサーバプログラム実行サーバ１１から入力されたデータにしたがってデータベースを更新する。

【００２９】サーバプログラム実行サーバ１１は、インターネット２に接続された他の端末からの要求と内部に保持しているサーバプログラムの内容にしたがい、適宜データベースサーバ１２と通信してインターネット２と情報のやり取りを行う。

【００３０】ＰＣ１３は、インターネット２に接続されており、適宜サーバ１やマスタファイル記憶サーバ９、ファイル記憶サーバ１０、サーバプログラム実行サーバ１１と通信する。これにより、ＰＣ１３の利用者はこれら各種サーバ上に蓄積された情報を管理することができるようになされている。ただし、セキュリティの観点から、各サーバにおいてはサーバ外部からの管理操作において充分な認証動作を行う。

【００３１】このような仕組みにより、サーバ１は、インターネット２を介し、マスタファイル記憶サーバ９からマスタファイルを取り出し、ファイル記憶サーバ１０との間でリモートファイルをやり取りし、サーバプログラム実行サーバ１１を介してデータベースサーバ１２のデータをやり取りするようになされている。さらに、サーバ１は、インターネット２に接続された他のＰＣ１３と通信し、ＰＣ１３に情報を送付したり、逆にＰＣ１３からの命令に従ってサーバ１の動作を変更したりすることができるようになされている。

【００３２】サーバ１のスクリプトインタープリタ実行部５は、インターネット２を介して入力された、あるいはファイル一時記憶装置６に保持されたマスタスクリプトの内容にしたがって、適宜動作を切り替え、ファイル転送制御部４やファイル一時記憶装置６、電話回線網接続部７を制御し、これらの装置とデータのやり取りを行う。

【００３３】ファイル一時記憶装置６は、ファイル転送制御部４、認識合成部８と通信し、それらから入力されたデータを内部に保持し、これらの装置からの制御にしたがって保持したデータを適宜出力あるいは更新あるいは消去する。

【００３４】ファイル一時記憶装置６は、少なくとも一つのスクリプト管理ファイルを持つ。スクリプト管理ファイルは、例えば図３に示すような構造をしており、応答手順スクリプトファイル名と応答サービスコードの対応を管理する。

【００３５】認識合成部８は、電話回線網接続部７の制御に従い、電話回線網接続部７あるいはファイル一時記憶装置６から入力されたデータに対し音声合成、音声認識、文字認識、画像合成等の処理を行い、その結果を電話回線網接続部７あるいはファイル一時記憶装置６に出力する。この処理のために、認識合成部８は内部に音声合成部８Ａ、音声認識部８Ｂ、文字認識部８Ｃ、画像合成部８Ｄを内蔵しており、それらを適宜用いる。

【００３６】2.2　ファイル

2.2.1　応答手順スクリプト

本実施の形態では、電話端末１５等の端末を使用するユーザが電話回線網１４を通じてサーバ１と行う対話を司るプログラムを応答手順スクリプト（適宜、応答スクリプト、スクリプトなどとする）と呼んでいる。そして、計算機上のデータとしてこのプログラムがファイル化されたものを、応答手順スクリプトファイル（適宜、応答スクリプトファイル、スクリプトファイルなどとする）と呼んでいる。

【００３７】スクリプトファイルは、サーバ１のスクリプトインタープリタ実行部５で解釈され、その内容にしたがってサーバ１が動作する。すなわち、当該スクリプトファイルは、サーバ１の動作を制御するフローや命令を記したものである。以下に、応答スクリプトの例を示す。

【００３８】

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```
{
    while (TRUE) {
        &wait_call;
        &off_hook;
        &play_sound('hello.snd');
        &on_hook;
    }
}
```

また、図４にはその応答スクリプトの実行手順を示す。この図４のフローチャートにおいて、ステップＳＰ１では利用者の端末から電話がかかってくるのを待ち、ステップＳＰ２では利用者から電話がかかってきたときに回線が接続される。ステップＳＰ２にて回線が接続されると、ステップＳＰ３では、ファイル名が「hello.snd」となされている音声ファイルを再生する。その後は、ステップＳＰ４にて回線を切断する。

【００３９】上記応答手順スクリプトの中で、特にサーバ１の起動時に最初に読み込まれるものをマスタスクリプトと呼ぶ。

【００４０】スクリプトは電子的にファイル化されたものがファイル一時記憶装置６かマスタファイル記憶サーバ９かファイル記憶サーバ１０に存在しなければならない。

【００４１】2.2.2　データ

前述のスクリプト例のプログラム中の「hello.snd」のように、スクリプトファイルからは他のデータファイルを参照することができるようになされている。この例では音声データを参照しているが、他にもテキストデータや画像データ等を利用することが可能である。さらに、同じ音声データについても、様々なフォーマットのデータファイルを利用することが可能である。それらのデータは電子的にファイル化されたものであり、ファイル一時記憶装置６や、ファイル記憶サーバ１０等に格納される。

【００４２】2.3　応答サービスコード

本実施の形態のシステムにおいて、電話端末１５等により電話回線網１４から接続してくるユーザに対して行われる、応答手順スクリプトによって構成されるサービスには、それぞれ固有のコード番号を割り当てることとし、これを応答サービスコードと呼ぶ。これにより、天気予報サービス、道路交通情報サービス、地図印刷サービスなどサーバ１に登録された様々なサービスを、ユーザはユーザ端末にて当該コード番号により選択することができる。

【００４３】前記図３に示した管理ファイルは、このコード番号と実際の応答サービスを表すスクリプトとを関連付けるものであり、当該サービスにおいてユーザがユーザ端末から当該コード番号を入力すると、サーバ１はこの管理ファイルに基づいて対応するスクリプトを決定することができるようになされている。

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【００４４】応答サービスコードは、応答手順スクリプトの作者がサーバ１にスクリプトを登録する際にサービス管理部１９により生成される。

【００４５】2.4　基本動作

本発明実施の形態によるシステムの基本動作として、以下の項目が挙げられる。

【００４６】

・応答手順スクリプト及び関連データの作成
・サーバ１への同スクリプトの登録
・同スクリプトによるサービスの利用
・同スクリプト及び関連データのメンテナンス

以下では、上記各項目のそれぞれについて説明する。

【００４７】2.4.1　スクリプトとデータの作成

前記2.2節で述べた通り、本実施の形態のシステムによって実現され、電話回線網１４に接続した機器を利用するユーザに供されるサービスは、応答手順スクリプトとそれに関連するデータにその内容が記述される。

【００４８】応答手順スクリプトは、前記2.2.1節で例示したテキストファイルであるが、その言語仕様は本発明に含まない。言語仕様にしたがってさえいれば誰でも作成することが可能である。応答手順スクリプトに関連するデータ（音声、画像など）も誰でも作成することが可能である。スクリプト、データ共に作成後にサーバ１に登録されて始めて、電話回線網１４を通じて利用されることができる。

【００４９】2.4.2　応答スクリプトの登録

インターネット２に接続されたＰＣ１３からサーバ１に応答スクリプトを登録する方法は、様々な例を考えることができる。

【００５０】図５には、ＰＣ１３からインターネット２を経由してサーバ１に応答スクリプトを登録するにおいて、サーバ１の動作手順の一例を示す。

【００５１】この図５に示すフローチャートにおいて、ユーザが例えばＰＣ１３上でいわゆるｗｅｂ閲覧ソフトを起動し、スクリプトの登録のためにサーバ１にＰＣ１３を接続させると、ｗｅｂサーバ１９が働き、当該ｗｅｂサーバ１９では、ステップＳＰ１１にてスクリプト登録用のｗｅｂページをＰＣ１３のｗｅｂ閲覧ソフトに送信する。上記ＰＣ１３上で実行したｗｅｂ閲覧ソフトによりディスプレイ上に表示される応答スクリプト登録画面としては、図６のような画面を一例として挙げることができる。この応答スクリプト登録画面上には、名前の入力部とファイル名の入力部が表示され、さらにその入力の登録を行うか否かのソフトキー表示（「ＯＫ」、「ＲＥＳＥＴ」）等が表示される。

【００５２】応答スクリプトの作成者は、ＰＣ１３において応答スクリプトを作成し、この画面を開いて、名前の入力部とファイル名の入力部の空欄に、自分の名前と応答スクリプトのファイル名を入力する。これにより、ＰＣ１３からは、当該ＰＣ１３上にある応答スクリプト

そのもの、または応答スクリプトの所在を表すアドレスがＨＴＴＰ（Hyper Text Transfer Protocol）によってサーバ１へ送られる。そして、サーバ１は、ステップＳＰ１２の処理に移り、送られてきたデータを受信する。

【００５３】続いて、サーバ１は、ステップＳＰ１３の処理に移り、スクリプト自身が送られてきたのか、スクリプトのアドレスが送られてきたのかを判定し、アドレスが送られてきたのであればステップＳＰ１４の処理に移ってそのアドレスからスクリプト自身を取り出す。なお、アドレスとしては、例えばいわゆるＵＲＬ（Unified Resource Locator）を使用することができ、その場合、サーバ１は当該ＵＲＬに記されたプロトコルにしたがってインターネット接続部３よりインターネット２を通じてＰＣ１３からスクリプトを取り出す。

【００５４】このようにして何れかの方法でスクリプトを受信したサーバ１は、次にステップＳＰ１５の処理に移り、スクリプトの内容をチェックし、文法的な誤りがないか判定する。ここで誤りが検出された場合は、ステップＳＰ１６の処理に移り、ＰＣ１３に対してエラーメッセージを送信する。これにより、ＰＣ１３のｗｅｂ閲覧ソフトの画面上にはエラーメッセージが表示され、ユーザに対して修正の後、改めて登録するよう促す。

【００５５】ステップＳＰ１５のチェックで誤りが検出されなかった場合、サーバ１はステップＳＰ１７の処理に進み、サービス管理部２０がこのスクリプトをファイル一時記憶装置６に保存する。さらに、ステップＳＰ１９の処理に進み、サービス管理部２０はスクリプトに対応するサービスコードを生成し、ｗｅｂサーバ１９に知らせる。すると続くステップＳＰ２０においてｗｅｂサーバ１９は通知されたサービスコードをユーザに知らせるためのｗｅｂページを生成し、そのデータをＰＣ１３に送信する。これにより、ユーザはＰＣ１３上のｗｅｂ閲覧ソフトに画面上において、サーバ１により発行されたサービスコードを確認することができる。図７には、このときｗｅｂ閲覧ソフトの画面上に表示される画面出力の一例を示す。すなわちこの図７の例では、登録結果として、「あなたの応答スクリプトファイルは正しく登録されました。この応答スクリプトのアクセス番号は３４８７です。」等の表示がなされる。

【００５６】2.4.3　スクリプトの利用

図８には、応答スクリプトによるサービスをサービス利用者が受ける場合の、サーバ１の動作手順を示す。

【００５７】この図８において、サービス利用者が電話端末１５を用い、電話回線網１４を通じてサーバ１に接続すると、サーバ１はステップＳＰ３１の処理に移り、電話端末１５に対し、ガイダンス音声（例えば「ご希望のサービスコードを入力してください」など）を送信する。これに対し、サービス利用者が希望のサービスコード（図７の例で登録されたスクリプトに対するものであれば３４８７）を電話端末１５の操作子により入力すると、サーバ１はステップＳＰ３２の処理に移り、その信号を電話回線網接続部７で受信・変換し、内部形式にする。

【００５８】続いてステップＳＰ３３で、この値をサービス管理部２０において適正かどうか判定し、適正でなければ、すなわち入力されたサービスコードに対応するサービスが提供可能でなければ、ステップＳＰ３６の処理に移って電話回線網接続部７から電話回線網１４を経由してサービス利用者の電話端末１５に対してサービスコードが不正であることの音声による通知を行い、続いてステップＳＰ３２の処理に戻って再度サービスコードが入力されるのを待ち受ける。

【００５９】ステップＳＰ３３の判定においてサービスコードが適正であれば、ステップＳＰ３４の処理に移って、サービス管理部２０がそのサービスコードに対応するスクリプトをファイル一時記憶装置６から取り出し、スクリプトインタープリタ実行部５に渡す。

【００６０】続いてステップＳＰ３５に移り、スクリプトインタープリタ実行部５が渡された応答スクリプトを解釈・実行する。

【００６１】このように個々の応答スクリプトにコード番号を割り付けることにより、一台のサーバ１で複数のサービスを実現することができる。図９には１台のサーバ１で複数のサービスを実現する場合の構成例を示す。

【００６２】この図９において、インターネット２上には、例えば「天気予報」の応答スクリプトＳ１の作者のＰＣ４１と、例えば「ニュース」の応答スクリプトＳ２の作者のＰＣ４２がそれぞれ接続されており、両者はそれぞれサーバ１に接続してスクリプトを登録する。これにより、サーバ１は、既に登録されている例えば「交通情報」の応答スクリプトＳ３と合わせてそれらのスクリプトを登録し、それぞれのスクリプトにコード番号を発行する。電話端末１５を用いてサーバ１に接続した利用者は、それぞれのコード番号（この例ではＳ１かＳ２かＳ３のスクリプト）のうち所望のサービスを提供するスクリプトの番号を入力することにより、所望のサービスを受けることができる。

【００６３】2.5　拡張機能

2.5.1　音声合成

前述のように、サーバ１は、予め用意された音声データを利用者の電話端末１５等に送信することが可能であるが、テキスト音声合成を用いることにより、テキストデータから音声を生成して送信することも可能である。

【００６４】図１０には、前記図２に示した全体構成の中で、音声合成に関係する部分のみを抜き出して表す。

【００６５】この図１０において、ファイル一時記憶装置６はプログラムと音声データのみならず、テキストデータをも保持することができるようになされている。

【００６６】そしてスクリプトインタープリタ実行部５は、読み込んだプログラムに従い、適宜テキストデータ

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をファイル転送制御部４に要求する。ファイル転送制御部４は、要求されたファイルをファイル一時記憶装置６から取り出して電話回線網接続部７に送信し、当該電話回線網接続部７が同データを認識合成部８へ送る。

【００６７】認識合成部８では、音声合成部８Ａにてこのデータを音声に変換し、生成された音声データを電話回線網接続部７に送信する。そして電話回線網接続部７より電話回線１４を通じてユーザの電話端末１５に音声が送信される。

【００６８】なお、ファイル一時記憶装置６に格納され

```
{
    while(TRUE){
       &wait_call;
    &off_hook;
        &play_text("ただいまサービスを停止しております。");
        &play_text("明日以降おかけ直し下さい。");
        &on_hook;
    }
}
```

このように本実施の形態のシステムでは、テキストデータから音声を生成して対話サービスに使用することができるため、対話サービスを作成する者が必ずしも音声データを用意する必要がなく、より簡単にサービスを作成することが可能となる。

【００７１】2.5.2　音声入力

前述のように、サーバ１はユーザからの入力として電話端末１５の操作子によるＤＴＭＦ信号を受け取り、解釈することが可能であるが、さらにユーザによる電話端末１５からの音声入力を受け取るようにもなされている。ユーザが電話端末１５のマイクロホンから入力した音声は、電話回線網１４を通じて電話回線網接続部７に入力される。実際にこの音声データの処理はスクリプトインタープリタ実行部５が、実行中のプログラムにしたがって決定し、電話回線網接続部７を制御することにより行う。

【００７２】例えば、プログラム中で電話端末１５からの音声をファイル一時記憶装置６に録音するよう指定されている場合は、電話回線網接続部７に入力された音声データは音声録音・再生部７Ｂにて内部形式に適宜変換され、ファイル一時記憶装置６に保存される。

【００７３】また、プログラム中で電話端末１５からの音声を音声認識に使用するよう指定されている場合は、電話回線網接続部７に入力された音声データは認識合成部８に送られ、音声認識部８Ｂにおいて音声認識処理にかけられ、その結果がスクリプトインタープリタ実行部５に送られる。

【００７４】このように、ユーザにより電話端末１５か

```
{
    while (TRUE) {
        &wait_call;
```

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たテキストデータを認識合成部８に送る場合においては、前述のような方法に限らず、ファイル一時記憶装置６より直接認識合成部８に送るようになされていても良い。その場合は、対象となるデータのファイルの識別子をスクリプトインタープリタ実行部５から電話回線網接続部７を通じて認識合成部８に通知する。

【００６９】以下に、特定の文章を読み上げるスクリプトの一例を示す。

【００７０】

ら入力された音声入力をサーバ１が受け取れるようになされていることにより、電話端末１５を介したユーザの音声を録音して後に再生するサービスや、複数メニューからの選択を電話端末１５の操作子によらず音声で行うことができるサービスなどを実現するプログラムを扱うことが可能となる。

【００７５】2.5.3　外部ファイルの取り込み

前述の図２に示したシステム例では、応答スクリプトやそれに付随するデータをサーバ１内のファイル一時記憶装置６に収めているが、本発明ではこれらスクリプトやデータをサーバ１の外に置くことも可能である。

【００７６】前記2.2.1節で取り上げた応答スクリプトでは、スクリプトの中で音声ファイルを再生するようになされている（前記応答スクリプトの例）。このスクリプトにおいて音声ファイル名を指定している部分をより一般化することにより、スクリプトファイルが保存されているのと同じ場所のみならず、ネットワーク上の様々な場所にあるデータを指定することができる。

【００７７】インターネット上のデータの所在（以下、住所と呼ぶ）を示す方法として代表的なものにＵＲＬ（Unified Resource Locator）があるが、本実施の形態のシステムでもＵＲＬ又はそれと同様の機能を持つものを用いる。

【００７８】例えば、前述の2.2.1節で取り上げた応答スクリプトの例に対し、下記のスクリプトでは、音声ファイル名を指定する部分でＵＲＬを指定している。

【００７９】

```
15                                                    16
    &off_hook;
    &play_sound('http://www.foo.co.jp/data/hello.snd');
    &on_hook;
  }
}
```

このスクリプトがサーバ１に登録され、ファイル一時記憶装置６に格納された状態を図１１に示す。

【００８０】この図１１において、データを指定したスクリプトをサーバ１で実行する場合、サーバ１は、必要に応じて適宜指定されたデータファイルを、インターネット接続部３からインターネット２を通して取り出す。例えば、スクリプトインタープリタ実行部５がスクリプトを解釈・実行しているときにデータファイルの取り出しをインターネット接続部３に指示し、インターネット２を通じてファイル記憶サーバ１０から取り出された音声データを、音声録音・再生部７Ｂで再生するなどという形が考えられる。

【００８１】さらに、図１２に示すように、スクリプト自体をサーバ１の外部に置くことも可能である。

【００８２】この図１２の例の場合、応答スクリプトの作成者は、スクリプト自体を登録する代わりに、スクリプトの所在を表すＵＲＬをサーバ１に登録する。サーバ１はファイル一時記憶装置６内のスクリプト一覧に登録されたＵＲＬを保存し、応答サービスの中で必要となった時点でインターネット２を通じて登録された応答スクリプトの実体をファイル記憶サーバ１０から取り出し、実行する。なお、図１２では、スクリプトとデータファイルが同一のサーバ（ファイル記憶サーバ１０）上に置かれているが、それぞれ異なるサーバ上に置かれていても良い。この場合、それぞれにＵＲＬが割り当てられており、それにしたがってサーバ１から取り出すことが可能であれば良いのである。また、ＵＲＬの代わりに同様の機能（ネットワーク上のデータの所在を一意に決定する機能）を有する符号化法を用いても良い。

【００８３】上記図１１や図１２のように、スクリプトやスクリプトから使用されるデータをサーバ１の外部に置くことにより、それらの変更や追加を容易に行うことができるようになる。例えば、スクリプトの作成者が自分のｗｅｂサーバを管理している場合、そのサーバにスクリプトを置くことにより、随時スクリプトの内容を変更することができる。

【００８４】2.5.4　ファイル転送制御部

本実施の形態のシステムのサーバ１では、図１３に示すように、内部にファイル転送制御部４を置くことにより、より柔軟なデータ転送を実現することができる。なお、図１３は、サーバ１内のファイル転送制御部４とそれに関連する部分のみを抜き出して示している。

【００８５】この図１３において、ファイル転送制御部４は、インターネット接続部３を介して得られる応答スクリプトやそれに付随する各種のデータをサーバ１の内部におけるデータ形式に適宜変換してスクリプトインタープリタ実行部５やファイル一時記憶装置６に出力し、またこれとは逆にスクリプトインタープリタ実行部５やファイル一時記憶装置６から送られてきたデータを適宜適切な形式に変換してインターネット２に出力する。ただし、ここでインターネットにおけるデータ形式とサーバ１の内部におけるデータ形式は、必ずしも異なっている必要はない。

【００８６】2.5.5　ファイルのキャッシュ

ファイル転送制御部４はインタープリタ実行部５から要求があったデータをインターネット２上の他のサーバから取り出した際に、そのデータをファイル一時記憶装置６に保存し、後に再び同じデータの要求があったときに、インターネット２上のサイトから再度取り出さずにファイル一時記憶装置６に保存してあるデータを返すようになされていてもよい。これによって同じファイルの読み込みにかかる時間のために応答スクリプトの実行が遅延することを防ぐことができる。このダウンロードファイルのキャッシュに関しては、後述する2.6節の「ダウンロードファイルのキャッシュの詳細」にて詳しく説明する。

【００８７】なお、ダウンロードファイルのキャッシュにおいて、スクリプト作成者の意志によっては一律にキャッシュさせずに、キャッシュしなくてよいファイルやできるだけ長くキャッシュして欲しいファイル、特定の時期までキャッシュして欲しいファイルなどの区別を行いたい場合がある。また、キャッシュされているファイルがダウンロード後にサイト側で更新されているかのチェックもする必要があるが、その更新チェック頻度も指定したい場合がある。このような要求にはサイト側に管理ファイルを持っていて、それをダウンロードすることによって対応することができる。このキャッシュの拡張制御に関しては、後述する2.7節の「キャッシュ制御の拡張の詳細」にて詳しく説明する。

【００８８】2.5.6　ファイルの先読み

本実施の形態のシステムにおいては、実行中あるいは実行前の応答スクリプトで必要となるファイルを予めファイル一時記憶装置６に読み込んでおくようになされてもよい。これによってスクリプト実行中に、あるファイルが必要になった時点で初めて読み込みを始めるのに比べて、応答スクリプトの実行が遅延することを防ぐことができる。実行中の応答スクリプトで必要となるファイルの先読みに関しては、後述する2.8節の「ダウンロードファイルの先読みの詳細」にて詳しく説明する。

【００８９】なお、ダウンロードファイルの先読みにお

いて、スクリプト作成者の意志によっては、ファイルにより他のものよりも早く先読みしたほうがよいものや、また先読みしたくないものがあったりすることがある。

【００９０】そのような場合は、スクリプト自身に明示的に特定ファイルの先読みを優先指示するコマンドを記述したり、先読みを禁止するコマンドを記述したりすることによって、そのような要求にも応えることが可能になる。

【００９１】2.5.7　スクリプトの機能制限・機能変更

本実施の形態のシステムでは、様々なサイトからの応答スクリプトファイルをダウンロードして実行することが可能であるが、どの応答スクリプトも無条件にあらゆる機能を実行できるようにすると、逆にシステムのセキュリティやリソース量などで問題になる場合がある。

【００９２】このような場合、サイト毎の、又はファイル別のスクリプトの実行権限を設定したファイルを用意しておくことにより、その設定に応じてスクリプトに記述されたコマンドを機能制限したり、または機能変更したりすることによってセキュリティやリソース量などの問題を解消することが可能になる。

【００９３】リソース量使用量などの制限では、例えば録音最大時間やダウンロード可能なファイルのサイズ、同時にキャッシュされるファイルの最大サイズやキャッシュアウトされる優先度、応答スクリプトの呼び出し可能レベルなどの設定項目が考えられる。また、セキュリティによる制限では、ファイル一時記憶装置６内のファイルのアップロード可否やシステムファイルに対するアクセスの可否などの設定項目が考えられる。

【００９４】なお、機能変更とは、例えばアクセス制限された音声ファイルを再生しようとしたときに、エラー音声のファイルを再生するなどの代替処理を行うことである。これも機能制限と一緒に、代替処理を設定しておくことにより可能になる。

【００９５】2.5.8　スクリプトエンジンの自動選択

本実施の形態のシステムでは、応答スクリプトをスクリプトインタープリタ実行部５で解釈／実行する。この解釈／実行するプログラム（スクリプトエンジン）は、必ずしも１つである必然性はない。応答スクリプトの記述言語が複数あっても、それぞれに対してスクリプトエンジンを複数用意しておけば、応答スクリプトを実行する前にスクリプトインタープリタ実行部５がどのスクリプトエンジンで実行できる種類かを自動的に判別して該当するスクリプトエンジンに解釈／実行させることができる。

【００９６】種類の判別には、例えばスクリプト自身の最初にその記述言語の名称を記述しておいたり、対応するスクリプトエンジンの名前を記述しておいたりすることによって対応できる。

【００９７】また、応答スクリプトを記述する言語が同じであっても、言語ソースの形でそのまま記述されたものを実行するだけでなく、予め中間言語の形に変換された応答スクリプトを実行したい場合もある。このような場合に対しても、ソースおよび中間言語それぞれに応じたスクリプトエンジンを用意しておくことにより対応することができる。

【００９８】2.5.9　スクリプト実行関連ファイルの自動ダウンロード

スクリプトエンジンは、必ずしも予めサーバ１上に用意されている必要はなく、必要に応じてマスタファイル記憶サーバ９からダウンロードして、ファイル一時記憶装置６に格納するようになされていてもよい。例えばそのスクリプトエンジンで解釈／実行される必要がある応答スクリプトを実行しようとしたときにスクリプトインタープリタ実行部５がファイル転送制御部４に要求して必要なスクリプトエンジンをダウンロードしたり、または、ファイル転送制御部４が応答スクリプトをダウンロードしたときに、それを解釈／実行するのに必要なスクリプトエンジンがファイル一時記憶装置６に無かった場合に自分でダウンロードするというようになされていてもよい。

【００９９】また、自動でダウンロードするファイルは、スクリプトエンジンでなくてもよく、例えば応答スクリプトを解釈／実行しようとしたときに、そのスクリプト内で使われている特定のコマンドを実行するために必要なプログラムやデータがサーバ１上に無かった場合に、必要なファイルをマスタファイル記憶サーバ９からダウンロードしてくるようになされていてもよい。

【０１００】こうすることにより、サーバ１上に予め考え得るあらゆるプログラムやデータを予め用意しておく必要がなく、ファイル一時記憶装置６のリソースの節約になる。また、サーバ１の運用後にスクリプトエンジンやデータなどが更新されたり新しく作られたとしても、サーバ１の運用を停止することなく必要なときに最新のファイルをダウンロードすることができるので、常にシステムを最新の状態に保つことができる。また、それらのファイルをファイル一時記憶装置６に置くことにより、他のダウンロードファイルと同様のキャッシュイン、キャッシュアウト、ファイルの先読みの機能を使うことが出来、必要なくなったファイルが何時でもシステムのリソースを無駄使いすることがなくなる。

【０１０１】2.5.10　スクリプト記述外ユーザ制御

ＰＣなどで利用されるいわゆるＷＷＷブラウザにおいては、あるホームページのＨＴＭＬファイルを読み込んでＨＴＭＬの記述に従って表示したりするだけではなく、転送中や表示中においてもユーザの意図に従ってファイルの読み込み途中で中断したり、直前に表示したページを再度表示させたりということができるようになっている。画面を使った端末の場合はその機能のためのソフトスイッチを画面上に設け、それをユーザが好きなときに押すことによって可能になる。しかし、電話端末のよう

に、ユーザが入力できるインターフェースが極めて限定されている端末などの場合は、応答スクリプト上でそのインターフェースによる入力を待っていたりして、システムが前記のような特別な用途に占有できないことが多い。

【０１０２】このような場合は、スクリプトインタープリタ実行部５または電話回線網接続部７において、そのインターフェースから特定のシーケンスの入力があった場合に、応答スクリプト自身にその入力を渡さずに、スクリプトインタープリタ実行部５が独自の解釈を行って制御するようになされればよい。

【０１０３】このようにすれば、電話端末１５の操作子から、例えば連続して「＊＊＊＊１」が入力された場合は、直前のスクリプトに戻るようにし、また例えば連続して「＊＊＊＊０」が入力された場合は最初のスクリプトに戻るなどと制御することが応答スクリプト自身の記述に関係なく可能になる。もちろん、操作子による操作のみならず、音声による例えば「ストップ」や「戻る」等の入力によって同様の制御を行うようにすることも可能である。

【０１０４】2.5.11　接続先端末アドレス／種別によるスクリプトの自動選択

ところで、本実施の形態のシステムでは、当該システムを通信端末で利用する利用者が当該ネットワークに接続するときに、同じスクリプトのサービスを利用することが便利であるとは限らない。

【０１０５】そこで例えば、電話回線網制御部７に発信者番号検出部７Ｄを備え、ユーザの通信端末からの接続時にその番号をスクリプトインタープリタ実行部５に伝えることにより、スクリプトインタープリタ実行部５がその番号に応じた応答スクリプトを選択して実行するようになされていてもよい。

【０１０６】こうすることにより、例えば予め登録したユーザに応じたサービスをすぐに提供したりすることができる。

【０１０７】また、端末の種類を検知できる機能を電話回線網接続部７に備え、ユーザの通信端末からの接続時にその端末の種類をスクリプトインタープリタ実行部５に伝えることにより、スクリプトインタープリタ実行部５がその番号に応じた応答スクリプトを選択して実行するようになされていてもよい。

【０１０８】こうすることにより、例えば電話端末で接続するユーザ、ファクシミリ端末で続するユーザ、ＰＤＡ（personal digital assistant）などで接続するユーザそれぞれに対して、最適のサービスを提供することができるようになる。

【０１０９】2.5.12　サーバプログラム，データベースアクセス

本実施の形態のシステムのサーバで使用する応答スクリプトでは、インターネット２上の他のWWW情報を参照・利用することができる。インターネット２上の特定のｗｅｂページの内容を読み上げるスクリプトの一例としては、下記のようなスクリプトが考えられる。

【０１１０】

```
{
    while (TRUE) {
        &wait_call;
        &off_hook;
        &read_aloud_html('http://www.foo.co.jp/data/news.html');
        &on_hook;
    }
}
```

また、読み上げに限らず、WWW上のデータやサーバプログラム（ＣＧＩなど）から得られる情報を様々に利用することができるようになされている。例えば、あるサーバプログラムがそのときの現在時刻を返すようになされている場合、下記のように、そのプログラムを利用したスクリプトは、接続してきたユーザに対し、現在時刻を知らせる。

【０１１１】

```
{
    while (TRUE) {
        &wait_call;
        &off_hook;
        $time = &get_web('http://www.foo.co.jp/cgi-bin/time.cgi');
        &play_text("ただいまの時刻は $time です。");
        &on_hook;
    }
}
```

このようなスクリプトを処理する場合、スクリプトインタープリタ実行部５がこのスクリプトを解釈し、サーバ１の外部のインターネット２上に存在する情報を利用するように記述された部分を検知し、その情報をインター

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ネット接続部３から直接、またはファイル転送制御部４を介して取り出すようになされている。

【０１１２】以上のように、本発明実施の形態に係るシステムは、既にインターネット上に存在する情報をも利用できるようになされており、応答スクリプトの作成者は自分が作成するスクリプトのもたらす情報をすべて自分で用意する必要はない。既にインターネット上に存在する情報を加工したり集計したりして作り出した情報を提供するようなサービスを行うこともできる。したがって、様々なサービスを提供するスクリプトをより多くの人々が作れる環境を提供することが可能である。

【０１１３】2.6　ダウンロードファイルのキャッシュの詳細

ファイル転送制御部４は、スクリプトインタープリタ実行部５の要求に応じてインターネット２経由でファイルをダウンロードするが、頻繁に使われるファイルは繰り返しダウンロードされることになる。同じファイルを何回もダウンロードするのは、インターネット２を通した通信の場合には時間がかかる場合が多いので利用者の利便上に問題がある。

【０１１４】そこで、ダウンロードしたファイルをファイル一時記憶装置６に一時的に保存しておき、次に同じファイルをダウンロードするように指示された時に、そのファイル一時記憶装置６から取り出すようにすれば、同じファイルを再度ダウンロードするのに比べて時間がかからず効率がよい。このような処理は一般にファイルキャッシュと呼ばれる。

【０１１５】図１４及び図１５には、本実施の形態のシステムでファイルキャッシュを管理するためのファイル（リモートファイル管理ファイル、ローカルキャッシュ管理ファイル）の一例を示す。これらのファイルは、ファイル転送制御部４が作成／更新してファイル一時記憶装置６に置かれる。

【０１１６】図１４のリモートファイル管理ファイルは、ダウンロードしたリモートファイルのＵＲＬとファイル一時記憶装置６内に格納したファイル名（ローカルファイル名）との対応関係などを記録しておく。なお、マスタファイルもリモートファイルと同様に扱ってもよい。ローカルファイル名は、リモートファイルをダウンロードしたときに、ファイル転送制御部４によって既にあるローカルファイル名と重ならないように生成されるようになされている。また、このファイルの項目として、リモートファイルが何時、作成／更新されたものかを記録するためのリモートファイル更新日時と、リモートファイルを何時、ダウンロードするかどうか調べたかを記録するための最終更新チェック日時などがある。この図１４の例では、リモートファイルＵＲＬ「http://test.jp/a.txt」は「a0121.txt」というファイル名でローカルファイルとして管理されていて、ダウンロードしたリモートファイルの作成／更新された日時は１９９７年１１月１１日１０時１０分１５秒で、最後にこのリモートファイルの更新日時を確認したのが１９９７年１１月１３日１２時１５分０５秒であることを示している。

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【０１１７】また、図１５のローカルキャッシュ管理ファイルは、ローカルファイルのアクセスに関する情報を記録するためのものである。ローカルファイル毎に記録される項目として、ローカルファイルを最後にアクセスした日時である最終アクセス日時と現時点で該当するローカルファイルを使おうとしている（ダウンロード要求した）スクリプトの数であるアクセス中カウンタがある。このアクセス中カウンタは、その値が０のときはそのローカルファイルを使っていないことを示し、１以上の値のときは使われていることを示している。これによって、ローカルファイルを更新したり削除したりしてよいかどうかの判断が可能になる。この図１５の例では、ローカルファイル「a0121.txt」が最後にアクセスされたのは１９９７年１１月１３日１５時５１分１１秒であり、現在２つのスクリプトによって使われていることを示している。

【０１１８】2.6.1　キャッシュイン手順

図１６にはリモートファイルをダウンロードするときにファイル転送制御部４がファイルキャッシュに関して行う手順を示す。これは、例えばスクリプトインタープリタ実行部５がスクリプトの記述に応じてリモートファイルのダウンロードをファイル転送制御部４に要求する場合などに実行される。

【０１１９】この図１６において、先ずステップＳＰ４１では、リモートファイル管理ファイルのリモートファイルＵＲＬを検索キーにしてダウンロードしたいリモートファイルが登録されているか、つまり既にファイル一時記憶装置６にダウンロードされているか検索を開始する。ここで、ステップＳＰ４２では、リモートファイル検索が成功したか否かの判定を行い、検索が失敗したならば、つまり該当するリモートファイルが登録されていないならば、ステップＳＰ４７の処理に移ってダウンロードを行う。

【０１２０】一方、ステップＳＰ４２において、検索が成功、つまり該当リモートファイルが登録されているならば、再びダウンロードするかどうかを、以下の手順で調べて決める。

【０１２１】上記ステップＳＰ４２にてリモートファイルが登録されていると判定した場合において、ステップＳＰ４３では、リモートファイル管理ファイルの該当エントリに記録されている対応するローカルファイル名を取得し、ローカルキャッシュ管理ファイルから同じローカルファイル名のエントリを検索する。

【０１２２】次に、ステップＳＰ４４では、該当エントリのアクセス中カウンタを調べる。ここでは、エントリのアクセス中カウンタの値が１以上なら他にもローカルファイルをアクセスしているスクリプトなどがあると見

なしてダウンロードしないでステップＳＰ５１の処理に移る。一方、アクセス中カウンタの値が０ならば、ステップＳＰ４５の処理に移る。

【０１２３】ステップＳＰ４５では、インターネット接続部３を通してリモートのファイル記憶サーバ１０などにリモートファイル自身の更新日時を問い合わせ、その結果を最新の更新日時として取得する。

【０１２４】次に、ステップＳＰ４６では、その最新の更新日時とリモートファイル管理ファイルに記録されているリモートファイル更新日時を比べ、同じならばリモートファイルが更新されておらずローカルファイルと同じものと見なしてダウンロードしないでステップＳＰ５０の処理に移る。

【０１２５】一方、ステップＳＰ４６での判定において、リモートファイルの更新日時が違っているならば、前回のダウンロードからリモートファイルが更新されていると見なして以下の手順でダウンロードを行う。

【０１２６】上記ステップＳＰ４６にてリモートファイルの更新日時が違っていると判定した場合において、ステップＳＰ４７では、キャッシュアウトチェックとしてファイル一時記憶装置６の記憶容量に余裕があるか否か調べ、余裕が無いならばあまり使われそうにないローカルファイルを削除する。この動作の詳細は、この後の図１７のフローチャートの解説の際に説明する。

【０１２７】次に、ステップＳＰ４８では、インターネット接続部３を通してファイル記憶サーバ１０などに該当するリモートファイルの転送要求を行い、ファイル一時記憶装置６にダウンロードする。このときリモートファイル管理ファイルに登録されているファイルならば、既にある該当するローカルファイルを上書きし、登録されていないならば他のローカルファイルと重ならない名前を付けて新しいローカルファイルとして格納する。

【０１２８】次いで、ステップＳＰ４９では、リモートファイル管理ファイルとローカルキャッシュ管理ファイルの該当するエントリの内容を最新情報に更新する。ここでもし未登録のリモートファイルならば新しいエントリをそれぞれのファイルに作成する。リモートファイル更新日時とローカルファイルの最終アクセス日時は、現在の日時、アクセス中カウンタの値は０とする。

【０１２９】次のステップＳＰ５０では、リモートファイル管理ファイルの最終更新チェック日時を現在の日時に更新する。

【０１３０】その後、ステップＳＰ５１では、ローカルキャッシュ管理ファイルのアクセス中カウンタに１を加算（１インクリメント）し、該当するローカルファイルの利用を開始したことを記憶する。

【０１３１】最後に、ステップＳＰ５２では、ローカルキャッシュ管理ファイルの最終アクセス日時を現在の日時に更新し、このダウンロード処理を終わる。

【０１３２】ここで、もしこの処理がスクリプトインタープリタ実行部５の要求によって行われたものならば、ダウンロードが終わったことをスクリプトインタープリタ実行部５に知らせる。

【０１３３】2.6.2　キャッシュアウト手順

図１７には、リモートファイルをダウンロードするときなどに、ファイル転送制御部４がファイルキャッシュから、使われる可能性が少ないローカルファイルを削除する手順（通常キャッシュアウトと呼ばれる）の一例を示す。この図１７の例では、ファイル一時記憶装置６のローカルファイルを格納する領域に余裕ができるまで、最近アクセスされていないローカルファイルから順番に削除している。

【０１３４】この図１７において、先ずステップＳＰ６１では、ファイル一時記憶装置６の空き領域に余裕があるか否かを調べ、余裕があるならば処理を終了する。一方、もし余裕がないならばステップＳＰ６２の処理に進む。

【０１３５】ステップＳＰ６２では、ローカルキャッシュ管理ファイルの各エントリを最終アクセス日時の古い順に並べ、次のステップＳＰ６３では、最初のエントリ、つまり最終アクセス日時が一番古いものを取り出す。

【０１３６】次に、ステップＳＰ６４では、そのエントリのアクセス中カウンタの値が０かどうか調べ、０でないならば現在アクセス中なのでそのエントリを飛ばしてステップＳＰ６８の処理に進む。一方、アクセス中カウンタの値が０ならば、該当するローカルファイルを削除するため、先ず、ステップＳＰ６５にてリモートファイル管理ファイルとローカルキャッシュ管理ファイルのそのローカルファイルに対応するエントリを削除する。

【０１３７】次に、ステップＳＰ６６では、そのローカルファイル自身を削除する。

【０１３８】次のステップＳＰ６７では、このローカルファイルの削除によってファイル一時記憶装置６の空き容量に余裕が出来たか否かを調べ、余裕が出来たならば処理を終了する。一方、まだ余裕がないならばステップＳＰ６８の処理に進む。

【０１３９】このステップＳＰ６８では、選択しているエントリが最後のエントリか否かを調べ、最後のエントリである場合には処理を終了し、最後のエントリでないならばステップＳＰ６９の処理に進む。

【０１４０】ステップＳＰ６９では、次のエントリを取得し、その後、ステップＳＰ６４の処理に戻って、再び削除できるローカルファイルを調べることを繰り返す。

【０１４１】図１８には、ファイル転送制御部４がローカルファイルのアクセスを終了する手順を示す。これは、例えばスクリプトインタープリタ実行部５が１つのスクリプトの実行を終了するときに、そのスクリプトでダウンロードしたファイルについて利用が終わったことを知らせるために、ファイル転送制御部４に対して処理

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の要求を行う。例えばもし図１６の処理をスクリプトインタープリタ実行部５がスクリプトの記述に従って要求した場合、スクリプトインタープリタ実行部５がダウンロード要求したファイルを覚えておき、そのスクリプトを終了するときに、この覚えておいた全てのファイルについてその処理を要求する。同じファイルを複数回ダウンロード要求したならば、同じ回数だけこの処理を呼ぶことになる。

【０１４２】この図１８において、先ずステップＳＰ７１では、ローカルキャッシュ管理ファイルから該当するローカルファイル名をキーにしてエントリを検索する。

【０１４３】次に、ステップＳＰ７２では、検索したエントリの最終アクセス日時を現在時刻に更新する。

【０１４４】次のステップＳＰ７３では、アクセス中カウンタの値から１を減算し、その後処理を終了する。これにより、基本的なファイルキャッシュの機能が可能になる。

【０１４５】2.7　キャッシュ制御の拡張の詳細

前述したキャッシュ機能は、ダウンロードしたファイルを全てファイルキャッシュに入れて、ファイル一時記憶装置６の空き容量が足りなくなってきたら一番使われていないファイルから消していくという一般的なキャッシュ機能を、本実施の形態のシステムに適用したものである。また、ファイル記憶サーバ１０にあるファイルが更新されているかどうかを毎回確認していた。

【０１４６】しかしながら、場合によってはファイル毎にキャッシュにおける扱いを指定できた方がよい場合がある。例えばマスタファイルなどでしばらく使われなくてもデフォルトのファイルとしてファイル一時記憶装置６上に残しておきたいファイルのような場合である。このようなファイルは、殆ど更新されないことが予めわかっているため、毎回更新チェックをする必要がないファイルである。またそれとは逆に、頻繁に更新されるために長期間キャッシュに残しておく必要が無いファイルもあり、これら様々な場合が想定される。前述したキャッシュ機能は、全てのファイルに対して同等の扱いをしていたが、以下の処理によってファイルそれぞれ若しくは一部のファイルについてのみ、キャッシュにおける扱いを特別なものにすることができる。

【０１４７】図１９及び図２０には、ファイルに対して個別にキャッシュにおける扱いを行うために使うファイルの一例を示す。

【０１４８】図１９に示すサイトキャッシュ設定ファイルは、ファイル記憶サーバ１０やマスタファイル記憶サーバ９のリモートファイルがあるディレクトリ（サイト）に、そのディレクトリの管理者が置く。このファイル自身もリモートファイルである。このファイルは、そのディレクトリ（サイト）上にあるリモートファイルそれぞれに関してファイル名とそのファイルの更新日時をチェックする頻度を示す更新日時チェック頻度、ファイルをキャッシュ内にどれだけ置いておきたいかを示すファイルライフタイムが対応付けられている。この図１９の例においては、例えばこのサイトキャッシュ設定ファイル自身のＵＲＬが「http://test.jp/d/sitec.def」とすると、同じサイトのファイル「a.wav」つまり「http://test.jp/d/a.wav」は更新される予定がないので更新日時チェックは不要で、キャッシュにできるだけ長く置いておくという設定である。また同様に、ファイル「b.scd」は１９９７年１１月２０日を過ぎたならば更新をチェックし、１９９７年１１月３０日を過ぎたならばキャッシュから削除してもよいという設定である。ファイル「sitec.def」は、更新チェックを前回のチェックから１時間以上過ぎたときに行い、キャッシュの扱いは通常通りにするという設定である。この設定のファイル名の指定には、ファイル毎の指定だけではなく、例えばワイルドカードや正規表現といった表現も可能であり、この図１９の例のファイル「*.txt」では例えば「abc.txt」や「foo.txt」などを含む。また、このファイル「*.txt」は、頻繁に更新されるので、更新日時チェックをアクセス毎に行い、キャッシュはスクリプト実行中のみ有効という扱いになっている。

【０１４９】図２０に示すキャッシュ設定対応ファイルは、リモートサイトからダウンロードしたサイトキャッシュ設定ファイルのローカルファイル名との対応を管理するためのものであり、リモートサイトＵＲＬとそのサイトのキャッシュ設定対応ファイルのローカルファイル名との対応を記録しておく。この図２０の例においては、ＵＲＬが「http://test.jp/d/」のリモートサイトからダウンロードしたキャッシュ設定対応ファイルはファイル「b0533.def」という名前でファイル一時記憶装置６に格納されている。このファイルは、ファイル転送制御部４が作成／更新してファイル一時記憶装置６に置かれる。

【０１５０】2.7.1 個別キャッシュインチェック

図２１には、リモートファイルをダウンロードするときにファイル転送制御部４がファイルキャッシュに関して個別にロードチェックを行う手順を示す。この図２１のフローチャートは、図１６におけるステップＳＰ４４とステップＳＰ４５の間に挿入し、実行されることを想定している。

【０１５１】この図２１において、先ずステップＳＰ８１では、キャッシュ設定対応ファイルからリモートサイトのＵＲＬを検索する。

【０１５２】次のステップＳＰ８２では、ステップＳＰ８１においてダウンロード要求されたリモートファイルのＵＲＬに対応するリモートサイトのＵＲＬ（リモートファイルＵＲＬが「http://www.test/d/a.wav」とすると、リモートサイトのＵＲＬは「http://www.test/d/」）がキャッシュ設定対応ファイルに登録されているかどうか検索する。このステップＳＰ８２において、登

録されている場合はステップＳＰ８６の処理に移り、登録されていない場合はステップＳＰ８３の処理に移る。

【０１５３】ステップＳＰ８３では、該当するキャッシュ設定対応ファイルをダウンロードする。

【０１５４】次のステップＳＰ８４では、ダウンロードが成功したか否かを調べ、ここでもしキャッシュ設定対応ファイルがダウンロードできなかったならば、ステップＳＰ９１の処理に移り、ここから図１６のステップＳＰ４５の処理に続くことになる。

【０１５５】一方、ステップＳＰ８４にてキャッシュ設定対応ファイルがダウンロードできた場合は、ステップＳＰ８５の処理に移る。このステップＳＰ８５では、キャッシュ設定対応ファイルに、そのリモートサイトＵＲＬとローカルファイル名を登録する。

【０１５６】次に、ステップＳＰ８６では、該当するサイトキャッシュ設定ファイルの各エントリのファイル名の中に、ダウンロード要求されたリモートファイルの名前にマッチするものがあるかどうか検索する。このとき、ファイル名にワイルドカードや正規表現などがなされていた場合はそのように検索する。

【０１５７】次のステップＳＰ８７では、その検索の結果、該当するリモートファイルのエントリが無かったならば、ステップＳＰ９１を介して図１６のステップＳＰ４５の処理に進み、エントリが見つかったらばステップＳＰ８８の処理に進む。

【０１５８】ステップＳＰ８８では、該当するエントリの更新日時チェック頻度を取得する。

【０１５９】そして、ステップＳＰ８９では、更新日時チェック頻度によって更新日付チェックが必要かどうかを判断し、必要ならばステップＳＰ９１を介して図１６のステップＳＰ４５の処理に進み、もし更新日付が不要ならばステップＳＰ９２を介して図１６のステップＳＰ５１の処理に進む。

【０１６０】このようにして、リモートファイル個別に更新日時のチェックが必要かどうかを調べ、処理する。

【０１６１】2.7.2　個別キャッシュアウトチェック

図２２にはトラストサイト設定ファイルを示す。このトラストサイト設定ファイルは、信用できるリモートサイトを登録しておくファイルで、管理者が作成してマスタファイル記憶サーバ９に格納しておき、これをシステム立ち上げ時などにファイル転送制御部４がファイル一時記憶装置６にダウンロードするようになされている。このファイルは、特定のリモートサイトのサイトキャッシュ設定ファイルなどの記述をそのまま信用するかどうか判断するのに使われ、ファイル転送制御部４やスクリプトインタープリタ実行部５が参照する。この図２２の例では「http://master.jp/a/」と「http://test.jp/d/」というＵＲＬで表されるリモートサイトが、信用できるサイトとして登録されている。

【０１６２】図２３には、使われないファイルをファイルキャッシュから削除する場合などにファイル毎に予め設定された寿命チェックを行う手順を示す。このフローチャートは、図１７におけるステップＳＰ６４とステップＳＰ６５の間に挿入し、実行されることを想定している。

【０１６３】この図２３において、先ずステップＳＰ１０１では、キャッシュから削除しようとしているローカルファイルのリモートファイルＵＲＬをリモートファイル管理ファイルから取得する。

【０１６４】次のステップＳＰ１０２では、このリモートファイルＵＲＬに対応するリモートサイトＵＲＬがキャッシュ設定対応ファイルに登録されているかどうか検索する。

【０１６５】次に、ステップＳＰ１０３では、リモートサイトＵＲＬの検索が成功したか否かを調べ、登録されていなかったらばステップＳＰ１１０を介して図１７のステップＳＰ６５の処理に移ってローカルファイルを削除するが、登録されていれば次のステップＳＰ１０４の処理に進む。

【０１６６】ステップＳＰ１０４では、キャッシュ設定対応ファイルから該当するサイトキャッシュ設定ファイルを特定し、そのファイルからリモートファイル名を検索する。

【０１６７】次のステップＳＰ１０５では、ファイル名の検索が終了したか否かを調べ、この検索によってリモートファイルのエントリが見つからなかったらばステップＳＰ１１０を介して図１７のステップＳＰ６５の処理に移り、見つかったらばステップＳＰ１０６の処理に進む。

【０１６８】ステップＳＰ１０６では、該当するエントリのファイルライフタイムを取得する。

【０１６９】次に、ステップＳＰ１０７では、ファイルライフタイムの設定が永久保存等、通常の設定でなく且つまだ削除しない設定となっているか否かを調べ、まだ削除しない設定となっている場合は、ステップＳＰ１０８の処理に進むが、そうでなければステップＳＰ１１０を介して図１７のステップＳＰ６５の処理に移る。

【０１７０】ステップＳＰ１０８では、サイトキャッシュ設定ファイルの内容を信用してもよいか調べるためにトラストサイト設定ファイルから該当するリモートサイトを検索する。

【０１７１】次のステップＳＰ１０９では、リモートサイトＵＲＬの検索が成功したかどうか調べ、もしその検索の結果、リモートサイトが見つからなかったらばステップＳＰ１１０を介して図１７のステップＳＰ６５の処理に移り、見つかったらばステップＳＰ１１１を介して図１７のステップＳＰ６８の処理に移ってファイルの削除をしない。

【０１７２】ステップＳＰ１１０では、図１７のステップＳＰ６５の処理に進むが、もし削除するファイルがサ

イトキャッシュ設定ファイルであるならば、キャッシュ設定対応ファイルから該当するエントリを削除する処理を追加する。

【０１７３】このようにして、ファイル毎に予め設定されていたファイルの寿命を考慮してキャッシュから削除するタイミングを調整することができる。

【０１７４】図２４には、ローカルファイルアクセス終了時などに、ファイル転送制御部４が必要なくなったファイルか調べて削除する手順を示す。この図２４のフローチャートは、図１８のステップＳＰ７３の後に挿入されて実行されることを想定している。

【０１７５】この図２４において、先ずステップＳＰ１２１では、アクセス終了したファイルに関してローカルキャッシュ管理ファイルの中のアクセス中カウンタが０になったかどうか調べ、０でなければ処理を終了する。一方、もしアクセス中カウンタが０になったら、ステップＳＰ１２２の処理に進む。

【０１７６】ステップＳＰ１２２とそれに続くステップ１２３では、図２３のステップＳＰ１０１及びステップＳＰ１０２と同じ処理を行う。すなわち、キャッシュ設定対応ファイルの該当するリモートサイトのエントリを検索する。

【０１７７】次のステップＳＰ１２４では、リモートサイトＵＲＬの検索が成功したかどうか調べ、検索できずにエントリが見つからなかったらば処理を終了し、見つかったらば次のステップＳＰ１２５の処理に進む。

【０１７８】ステップＳＰ１２５では、図２３のステップＳＰ１０４と同じ処理を行う。つまり、サイトキャッシュ設定ファイルから該当するリモートファイルのエントリを検索する。

【０１７９】次のステップＳＰ１２６では、ファイル名の検索が成功したかどうか調べ、もしファイル名が無ければ処理を終了し、見つかればステップＳＰ１２７の処理に移る。

【０１８０】ステップＳＰ１２７では、該当エントリのファイルライフタイムを取得する。

【０１８１】次に、ステップＳＰ１２８では、ファイルライフタイムの設定によってそのファイルの寿命が来ている、つまり１つのスクリプトがアクセス中しかキャッシュに残さない設定やキャッシュに残す日付の設定が既に過ぎているかどうか調べ、削除する設定になっている場合には、次のステップＳＰ１２９の処理に進み、そうでなければ処理を終了する。

【０１８２】ステップＳＰ１２９とそれに続くステップＳＰ１３０では、図１７のステップＳＰ６５及びステップＳＰ６６と同様に、各管理ファイルからエントリを削除し、ローカルファイル自身を削除する。その後は処理を終了する。

【０１８３】このようにしてスクリプト終了時などで随時いらなくなったファイルを個別にファイルキャッシュ

から削除していくことが可能になる。

【０１８４】2.8　ダウンロードファイルの先読みの詳細

ファイル転送制御部４は、スクリプトインタープリタ実行部５の要求に応じてリモートファイルや、マスタファイル９またはサーバプログラムの実行結果をダウンロードするが、インターネット２を使った通信を行うので、ＬＡＮ（LocalArea Network）内で構成されたシステムよりもダウンロードに時間がかかることが多い。スクリプトファイル内のファイルのダウンロードを指示する部分で毎回ダウンロードを行っていると、電話端末１５などを使ってサーバ１にアクセスしている利用者をその都度待たせることになるので利便上問題がある。

【０１８５】そこで、本実施の形態では、ファイルのダウンロードをスクリプトで明示的に指示される部分よりも前から、他の処理と平行して行うようにすることで、上記の問題を略々解消するようにしている。

【０１８６】例えば、電話端末１５を使ってサーバ１にアクセスする利用者に対してスクリプトに従って音声再生などを行っている間に、その後にダウンロードする可能性があるファイルを予めダウンロードする。

【０１８７】図２５には、スクリプトを実行するときにファイルを先読みする処理をスクリプトインタープリタ実行部５が行う手順を示す。

【０１８８】この図２５のフローチャートにおいて、先ずステップＳＰ１４１では、スクリプトを実行する前に、そのスクリプト中でダウンロードされる可能性があるファイル名を取得する。

【０１８９】次のステップＳＰ１４２では、取得したファイル名をファイル転送制御部４に送って、それらのファイルのダウンロードを開始してもらう。この後から実際にスクリプトの手順に従って実行を行う。

【０１９０】ステップＳＰ１４３では、スクリプトの最初のコマンドを読む。

【０１９１】次のステップＳＰ１４４では、そのコマンドがダウンロードのコマンドか調べ、ダウンロードするコマンドならばステップＳＰ１４５の処理に進み、それ以外のコマンドならステップＳＰ１４７の処理に移る。

【０１９２】ステップＳＰ１４５では、ダウンロードするファイル名が既にステップＳＰ１４２でダウンロードを開始したファイルかどうか調べ、そのファイルであるならばステップＳＰ１５０の処理に移り、そのファイルでないならばステップＳＰ１４６の処理に進む。

【０１９３】ステップＳＰ１４６では、そのファイル名をファイル転送制御部４に送ってダウンロードを開始してもらう。

【０１９４】一方、ステップＳＰ１４７においては、ダウンロードするコマンド以外のコマンドのうち、音声ファイルの再生などダウンロードしたファイルを使うコマンドかどうか調べ、違うならばステップＳＰ１４９の処

理に移ってそれぞれのコマンドを実行する。これに対して、そのコマンドであるならばステップＳＰ１４８の処理に移る。

【０１９５】ステップＳＰ１４８では、ファイル一時記憶装置６にそのファイルがダウンロードされたか調べて、未だダウンロードされていないならばダウンロードされるまで待つ。

【０１９６】ステップＳＰ１４８にてダウンロードがなされたらば、ステップＳＰ１４９の処理に移ってそのコマンドを実行する。

【０１９７】最後に、ステップＳＰ１５０では、スクリプトが終了したかどうか調べ、まだ終了していないならステップＳＰ１５１の処理に移って次のコマンドをスクリプトから読んだ後にステップＳＰ１４４の処理まで戻って同じ処理を繰り返す。

【０１９８】一方、ステップＳＰ１５０にてスクリプトが終了したならば、そのスクリプトの実行を終わる。

【０１９９】次に、図２６と図２７を使って実際の動作の例を説明する。

【０２００】図２６には、例として２つの音声ファイルを順番にダウンロードして再生するスクリプト自身の記述手順を示す。

【０２０１】この図２６において、スクリプトの内容としては、先ずステップＳＰ１６１で音声ファイルＡをファイル記憶サーバ１０からダウンロードする。

【０２０２】次のステップＳＰ１６２では、ダウンロードした音声ファイルＡを再生する。

【０２０３】同様にして、ステップＳＰ１６３では、音声ファイルＢをダウンロードし、ステップＳＰ１６４では、ダウンロードした音声ファイルＢを再生する。

【０２０４】図２７には、図２６のスクリプトを実際にスクリプトインタープリタ実行部５が行う手順を示す。

【０２０５】この図２７において、先ず、ステップＳＰ１７１では、図２６のスクリプトからダウンロードする可能性があるファイルのファイル名（音声ファイルＡと音声ファイルＢ）を抽出する。これは、図２５のステップＳＰ１４１の処理に対応する。

【０２０６】次に、ステップＳＰ１７２では、抽出したファイル名（音声ファイルＡと音声ファイルＢ）をファイル転送制御部４に送ってダウンロードを要求する。これは、図２５のステップＳＰ１４２の処理に対応する。

【０２０７】次に、ステップＳＰ１７３では、スクリプトの先頭コマンドである図２６のステップＳＰ１６１を読み、ダウンロード要求コマンドでしかも既にダウンロード要求済なので、次のコマンドに進む。これは、図２５のステップＳＰ１４３からステップＳＰ１４５の処理、ステップＳＰ１５０からステップＳＰ１５１の処理に対応する。また、図２６のステップＳＰ１６２は、ダウンロード要求済ファイル（音声ファイルＡ）を利用するコマンドなので、ファイル一時記憶装置６にそのファイルがダウンロード完了するまで待つ。これは、図２５のステップＳＰ１４４、ステップＳＰ１４７からステップＳＰ１４８の処理に対応する。

【０２０８】そして、ステップＳＰ１７４では、ダウンロードが完了した音声ファイルＡを電話回線網接続部７の音声録音・再生部７Ｂにて再生してもらう。これは図２５のステップＳＰ１４９の処理に対応する。

【０２０９】ステップＳＰ１７５とステップＳＰ１７６も、ステップＳＰ１７３とステップＳＰ１７４と同様にして音声ファイルＢを再生し、スクリプトの実行を終了する。

【０２１０】

【発明の効果】以上の説明で明らかなように、本発明においては、コンピュータネットワークを介して取得し、記憶した情報を個別に制御可能となすことにより、インターネット等を介して情報を取得する場合に使用されるキャッシュの機能をユーザに要求に応じて設定可能である。

【図面の簡単な説明】

【図１】本発明の情報処理装置が適用されるシステムの基本的な構造を示すブロック図である。

【図２】本発明実施の形態のシステムの全体構成を示すブロック図である。

【図３】スクリプト管理ファイルの構造を示す図である。

【図４】応答スクリプトと実行手順を示すフローチャートである。

【図５】応答スクリプトの登録手順を示すフローチャートである。

【図６】画面上の登録フォームの一例を示す図である。

【図７】画面上の登録結果通知の一例を示す図である。

【図８】サービス利用時の手順を示すフローチャートである。

【図９】複数サービスが混在した例の説明に用いる図である。

【図１０】全体構成図のうち、音声合成に関する部分のみを抜き出して示すブロック図である。

【図１１】データファイルをサーバの外部に置いた例の説明に用いるブロック図である。

【図１２】応答スクリプトをサーバの外部に置いた例の説明に用いるブロック図である。

【図１３】ファイル転送制御部の位置関係の説明に用いるブロック図である。

【図１４】リモートファイル管理ファイルの一例を示す図である。

【図１５】ローカルキャッシュ管理ファイルの一例を示す図である。

【図１６】ファイル転送制御部のファイルキャッシュに関して行う処理手順を示すフローチャートである。

【図１７】ファイル転送制御部のキャッシュアウト処理

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手順を示すフローチャートである。

【図１８】ファイル転送制御部のファイルアクセス終了時の処理手順を示すフローチャートである。

【図１９】サイトキャッシュ設定ファイルの一例を示す図である。

【図２０】キャッシュ設定対応ファイルの一例を示す図である。

【図２１】ファイル転送制御部の個別ロードチェック処理手順を示すフローチャートである。

【図２２】トラストサイト設定ファイルの一例を示す図である。

【図２３】ファイル毎の寿命チェック処理手順を示すフローチャートである。

【図２４】ファイルアクセス終了後などでの不必要になったファイルの削除処理手順を示すフローチャートである。

【図２５】ダウンロードファイルの先読みでスクリプトインタープリタが行う処理手順を示すフローチャートである。

【図２６】２つの音声ファイルを再生するスクリプトの

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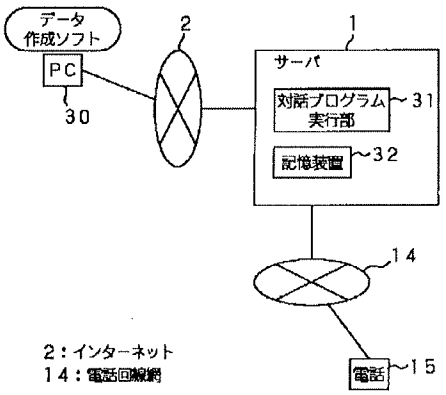
例の処理手順を示すフローチャートである。

【図２７】図２６のスクリプトの実行手順の例を示すフローチャートである。

【符号の説明】

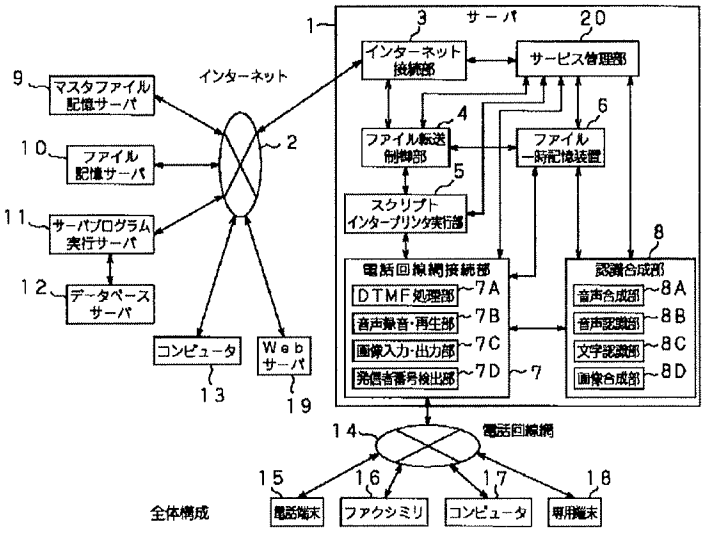
１　サーバ、　２　インターネット、　３　インターネット接続部、　４　ファイル転送制御部、　５　スクリプトインタープリタ実行部、　６　ファイル一時記憶装置、　７　電話回線網接続部、　７Ａ　ＤＴＭＦ処理部、　７Ｂ　音声録音・再生部、　７Ｃ　画像入力・出力部、　７Ｄ　発信者番号検出部、　８認識合成部、　８Ａ　音声合成部、　８Ｂ　音声認識部、　８Ｃ　文字認識部、８Ｄ　画像合成部、　９　マスタファイル記憶サーバ、　１０　ファイル記憶サーバ、　１１　サーバプログラム実行サーバ、　１２　データベースサーバ、　１３　コンピュータ（ＰＣ）、　１４　電話回線網、　１５　電話端末、　１６　ファクシミリ端末、　１７　コンピュータ、　１８　専用端末、　１９　ｗｅｂサーバ、　２０　サービス管理部、　３０　ＰＣ、　３１　対話プログラム実行部、　３２　記憶装置

【図１】



基本的構造

【図２】



全体構成

【図３】

対応サービスコード	スクリプトファイル名
3344	file0001.sd
3345	file0002.sd
5348	http://banana/users/yamada/sd/test.sd
・・・	・・・

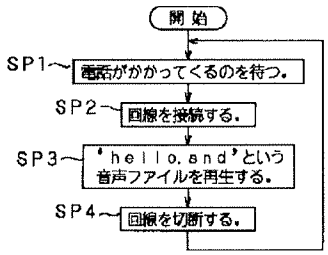
スクリプト管理ファイルの構造

【図１４】

リモートファイルURL	ローカルファイル名	リモートファイル更新日時	最終更新チェック日時
http://test.jp/a.txt	a0121.txt	1997/11/11,10:10:15	1997/11/13,12:15:05
・・・・	・・・・	・・・・	・・・・

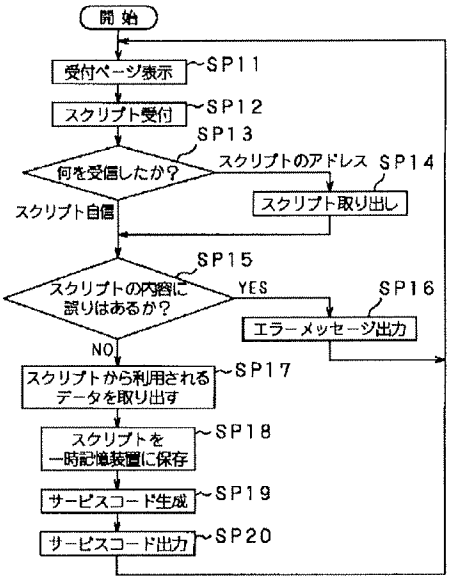
リモートファイル管理ファイル

【図４】



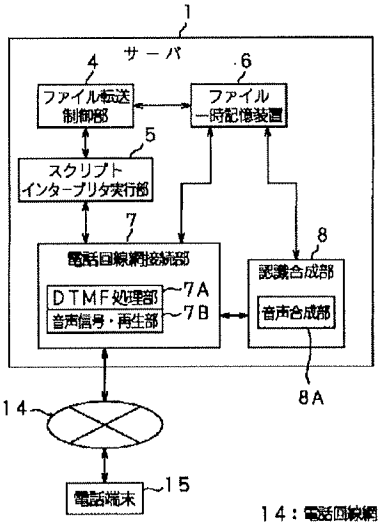
応答スクリプトの実行手順

【図５】



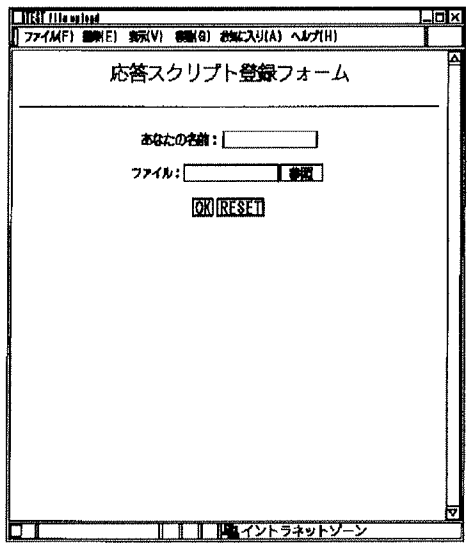
応答スクリプトの登録手順

【図１０】



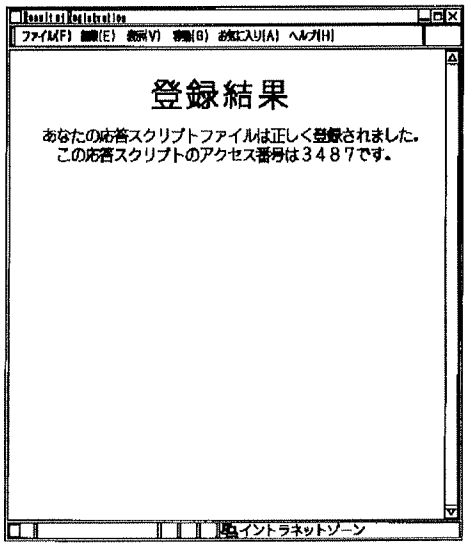
音声合成関連部分

【図６】



登録フォーム

【図７】



登録結果通知

【図１５】

ローカルファイル名	更新アクセス日時	アクセス中カウンタ
a0121.txt	1997/11/13,15:51:11	2
....	....	....

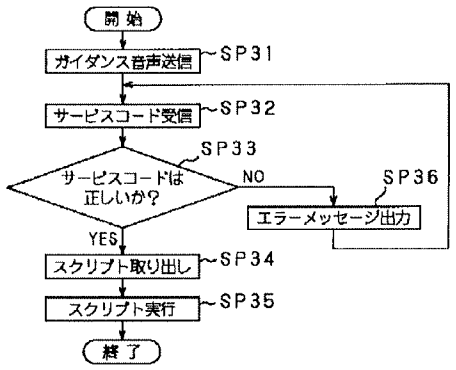
ローカルキャッシュ管理ファイル

【図２０】

リモートサイトURL	ローカルファイル名
http://test.jp/d/	b0533.def
...	...

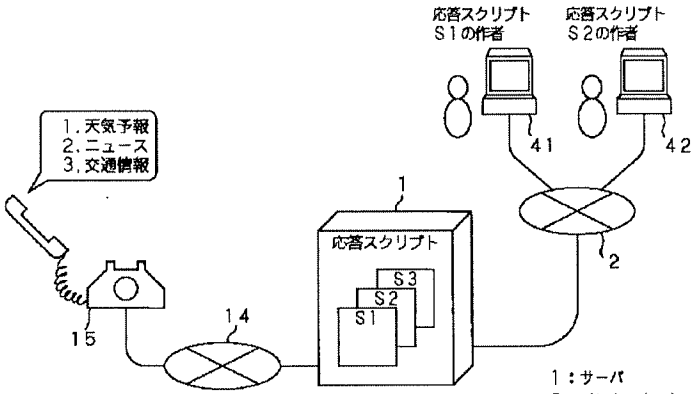
キャッシュ設定対応ファイル

【図８】



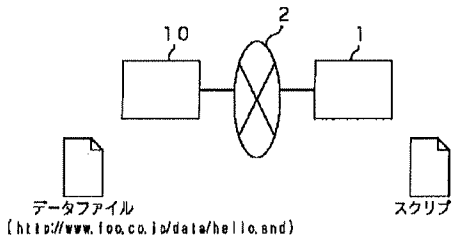
サービス利用時の手順

【図９】



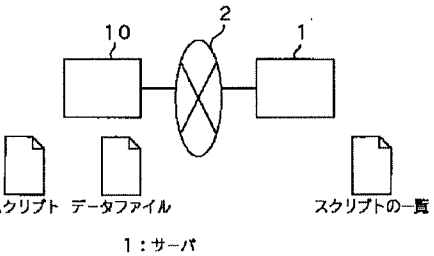
複数サービス混在の例

【図１１】



データファイルを外部に配置

【図１２】



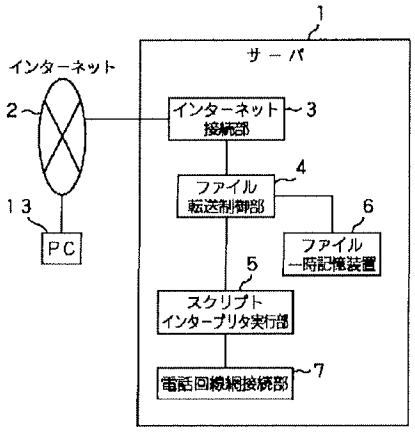
応答スクリプトを外部に配置

【図２２】

リモートサイトURL
http://master.jp/a/
http://test.jp/d/
・・・

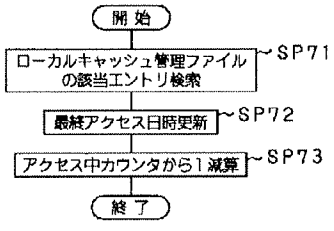
トラストサイト設定ファイル

【図１３】



ファイル転送制御部の位置関係

【図１８】



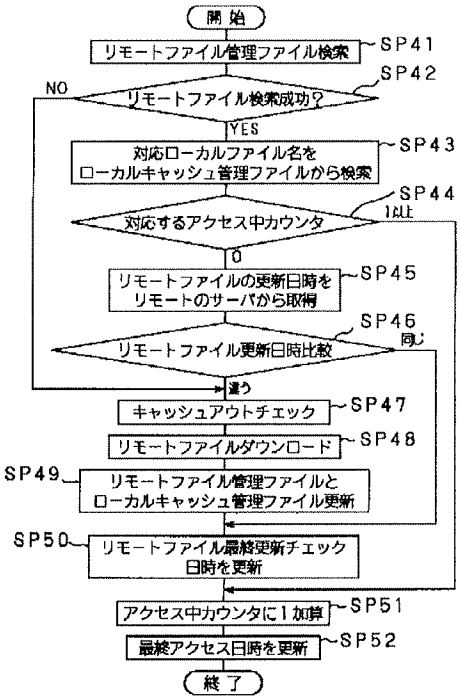
ファイルアクセス終了時の処理手順

【図１９】

ファイル名	更新日時チェック頻度	ファイルライフタイム
a.wav	チェック不要	永久保存
b.scd	1997/11/20	1997/11/30
sitec.def	1時間後	通常
*.txt	アクセス毎	スクリプト実行中

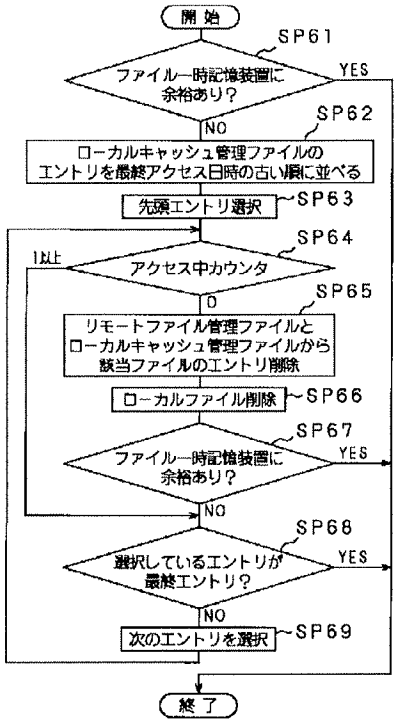
サイトキャッシュ設定ファイル

【図１６】



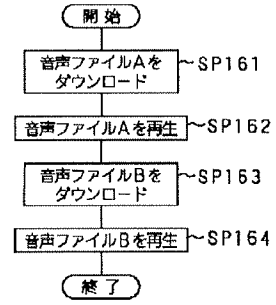
ファイルキャッシュ処理手順

【図１７】



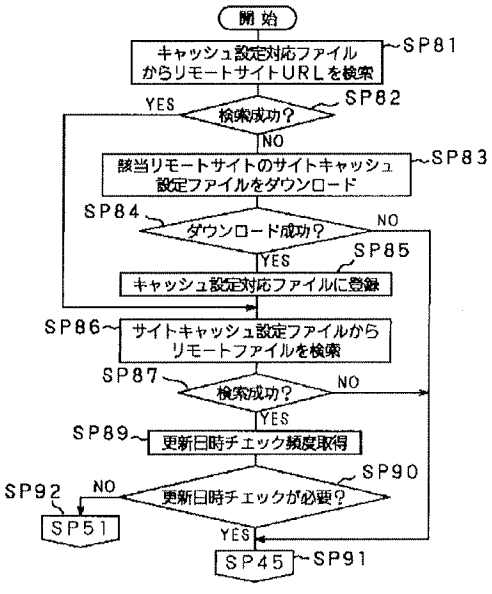
キャッシュアウト処理手順

【図２６】



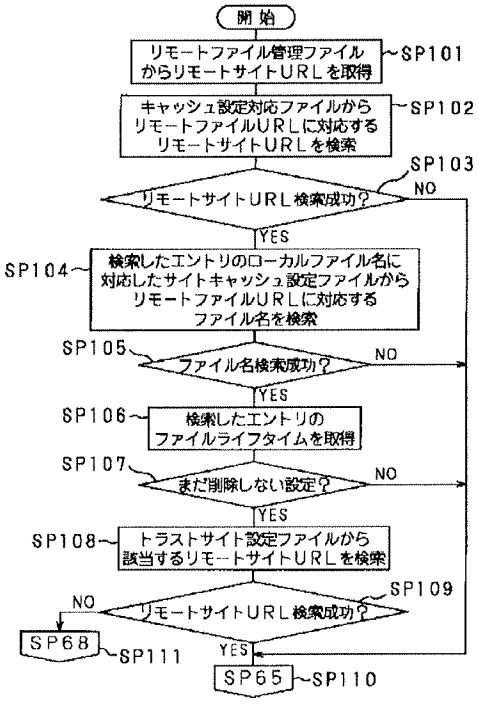
音声ファイル再生スクリプト例

【図２１】



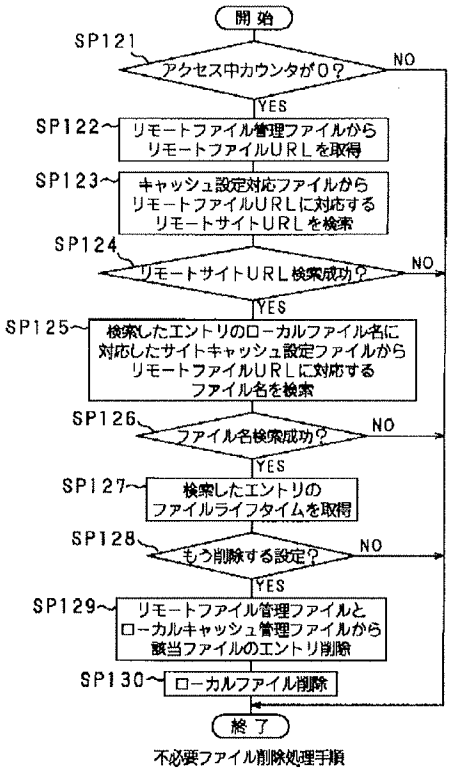
個別ロードチェック処理手順

【図２３】



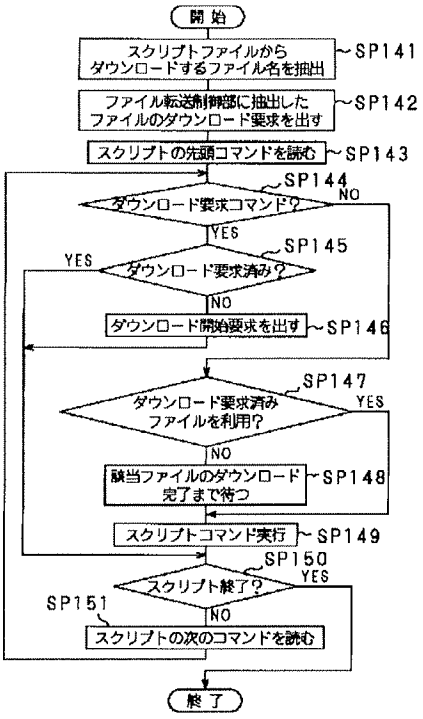
寿命チェック処理手順

【図２４】



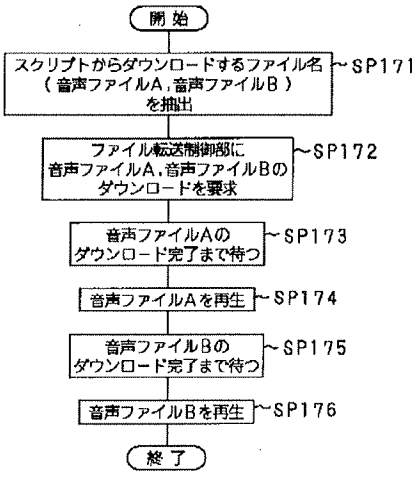
不必要ファイル削除処理手順

【図２５】



先読みスクリプトインタ処理手順

【図２７】



スクリプト実行手順

フロントページの続き

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]The present invention relates to the information processing apparatus which acquires information, for example using the Internet etc.
[0002]
[Description of the Prior Art]Although it was difficult for the general public to disseminate information and to circulate it to many and unspecified persons before, It is becoming comparatively easy to disseminate information, when the Internet spreads quickly and uses what is called WWW (World Wide Web) and an E-mail on it in recent years. Especially about WWW, the software which lays out information has spread and many people release various information, including for example, their result of research, a profile, the information on a hobby, etc., so that it may take to those who receive information and may be easy to read.
[0003]In order to take out information, including WWW or an E-mail, from on a network and to peruse it here, the method of connecting a personal computer (what is called a personal computer and the following are suitably referred to as PC) and a terminal for exclusive use to a network at present is common.
[0004]
[Problem to be solved by the invention]By the way, conventionally, when acquiring information via the Internet using a personal computer, the software for exclusive use called what is called a WWW browser is used. In this WWW browser, the information acquired from the server on the Internet as one of functions, It saves to the cache memory region provided on the hard disk, When it is going to acquire the information that it is behind the same again, the function which is whether what takes out again via the Internet acquired the information saved to the cache memory region of this hard disk via the Internet, without carrying out, and is made and used exists.
[0005]In this cache function, the information saved as a cache is made as [save / about the same data as the information which is saved only when new information is acquired via the Internet, and has already been saved to the cache memory region]. In the cache function, it is made as [save / the information acquired via the Internet / only during any period which the user set up / uniformly]. Therefore, if a fixed period set [above-mentioned] up passes, even if it is which data, it will be uniformly eliminated automatically from a cache memory region.
[0006]However, there is a case where he would like to distinguish the information etc. I want the information which does not need to be cached, and information to cache as for a long time as possible to be in the information acquired via the Internet, without making it cache uniformly, and to cache till a specific time. When information is updated by the site side on the Internet, it is more desirable if the updating can be checked.
[0007]Then, the present invention is made in view of such a situation.
The purpose is to provide information processing apparatus which enables at a user setting out of a function of a cache used when acquiring information via the Internet etc. according to a demand.

[0008]
[Means for solving problem]The network connection means connected to a computer network in

the information processing apparatus of the present invention, The problem which mentioned above the memory state on the memory means which memorizes the information acquired via the computer network at least, and the memory means concerned of the information acquired and memorized via the computer network by having a controllable control means individually is solved.

[0009]
[Mode for carrying out the invention]It describes about the preferable embodiment of the present invention, referring to Drawings.
[0010]According to this embodiment, it is mentioning to the example which applied the information processing apparatus of the present invention to the system which enables easily realization of the dispatch and the acquisition of information by the general public who used the Internet, a dial-up line network, etc., for example. Namely, in order to take out information, including WWW or an E-mail, from on a network and to peruse it. Although the method of connecting a personal computer (what is called a personal computer and the following are suitably referred to as PC) and a terminal for exclusive use to a network at present is common and it is required to be skilled in operation of the software for perusing these information to be carried out, In this embodiment, neither a personal computer nor a terminal for exclusive use is needed, It is not necessary to become skilled in operation of the software for an inspection, and ** also mentions as the example the system which can acquire those information without the Internet access provider (what is called an Internet provider) who still needs a utilization charge. Although systems, such as telephone answer service and facsimile service, exist conventionally as an example of service provision using a dial-up line network, for example, In those who want to provide response service (organizations, such as an individual or a company), in this system, oneself creates data, It is made as [commission / a special contractor / prepare and manage the equipment only for this response service, or / creation of data, and employment of equipment], The cost which introduces equipment in the former is difficult for updating of frequent data in the latter largely, Are unsuitable for the purpose that also generate the cost of consignment, make it any and an individual disseminates information freely like peach WWW, Various information, including WWW etc., which exists on the Internet in the system cannot be used, Many mention as the example a system which is easy and is realized in low cost for dispatch of information, and acquisition of information by this embodiment to the ability to only access the information which an individual or an organization etc. which manages service owns itself.
[0011]The following, 1 Outline 2 system-configuration 2.1 The entire configuration 2.2. File 2.2.1 The response procedure script 2.2.2. Data 2.3 The response service code 2.4. Basic motion 2.4.1 Creation 2.4.2 of a script and data. Registration 2.4.3 of a response script Use 2.5 of a script. Expanded-function 2.5.1 Voice synthesis 2.5.2. Incorporation 2.5.4 of voice input 2.5.3 external file. File transfer control part 2.5.5 [Auto select 2.5.9 of a script engine / Automatic download 2.5.10 of a script execution related file.] Cache 2.5.6 of a file Prediction 2.5.7 of a file The function restriction and function change 2.5.8 of a script Auto select 2.5.12 of the script according [the outside of script description] to a user control 2.5.11 connection-destination terminal address / classification Server program, Database access 2.6 [The individual cache yne check 2.7.2.] Details 2.6.1 of a cache of a downloaded file Cache yne procedure 2.6.2 Details 2.7.1 of extension of cash-out procedure 2.7 cache control individual -- it describes in the detailed order of prediction of cash-out check 2.8 downloaded file.
[0012]1 In the system concerning the information processing apparatus of the outline present invention, Provide the environment where information can be created and managed by managing information using the Internet like WWW more freely than the conventional telephone answer service, facsimile service, etc., and. More people enable it to receive information freely by enabling it to use a telephone terminal and a facsimile terminal as a means to receive information.

[0013]As a typical usage pattern to which the information processing apparatus of the present invention is applied, service information is created and managed with a personal computer (PC30), and the system configuration of an embodiment which receives offer of service with the telephone terminal 15 is shown in Fig.1. That is, the system of this embodiment is a system which has the strong point of both sides, such as WWW, telephone answer service, etc. which were mentioned above, and with which demerit was compensated.

[0014]The point that the system of this embodiment shown in Fig.1 differs from the telephone answering system which exists conventionally largely here, From other terminals (PC30 etc.) which the equipment (server 1) which employs response service is connected to the Internet 2, and were connected on the Internet 2 concerned, I hear that the data as response service can be downloaded, and it is.
[0015]That is, according to the system of this embodiment, the application creation side (PC30) of response service does not need to be engaged in management of service, and does not need to use a self terminal (PC30) for service management. This is also one of the advantages in the present WWW. Therefore, compared with the conventional telephone answer service, more people can participate now in creation of response service application freely, and are expected that many convenient information will be further brought about by the general public in addition to WWW.
[0016]It is made as [use / it uses that the equipment (server 1) which employs response service is connected to the Internet 2, and / the information on the existing WWW which exists on the Internet 2]. The audio response service which utilized a vast quantity of existing data of WWW by this can be provided now.
[0017]On the other hand, the point that the system of this embodiment differs from the system of the conventional WWW largely is a point that the server 1 is connected with the telephone network 14, it connects from the common telephone terminal 15, and service can be received. The information on the server 1 can be accessed now using the telephone terminal 15 which has thereby already spread through a world widely. Namely, although it was common to have accessed a server from the terminal (PC) connected to the Internet 2 in the system of the conventional WWW, and to have perused information in a visual form, According to the system of this embodiment, it can access from the telephone terminal 15 and information can be pulled out in an auditory form.
[0018]In order to realize a system which was mentioned above, this embodiment defines a programming language for exclusive use. In the conventional WWW, in order to describe information, the language called what is called following HTML (Hyper Text Markup Language) is used. The HTML concerned is premised on perusing information visually.
[0019]
<HTML> <TITLE>test page</TITLE> <BODY bgcolor=white> <H1>Test Page</H1> <IMG src=ball.gif>This is a test page.
 For more information and go -- in the system of <A href=detail.html>here</A>. </BODY> </HTML>, on the other hand this embodiment, The programming language for describing the information with which the user of the telephone terminal 15 is provided is made as [program / supposing exchanging information in an auditory form by telephone / the treatment of the button input from the turn which reproduces a sound, timing, and a telephone terminal user, etc.]. In the system of this embodiment, since it assumes that the use from terminals (facsimile terminal etc.) other than a telephone terminal also mentions later, the programming language is designed to become available also from those terminals.
[0020]Therefore, although "the document file described in HTML and the data of an image, a sound, etc. which accompany it" are stored in the conventional WWW system, "the data of the file described by the special purpose language, an image, a sound which accompany it, etc., etc." is used in the system of this embodiment. In the following descriptions, this "file described by the special purpose language" is carried out to a "response script file" or only calling it a "response script."
[0021]The easy example of the response service described in the above-mentioned response script is what is called telephone information service. That is, if the code number specific guide sound voice will be reproduced if the donor of the service is telephoned, and asks a user for selection of information, and a user indicates desired information to be is input by the operator of a telephone terminal, the corresponding sound of information will be reproduced. Thus, it is made as [be / providing the conventional telephone answer service and the same service in the system of this embodiment to the user who accesses from a telephone terminal / possible], and it is possible to also provide the service which is not in the conventional service so that it may mention later further.
[0022]2 System configuration 2.1 The whole system composition of an embodiment of the

invention and the internal configuration of the server 1 connected to the information network of the system concerned are shown in entire configuration Fig.2.

[0023]The service Management Department 20, the Internet connectivity part 3, the file transfer control part 4, the script interpreter execution part 5, the telephone network connection part 7, and the recognition synchronizer 8 from which the server 1 constitutes the dialog program execution part 31 of Fig.1 in this Fig.2,It has the file temporary memory 6 which constitutes some memory storage 32 of Fig.1. This server 1 communicates with user terminals, such as the telephone terminal 15, the facsimile terminal 16, the computer terminal 17, and the dedicated terminal 18, via the telephone network 14, The Internet 2 is passed if needed and they are other servers (the master file memory server 9, the file memory server 10, the server program execution server 11, the database server 12, the web server 19, etc. which are mentioned later) and computers (for example, a personal computer and the following). It communicates with 13 set to PC. Thereby, this server 1 provides various services according to the demand from a user terminal.

[0024]Namely, in this server 1 the telephone network connection part 7, Transmit and receive voice data, facsimile information, a DTMF (Dual Tone Multi-Frequency) signal, etc. through the telephone network 14, Encoding, decoding, an error correction, etc. are processed to each data by voice recording and the regenerating section 7B, an image input and an outputting part 7C, and the DTMF processing part 7A. In the sender number primary detecting element 7D, if detection of the telephone number of the user terminal connected to this server 1 is possible, it will detect. Thus, in the server 1, it is made as [provide / operation of the operator in the telephone terminal 15 and the facsimile terminal 16, and the sound and facsimile information which are input are detected, and / various services]. The user terminals linked to the telephone network 14 may be the above-mentioned telephone terminal 15 or not only the facsimile terminal 16 but the computer terminal 17, the dedicated terminal 18, a cellular phone, what is called PHS (personal handyphone system), etc.

[0025]The voice data in which the file transfer control part 4 is obtained from the Internet connectivity part 3 via the Internet 2, The image data of a facsimile terminal, the document data of WWW (WorldWide Web), Convert response procedure script data etc. to the data format in the inside of the server 1 suitably, and it outputs to the script interpreter execution part 5 or the file temporary memory 6, The data sent from the script interpreter execution part 5 or the file temporary memory 6 contrary to this is suitably converted to a suitable form, and it outputs to the Internet 2. However, the data format in the Internet 2 does not necessarily need to differ from the data format in the inside of the server 1 here.

[0026]The master file memory server 9 connected to the above-mentioned Internet 2 holds the master file for controlling work of the server 1.

[0027]The file memory server 10 holds the data (it names generically and is called a remote file) of response procedure script data, a sound, an image, etc., etc.

[0028]Hold the database server 12 inside and a database by the demand from the server program execution server 11, A database is updated according to the data which outputted the contents of the database to the server program execution server 11 suitably, and was conversely input from the server program execution server 11.

[0029]According to the contents of the server program currently held from other terminals connected to the Internet 2 to a demand and an inside, the server program execution server 11 communicates with the database server 12 suitably, and performs the exchange of the Internet 2 and information.

[0030]The Internet 2 is accessed and PC13 communicates with the server 1, the master file memory server 9, the file memory server 10, and the server program execution server 11 suitably. Thereby, the user of PC13 is made as [manage / the information accumulated on / these various / the server]. However, in each server, sufficient authentication operation is performed in the overhead operation from the server outside in view of security.

[0031]According to such structure, the server 1 takes out a master file from the master file memory server 9 via the Internet 2, It is made as [exchange / via the server program execution server 11 / exchange a remote file between the file memory servers 10, and / the data of the database server 12]. The server 1 communicates with other PC13 connected to the Internet 2, and is made as [change / according to the command from PC13 / conversely / information can

be sent to PC13 or / into it / operation of the server 1].
[0032]The script interpreter execution part 5 of the server 1, According to the contents of the master script input or held via the Internet 2 at the file temporary memory 6, operation is switched suitably, the file transfer control part 4, and the file temporary memory 6 and the telephone network connection part 7 are controlled, and an exchange of these equipment and data is performed.
[0033]the data which the file temporary memory 6 communicated with the file transfer control part 4 and the recognition synchronizer 8, held the data input from them inside, and was held according to the control from these pieces of equipment -- suitably -- an output -- or it updates or eliminates.
[0034]The file temporary memory 6 has at least one script management file. The script management file is having structure as shown, for example in Fig.3, and manages correspondence of a response procedure script file name and a response service code.
[0035]The recognition synchronizer 8 processes voice synthesis, speech recognition, character recognition, an image synthesis, etc. according to control of the telephone network connection part 7 to the data input from the telephone network connection part 7 or the file temporary memory 6, and outputs the result to the telephone network connection part 7 or the file temporary memory 6. For this processing, the recognition synchronizer 8 builds the speech synthesis section 8A, the voice recognition part 8B, the character recognition part 8C, and the image synthesis section 8D in the inside, and uses them suitably.
[0036]2.2 File 2.2.1 In the response procedure script book embodiment, the program in which the user who uses the terminal of the telephone terminal 15 etc. manages the dialog to perform with the server 1 through the telephone network 14 is called the response procedure script (it is suitably considered as a response script, a script, etc.). And this program is calling what was file-ized the response procedure script file (it is suitably considered as a response script file, a script file, etc.) as data on a computer.
[0037]A script file is interpreted by the script interpreter execution part 5 of the server 1, and the server 1 operates according to the contents. That is, the script file concerned describes the flow and command which control operation of the server 1. Below, the example of a response script is shown.
[0038]

```
{
    while (TRUE) {
        &wait_call;
        &off_hook;
        &play_sound('hello.snd');
        &on_hook;
    }
}
```

The order of the real way of the response script is shown in Fig.4. In the flow chart of this Fig.4, by step SP1, when the telephone call has been got [geting a telephone call from a user's terminal and] from the user in waiting and step SP2, a circuit is connected. If a circuit is connected in step SP2, in step SP3, a file name will reproduce "hello.snd" and the voice file currently made. After that, a circuit is cut in step SP4.
[0039]In the above-mentioned response procedure script, what is read first especially at the time of starting of the server 1 is called a master script.
[0040]That by which the script was file-ized electronically must exist in the file temporary memory 6, the master file memory server 9, or the file memory server 10.
[0041]2.2.2 Like "hello.snd" in the program of the example of a script of the data above-mentioned, it is made as [refer to / other data files] from the script file. Although voice data is referred to in this example, it is possible to use text data, image data, etc. for others. It is possible to use the data file of various formats also about the same voice data. Those data is file-ized electronically and is stored in the file temporary memory 6, the file memory server 10, etc.

[0042]2.3 In the system of a response service code book embodiment, it is carried out to the user who connects from the telephone network 14 with the telephone terminal 15 etc., It supposes that a respectively peculiar code number is assigned, and this is called a response service code to service constituted in a response procedure script. Thereby, the user can choose various services registered into the servers 1, such as weather service, road-traffic-information service, and map print service, with the code number concerned with a user terminal.
[0043]If the management file shown in the aforementioned Fig.3 associates the script showing this code number and actual response service and a user inputs the code number concerned from a user terminal in the service concerned, The server 1 is made as [determine / a script corresponding based on this management file].
[0044]A response service code is generated by the service Management Department 19 when the author of a response procedure script registers a script into the server 1.
[0045]2.4 The following items are mentioned as basic motion of the system by a basic motion present invention embodiment.
[0046]
- Describe about each of each above-mentioned item below by the maintenance of use and the script of the service in registration and the script of a response procedure script and the script to creation and the server 1 of associated data, and associated data.
[0047]2.4.1 The contents are described by the data relevant to a response procedure script and it in the service with which the user who is realized by the system of this embodiment and uses the apparatus connected to the telephone network 14 is presented as the creation aforementioned Section 2.2 of a script and data described.
[0048]Although a response procedure script is the text file illustrated with aforementioned Section 2.2.1, the language specification is not included in the present invention. According to language specification, it is clear, and anyone is able to create if it is. The data (a sound, an image, etc.) relevant to a response procedure script can also be created by anyone. A script and data are registered into the server 1 after creation, and it begins, and can be used through the telephone network 14.
[0049]2.4.2 The method of registering a response script into the server 1 from PC13 connected to the registration Internet 2 of a response script can consider various examples.
[0050]It sets via the Internet 2 from PC13 to register a response script into the server 1, and an example of the operation procedures of the server 1 is shown in Fig.5.
[0051]If a user starts what is called a web browser for example, on PC13 and connects PC13 to the server 1 in the flow chart shown in this Fig.5 for registration of a script, The web server 19 works and the web page for script registration is transmitted to the web browser of PC13 in the web server 19 concerned step SP11. As a response script registration picture displayed on a display with the web browser performed on the above-mentioned PC13, a screen like Fig.6 can be mentioned as an example. On this response script registration picture, the input part of a name and the input part of a file name are displayed, and the soft key display ("O.K.", "RESET") of whether to register that input further, etc. are displayed.
[0052]The maker of a response script creates a response script in PC13, opens this screen, and inputs his name and the file name of a response script into the blank of the input part of a name, and the input part of a file name. Thereby, from PC13, the address showing the whereabouts of the response script on the PC13 concerned itself or a response script is sent to the server 1 by HTTP (Hyper Text Transfer Protocol). And it shifts to processing of step SP12 and the server 1 receives the sent data.
[0053]Then, it will shift to processing of step SP14 and the server 1 will take out the script itself from the address, if it shifted to processing of step SP13, it judged whether the script itself has been sent and whether it would have been sent in the address of a script and the address has been sent. As an address, what is called URL (Unified Resource Locator) can be used, for example, In that case, the server 1 takes out a script from PC13 through the Internet 2 according to the protocol described at the URL concerned from the Internet connectivity part 3.
[0054]Thus, next, it shifts to processing of step SP15, and the server 1 which received the script by which method checks the contents of the script, and judges whether there is any grammatical error. When an error is detected here, it shifts to processing of step SP16 and an error message is transmitted to PC13. Thereby, on the screen of the web browser of PC13, an error message is

displayed and he is urged to register anew after correction to a user.
[0055]When an error is not detected with the check of step SP15, he proceeds the server 1 to processing of step SP17, and the service Management Department 20 saves this script at the file temporary memory 6. Proceeding to processing of step SP19, the service Management Department 20 generates the service code corresponding to a script, and tells the web server 19. Then, in subsequent step SP20, the web server 19 generates the web page for telling a user about the notified service code, and transmits the data to PC13. Thereby, the user can check the service code published by the server 1 on the screen by the web browser on PC13. An example of the picture output displayed on the screen of a web browser at this time is shown in Fig.7. namely, -- the example of this Fig.7 -- as a registration result -- "-- your response script file was registered correctly. The access number of this response script is 3487. The display of " etc. is made.
[0056]2.4.3 The operation procedures of the server 1 in case a service user receives the service in a response script are shown in the use Fig.8 of a script.
[0057]In this Fig.8, if a service user connects with the server 1 through the telephone network 14 using the telephone terminal 15, it will shift to processing of step SP31 and the server 1 will transmit a guidance voice (for example, "please input the service code of hope" etc.) to the telephone terminal 15. On the other hand, if a service user inputs the service code (it is 3487 to the script registered in the example of Fig.7 if) of hope by the operator of the telephone terminal 15, It shifts to processing of step SP32, and the server 1 receives and converts the signal in the telephone network connection part 7, and makes it a content-type.
[0058]Then, judge whether at the service Management Department 20, it is proper at step SP33 in this value, and if not proper, Namely, if the service corresponding to the input service code cannot be provided, It awaits that shift to processing of step SP36, perform the notice with a sound with an unjust service code and return to processing of step SP32 from the telephone network connection part 7 continuously to a service user's telephone terminal 15 via the telephone network 14, and a service code is input again.
[0059]If the service code is proper in the judgment of step SP33, it shifts to processing of step SP34, and the service Management Department 20 will take out the script corresponding to the service code from the file temporary memory 6, and will hand the script interpreter execution part 5.
[0060]Then, it moves to step SP35, and the response script in which the script interpreter execution part 5 was passed is interpreted and performed.
[0061]Thus, by assigning a code number to each response script, two or more services are realizable by one set of the server 1. The configuration example in the case of realizing two or more services by one set of the server 1 is shown in Fig.9.
[0062]In this Fig.9, on the Internet 2, PC42 of the author of the response script S2 of "news" is connected with PC41 of the author of the response script S1 of a "weather report", respectively, for example, and both connect with the server 1, respectively and register a script. Thereby, for example, the server 1 is already registered, those scripts are registered together with the response script S3 of "traffic information", and it publishes a code number in each script. The user connected to the server 1 can receive desired service using the telephone terminal 15 by inputting the number of the script which provides desired service among each code number (it is a script of S1, S2, or S3 at this example).
[0063]2.5 expanded-function 2.5.1 voice synthesis -- as mentioned above, although the server 1 can transmit the voice data prepared previously to a user's telephone terminal 15 etc., it is also possible by using text-to-speech synthesis to generate a sound and to transmit from text data.
[0064]Only the portion related to voice synthesis is extracted and expressed to Fig.10 in the entire configuration shown in the aforementioned Fig.2.
[0065]In this Fig.10, the file temporary memory 6 is made as [hold / a program and not only voice data but text data].
[0066]And the script interpreter execution part 5 requires text data of the file transfer control part 4 suitably according to the read program. The file transfer control part 4 takes out the demanded file from the file temporary memory 6, and transmits to the telephone network connection part 7, and the telephone network connection part 7 concerned sends the data to the recognition synchronizer 8.

[0067]In the recognition synchronizer 8, this data is converted to a sound by the speech synthesis section 8A, and the generated voice data is transmitted to the telephone network connection part 7. And a sound is transmitted to a user's telephone terminal 15 by the telephone network connection part 7 through the telephone line 14.
[0068]When sending the text data stored in the file temporary memory 6 to the recognition synchronizer 8, it may be made as [send / not only from the above methods but from the file temporary memory 6 / to the recognition synchronizer 8 / directly]. In that case, the identifier of the file of the target data is notified to the recognition synchronizer 8 through the telephone network connection part 7 from the script interpreter execution part 5.
[0069]Below, an example of a script which reads out a specific text is shown.
[0070]
{while(TRUE) {&wait_call;&off_hook; &play_text (" -- I have suspended service now.) " --) &play_text; (" -- please apply again after tomorrow.) "); &on_hook;}
}
Thus, in the system of this embodiment, since a sound can be generated from text data and it can be used for dialogue service, those who create dialogue service do not necessarily need to prepare voice data, and it becomes possible to create service more simply.
[0071]2.5.2 voice input -- as mentioned above, the server 1 receives the DTMF signal by the operator of the telephone terminal 15 as an input from a user, and although interpreting is possible, it is made also as [receive / further / the voice input from the telephone terminal 15 by a user]. The sound which the user input from the microphone of the telephone terminal 15 is input into the telephone network connection part 7 through the telephone network 14. The script interpreter execution part 5 determines processing of this voice data according to the program under execution, and actually performs it by controlling the telephone network connection part 7.

[0072]For example, when specified that it records the sound from the telephone terminal 15 to the file temporary memory 6 in a program, the voice data input into the telephone network connection part 7 is suitably converted to a content-type by voice recording and the regenerating section 7B, and is saved at the file temporary memory 6.
[0073]When specified that it uses the sound from the telephone terminal 15 for speech recognition in a program, The voice data input into the telephone network connection part 7 is sent to the recognition synchronizer 8, in the voice recognition part 8B, it is applied to speech recognition processing, and the result is sent to the script interpreter execution part 5.
[0074]Thus, by being made as [receive / the voice input input by the user from the telephone terminal 15 / the server 1], It becomes possible to treat the program which realizes service which records the sound of the user through the telephone terminal 15, and is played behind, service which cannot depend selection from two or more menus on the operator of the telephone terminal 15, but can perform it with a sound, etc.
[0075]2.5.3 Although the data which accompanies a response script and it is stored in the file temporary memory 6 in the server 1 in the example of a system shown in the Fig.2 of the incorporation above-mentioned of the external file, it is also possible to place these scripts and data out of the server 1 in the present invention.
[0076]In the response script taken up with aforementioned Section 2.2.1, it is made as [reproduce / in a script / a voice file] (example of the aforementioned response script). By generalizing more the portion which specifies the voice file name in this script, the data not only at the same place as the script file being saved but various places on a network can be specified.

[0077]Although URL (Unified Resource Locator) is typical as a method of showing the whereabouts (it is hereafter called an address) of the data on the Internet, what has the same function as URL or it also by the system of this embodiment is used.
[0078]For example, with the following script, URL is specified in the portion which specifies a voice file name to the example of the response script taken up with above-mentioned Section 2.2.1.
[0079]
{while (TRUE) {&wait_call;&off_hook; &play_sound ('http://www.foo.co.jp/data/hello.snd'); &on_hook;} This script is registered into the server 1,} The state where it was stored in the file

temporary memory 6 is shown in Fig.11.
[0080]In this Fig.11, when performing the script which specified data by the server 1, the server 1 takes out the data file specified suitably if needed through the Internet 2 from the Internet connectivity part 3. For example, while the script interpreter execution part 5 is interpreting and performing the script, extraction of a data file is instructed to the Internet connectivity part 3, The form where the voice data taken out from the file memory server 10 through the Internet 2 is played by voice recording and the regenerating section 7B etc. can be considered.
[0081]As shown in Fig.12, it is also possible to put the script itself on the outside of the server 1.

[0082]URL showing the whereabouts of a script is registered into the server 1 instead of the maker of a response script registering the script itself in the case of the example of this Fig.12. The server 1 saves URL registered into the script list in the file temporary memory 6, when it is needed in response service, takes out the substance of the response script registered through the Internet 2 from the file memory server 10, and performs it. Although the script and the data file are placed on the same server (file memory server 10) in Fig.12, it may be placed on a server different, respectively. In this case, URL is assigned to each, and it is good one if it is possible to take out from the server 1 according to it. The encoding method which has the same function (function which determines the whereabouts of the data on a network uniquely) instead of URL may be used.
[0083]Those change and additions can be easily performed now by putting the data used from a script or a script on the outside of the server 1 like the above-mentioned Fig.11 or Fig.12.For example, when the maker of a script has managed his web server, the contents of the script can be changed at any time by putting a script on the server.
[0084]2.5.4 In the server 1 of the system of a file transfer control part book embodiment, as shown in Fig.13, more flexible data transfer is realizable by putting the file transfer control part 4 on an inside. Fig.13 extracts and shows only the file transfer control part 4 in the server 1, and the portion relevant to it.
[0085]In this Fig.13, the file transfer control part 4, Convert suitably various kinds of data which accompanies the response script obtained via the Internet connectivity part 3, and it to the data format in the inside of the server 1, and it outputs to the script interpreter execution part 5 or the file temporary memory 6, The data sent from the script interpreter execution part 5 or the file temporary memory 6 contrary to this is suitably converted to a suitable form, and it outputs to the Internet 2. However, the data format in the Internet does not necessarily need to differ from the data format in the inside of the server 1 here.
[0086]2.5.5 When the cache file transfer controlling part 4 of a file takes out the data which had a demand from the interpreter execution part 5 from other servers on the Internet 2, When the data is saved at the file temporary memory 6 and there is a demand of the again same behind data, it may be made as [return / the data saved at the file temporary memory 6 without taking out from the site on the Internet 2 again]. It can prevent delaying execution of a response script for the time which reading of the same file takes by this. About a cache of this downloaded file, it describes in detail with "the details of a cache of a downloaded file" of Section 2.6 mentioned later.
[0087]In a cache of a downloaded file, without making it cache uniformly depending on a script maker's volition, There is a case where he would like to distinguish the file which does not need to be cached, the file I want you to cache as for a long time as possible, the file I want you to cache till a specific time, etc. Although it is necessary to also carry out the check of whether to update by the site side after the file cached downloading, there is a case where he would like to also specify the updating check frequency. It has a management file in such a demand at the site side, and can respond by downloading it. About the extended control of this cache, it describes in detail with "the details of extension of cache control" of Section 2.7 mentioned later.
[0088]2.5.6 In the system of the prediction book embodiment of a file, it may be made as [read / the file which is needed in the response script under execution or before execution / into the file temporary memory 6 / previously]. This can prevent execution of a response script from being delayed compared with beginning reading for the first time, when a certain file is needed during script execution. About prediction of the file which is needed in the response script under execution, it describes in detail with "the details of prediction of a downloaded file" of Section

2.8 mentioned later.
[0089]In prediction of a downloaded file, there may be what it is better to predict by a file depending on a script maker's volition earlier than other things, and a thing not to predict.
[0090]In such a case, it becomes possible to also meet such a demand by describing the command which carries out priority instruction of the prediction of a specific file to the script itself explicitly, or describing the command which forbids prediction.
[0091]2.5.7 Although it is possible to download and perform the response script file from various sites in the system of the function restriction and the function change book embodiment of a script, If every response script enables it to perform all functions unconditionally, it may become a problem with security, resource quantity, etc. of a system conversely.
[0092]In such a case, by preparing the file which set up the execution authority of the script according to file for every site, It becomes possible to eliminate problems, such as security and resource quantity, by carrying out function restriction of the command described by the script according to the setting out, or carrying out a function change.
[0093]In restriction of the amount of the resource quantity used, etc., setting-out items, such as sound recording maximum time, size of a downloadable file, the maximum size of the file cached simultaneously, and a level of the priority by which cash-out is carried out, and a response script that can be called, can be considered, for example. In restriction by security, setting-out items, such as upload propriety of the file in the file temporary memory 6 and propriety of access to a system file, can be considered.
[0094]A function change is performing substitution processing of reproducing the file of error sound voice, when it is going to reproduce the voice file by which access restriction was carried out, for example. It becomes possible when this also sets up substitution processing together with function restriction.
[0095]2.5.8 Interpret / perform a response script by the script interpreter execution part 5 in the system of the auto select book embodiment of a script engine. The necessity whose number is one does not necessarily have this interpretation / program (script engine) to execute. If two or more script engines are prepared to each even if two or more description languages of a response script occur, Before performing a response script, the script interpreter execution part 5 can interpret / perform the script engine which distinguishes automatically whether it is a kind which can be performed by which script engine, and corresponds.
[0096]It can respond to distinction of a kind by describing the name of the description language first [the script itself], for example, or describing the name of a corresponding script engine.
[0097]Even if the language which describes a response script is the same, it not only performs what was described as it was in the form of the language source, but it is to perform the response script previously converted to the form of the interlingua. In such a case, it can respond by also receiving and preparing the source and the script engine according to each interlingua.
[0098]2.5.9 The automatic download script engine of a script execution related file does not necessarily need to be previously prepared on the server 1, is downloaded from the master file memory server 9 if needed, and may be made as [store / in the file temporary memory 6]. For example, when it is going to perform the response script which needs to be interpreted / performed by the script engine, the script interpreter execution part 5 requires of the file transfer control part 4, and downloads a required script engine, or, When the file transfer control part 4 downloads a response script, it may be made as it downloads by itself, when there is no script engine required to interpret / perform it in the file temporary memory 6.
[0099]When the file downloaded automatically may not be a script engine, for example, it is going to interpret / perform a response script, When there are no program and data required in order to execute the specific command currently used within the script on the server 1, it may be made as [download / from the master file memory server 9 / a required file].
[0100]It is not necessary to prepare previously all the programs and data that can be considered previously on the server 1, and the resource of the file temporary memory 6 is saved by carrying out like this. Since the newest file can be downloaded without stopping operation of the server 1 when required even if a script engine, data, etc. are updated after employment of the server 1 or it is made newly, a system can always be maintained at the newest state. By putting those files on the file temporary memory 6, The function of prediction of other downloaded files, and the

same cache yne, cash-out and a file can be used, and it is lost that the file which became unnecessary wastes the resource of a system always.
[0101]2.5.10 In what is called WWW browser used with user control PC outside script description, etc., Read the HTML file of a certain homepage and it not only displays according to description of HTML, but, It can say now during transmission and a display, being interrupted in the middle of reading of a file according to a user's intention, or displaying again the page displayed immediately before. In the case of the terminal using a screen, the softswitch for the function is provided on a screen, and it becomes possible by pushing it, when you like a user. However, in the case of the terminal etc. in which the interface which a user can input is extremely limited like a telephone terminal, it is waiting for the input by the interface on the response script, and a system cannot occupy it for the above special uses in many cases.
[0102]In such a case, in the script interpreter execution part 5 or the telephone network connection part 7, What is necessary is to just be made as [control / the script interpreter execution part 5 / by performing an original interpretation in the response script itself / without passing the input], when there is an input of a specific sequence from the interface.
[0103]When doing in this way and "****1" is continuously input from the operator of the telephone terminal 15, for example, When it is made to return to the last script and "****0" is input continuously, for example, it becomes possible to control with returning to a first script etc. not related at description of a response script itself. Of course, it is possible not only the operation by an operator but for it to be made to perform same control by a "stop" and the input of "returning", for example, it is based on a sound.
[0104]2.5.11 When the user who uses the system concerned with a communication terminal connects with the network concerned by the system of this embodiment in time with the auto select of the script by a connection destination terminal address / classification, it is not necessarily convenient to use service of the same script.
[0105]Then, for example, by equipping the telephone network control part 7 with the sender number primary detecting element 7D, and transmitting the number to the script interpreter execution part 5 at the time of the connection from a user's communication terminal, It may be made as [perform / the script interpreter execution part 5 / the response script according to the number / choose and].
[0106]By carrying out like this, the service according to the user who registered previously, for example can be provided immediately.
[0107]By equipping the telephone network connection part 7 with the function which can detect the kind of terminal, and transmitting the kind of the terminal to the script interpreter execution part 5 at the time of the connection from a user's communication terminal, It may be made as [perform / the script interpreter execution part 5 / the response script according to the number / choose and].
[0108]By carrying out like this, the optimal service can be provided now to the user who connects, for example with a telephone terminal, the user who ** with a facsimile terminal, and each user who connects by PDA (personal digital assistant) etc.
[0109]2.5.12 In the response script used by the server of the system of a server program and a database access book embodiment, other WWW information on the Internet 2 can be referred to and used. The following scripts can be considered as an example of a script which reads out the contents of the specific web page on the Internet 2.
[0110]
{while (TRUE) {&wait_call;&off_hook; &read_aloud_html ('http://www.foo.co.jp/data/news.html'); &on_hook;} again,} It is made as [use / the information acquired from data and the server programs not only read-aloud but on WWW (CGI etc.) / variously]. For example, when made as [return / a certain server program / the current time at that time], the script using the program tells current time as follows to the user who has connected.
[0111]
{while (TRUE) {&wait_call;&off_hook; $time = &get_web('http://www.foo.co.jp/cgi-bin/time.cgi'); &play_text (the time of "free now is $time.) "); &on_hook;} When processing such a script, the script interpreter execution part 5 interprets this script,} The portion described to use the information which exists on the Internet 2 of the outside of the server 1 is detected, and it is made as [take / the information / from the Internet connectivity part 3 / via the direct or file

transfer control part 4].
[0112]As mentioned above, the system concerning a present invention embodiment is made as [use / the information which already exists on the Internet], and the maker of a response script does not need to prepare by himself all the information that the script which he creates brings about. Service which provides the information which processed the information which already exists on the Internet, or was totaled, and was made can also be offered. Therefore, it is possible to provide the environment where more people can make the script which provides various services.
[0113]2.6 The detailed file transfer control part 4 of a cache of a downloaded file will download repeatedly the file used frequently, although a file is downloaded by Internet 2 course according to the demand of the script interpreter execution part 5. Since downloading the same file repeatedly takes time in many cases in communication through the Internet 2, there is a problem on a user's convenience.
[0114]Then, if it is made to take out from the file temporary memory 6 when it instructs so that the downloaded file may be saved temporarily at the file temporary memory 6 and the same file as the next may be downloaded, Time is not taken compared with downloading the same file again, but it is efficient. Generally such processing is called a file cache.
[0115]An example of the file (a remote file management file, a local cache management file) for managing a file cache by the system of this embodiment is shown in Fig.14 and Fig.15.The file transfer control part 4 creates / updates these files, and they are placed by the file temporary memory 6.
[0116]The remote file management file of Fig.14 records the correspondency etc. of URL of the downloaded remote file, and the file name (local file name) stored in the file temporary memory 6. A master file as well as a remote file may be treated. The local file name is made as [generate / so that it may not already lap with a certain local file name by the file transfer control part 4], when a remote file is downloaded. There are a remote file update date for a remote file to record when it is what was created / updated as an item of this file, last updating check time for recording when it investigated a remote file would be downloaded, etc. In the example of this Fig.14, remote file URL "http://test.jp/a.txt" is managed as a local file by the file name "a0121.txt", Creation / updated time of the downloaded remote file is 10:10 15 seconds on November 11, 1997, and it is shown that it is 12:15 05 seconds on November 13, 1997 which finally checked the update date of this remote file.
[0117]The local cache management file of Fig.15 is for recording the information about access of a local file. There is a counter during access which is the number of the scripts which are trying (the download request was carried out) to use the last access time which is the time which accessed the local file at the end, and a local file applicable at present as an item recorded for every local file. It is shown that that local file is not being used for a counter during this access when that value is 0, and being used at the time of one or more values is shown. Judgment whether a local file may be updated or deleted by this is attained. In the example of this Fig.15, it is 15:51 11 seconds on November 13, 1997 that the local file "a0121.txt" was accessed at the end, and being used in two scripts now is shown.
[0118]2.6.1 When downloading a remote file to cache yne procedure Fig.16, the procedure which the file transfer control part 4 follows about a file cache is shown in it. This is performed when the script interpreter execution part 5 requires download of a remote file of the file transfer control part 4 according to description of a script, for example.
[0119]In this Fig.16, first, by step SP41, the remote file which wants to use remote file URL of a remote file management file as a search key, and to download it is registered, it has already downloaded to the file temporary memory 6, or search is started. Here, if the remote file which gets blocked and corresponds if it judges whether remote file search was successful and search fails in step SP42 is not registered, it will download by shifting to processing of step SP47.
[0120]On the other hand, in step SP42, in the following procedures, it will investigate and search will decide whether to download again, if a success, i.e., an applicable remote file, is registered.
[0121]When it judges with the remote file being registered in the above-mentioned step SP42, in step SP43, The corresponding local file name currently recorded on the applicable entry of a remote file management file is acquired, and the entry of the same local file name is searched from a local cache management file.

[0122]Next, in step SP44, a counter is investigated during access of an applicable entry. Here, it shifts to processing of step SP51 without considering that there are a script etc. which have otherwise accessed the local file and downloading, if the value of a counter is one or more during access of an entry. On the other hand, if the value of a counter becomes zero during access, it will shift to processing of step SP45.
[0123]In step SP45, a remote file's own update date is asked to the remote file memory server 10 etc. through the Internet connectivity part 3, and the result is acquired as the newest update date.
[0124]Next, the newest update date is compared with the remote file update date currently recorded on the remote file management file in step SP46, If the same, a remote file is not updated, but it will shift to processing of step SP50 without regarding it as the same thing as a local file and downloading.
[0125]On the other hand, in the judgment by step SP46, if the update date of the remote file is different, it will consider that the remote file is updated from the last download, and will download in the following procedures.
[0126]When it judges with the update date of a remote file being different in the above-mentioned step SP46, in step SP47, If it investigates whether the storage capacity of the file temporary memory 6 has a margin as a cash-out check and is hard-pressed, it will twist that it is likely to be used not much and a local file will be deleted. The details of this operation are described in the case of description of the flow chart of next Fig.17.
[0127]Next, in step SP48, the transfer request of the remote file which corresponds to the file memory server 10 etc. through the Internet connectivity part 3 is performed, and it downloads to the file temporary memory 6. If it is the file registered into the remote file management file at this time, a certain applicable local file is already overwritten, and if not registered, the name which does not lap with other local files is attached, and it stores as a new local file.
[0128]Subsequently, in step SP49, the contents of the entry to which a remote file management file and a local cache management file correspond are updated to the latest information. It carries out also here, and if it is an unregistered remote file, a new entry will be created to each file. A remote file update date and the last access time of a local file set the value of a counter to 0 during the present time and access.
[0129]In the following step SP50, the last updating check time of a remote file management file is updated at the present time.
[0130]Then, in step SP51, it memorizes having added 1 to the counter during access of a local cache management file (1 increment), and having started use of the applicable local file.
[0131]Finally, the last access time of a local cache management file is updated at the present time, and step SP52 finishes this download processing.
[0132]Here, if this processing was performed by the demand of the script interpreter execution part 5, the script interpreter execution part 5 will be told about download having finished.
[0133]2.6.2 When downloading a remote file, the file transfer control part 4 shows an example of a procedure (usually called cash-out) which deletes a local file with few possibilities of being used from a file cache to cash-out procedure Fig.17. In the example of this Fig.17, it has deleted in an order from the local file which is not accessed these days until a leeway is given to the region which stores the local file of the file temporary memory 6.
[0134]In this Fig.17, first, by step SP61, it investigates whether a margin is in the free space of the file temporary memory 6, and if generous, processing will be ended. On the other hand, supposing it is hard-pressed, it will proceed to processing of step SP62.
[0135]Each entry of a local cache management file is arranged in the old order of last access time, and a first entry, i.e., last access time, takes out the oldest thing by the following step SP63 step SP62.
[0136]Next, in step SP64, it investigates whether the value of a counter is 0 during access of the entry, and since it is [be / it] under access now if it is not 0, the entry is flown and it proceeds to processing of step SP68. On the other hand, if the value of a counter becomes zero during access, in order to delete an applicable local file, the entry corresponding to the local file of a remote file management file and a local cache management file is first deleted in step SP65.
[0137]Next, the local file itself is deleted in step SP66.
[0138]In the following step SP67, if it investigates whether a leeway was given in the availability

of the file temporary memory 6 and a leeway is given by deletion of this local file, processing will be ended. On the other hand, if yet hard-pressed, it will proceed to processing of step SP68.
[0139]In this step SP68, it investigates whether the chosen entry is the last entry, in being the last entry, it ends processing, and if it is not the last entry, it will proceed to processing of step SP69.
[0140]In step SP69, it repeats acquiring the next entry, returning to processing of step SP64 after that, and investigating the local file which can be deleted again.
[0141]The procedure in which the file transfer control part 4 ends access of a local file is shown in Fig.18. This requires processing from the file transfer control part 4, in order to tell that use finished about the file downloaded in the script, when the script interpreter execution part 5 ends execution of one script, for example. For example, when the script interpreter execution part 5 requires processing of Fig.16 according to description of a script, When the script interpreter execution part 5 keeps in mind the file which carried out the download request and ends that script, that processing is required about all these files kept in mind. If the multiple-times download request of the same file is carried out, only the same number of times will call this processing.
[0142]In this Fig.18, first, a local file name applicable from a local cache management file is used as a key, and an entry is searched with step SP71.
[0143]Next, in step SP72, the last access time of the searched entry is updated at current time.
[0144]In the following step SP73, 1 is subtracted from the value of a counter during access, and the post-processing is ended. Thereby, the function of a fundamental file cache is attained.
[0145]2.7 The cache function in which extension of cache control carried out the detailed above-mentioned, All the downloaded files are put into a file cache, and the general cache function of erasing from the file which is not used most if the availability of the file temporary memory 6 is becoming insufficient is applied to the system of this embodiment. It was being checked each time whether the file in the file memory server 10 would be updated.
[0146]However, it may be better to have been able to specify the treatment in a cache for every file depending on the case. For example, it is a case like [even if not used for a while by a master file etc.] a file to leave on the file temporary memory 6 as a default file. Since it turns out previously that it does not update, most such files are files which do not have to carry out each time updating check. Since it updates frequently conversely, there is also a file without the necessity of leaving the prolonged cache, and these various cases are assumed to be it. Although the cache function mentioned above was carrying out equivalent treatment to all the files, it can make treatment in a cache special only about each file or a part of files by the following processings.
[0147]An example of the file used in order to perform treatment in a cache individually to a file is shown in Fig.19 and Fig.20.
[0148]The administrator of the directory puts the site cache configuration file shown in Fig.19 on a directory (site) with the remote file of the file memory server 10 or the master file memory server 9. This file itself is a remote file. The update date check frequency which shows the frequency which checks the update date of a file name and its file about each remote file which has this file on that directory (site), The file life time which shows which wants to place the file into the cache is matched. In the example of this Fig.19, if URL of a site cache configuration file itself [this] sets to "http://test.jp/d/sitec.def", for example, File "a. wav" of the same site Since it is got blocked and "http://test.jp/d/a.wav" does not have a schedule updated, an update date check is setting out of it being unnecessary and leaving in a cache as for a long time as possible. Similarly, if it will check updating if a file "b. scd" passes over November 20, 1997, and it passes over November 30, 1997, it will be setting out that it may delete from a cache. Performing a file "sitec.def", when it passes over an updating check from the last check for 1 hour or more, the treatment of a cache is setting out of usually using a passage. Not only the specification for every file but expressions for example, such as a wild card and a regular expression, are possible to specification of the file name of this setting out, and "abc.txt", "foo.txt", etc. are included in it by the file "*. txt" of the example of this Fig.19. Since this file "*. txt" is updated frequently, an update date check is performed for every access, and the cache has become treatment of being effective, only during script execution.
[0149]The cache setting-out correspondence file shown in Fig.20, It is for managing

correspondence with the local file name of a site cache configuration file downloaded from the remote site, and correspondence with remote site URL and the local file name of the cache setting-out correspondence file of the site is recorded. In the example of this Fig.20, the cache setting-out correspondence file which URL downloaded from the remote site of "http://test.jp/d/" is stored in the file temporary memory 6 by the name of a file "b0533.def." The file transfer control part 4 creates / updates this file, and it is placed by the file temporary memory 6.

[0150]2.7.1 When downloading a remote file, the procedure in which the file transfer control part 4 performs a load check individually about a file cache is shown in individual cache yne check Fig.21. The flow chart of this Fig.21 is inserted between step SP44 in Fig.16, and step SP45, and it assumes performing.

[0151]In this Fig.21, URL of a remote site is first searched with step SP81 from a cache setting-out correspondence file.

[0152]URL of the remote site corresponding to URL of the remote file by which the download request was carried out in step SP81 in the following step SP82 (if remote file URL sets to "http://www.test/d/a.wav") URL of a remote site searches whether "http://www.test/d/" is registered into the cache setting-out correspondence file. In this step SP82, when registered, it shifts to processing of step SP86, and when not registered, it shifts to processing of step SP83.

[0153]In step SP83, an applicable cache setting-out correspondence file is downloaded.

[0154]In the following step SP84, if it investigates whether download was successful, it carries out also here and a cache setting-out correspondence file is not able to be downloaded, it will shift to processing of step SP91 and will become a subsequent thing from here to processing of step SP45 of Fig.16.

[0155]On the other hand, when a cache setting-out correspondence file is able to be downloaded in step SP84, it shifts to processing of step SP85. In this step SP85, that remote site URL and local file name are registered into a cache setting-out correspondence file.

[0156]Next, it is searched with step SP86 whether some which match the name of the remote file by which the download request was carried out are in the file name of each entry of an applicable site cache configuration file. At this time, when a wild card, a regular expression, etc. are made by the file name, it searches such.

[0157]if there is no entry of an applicable remote file the following step SP87 as a result of the search, it will proceed to processing of step SP45 of Fig.16 via step SP91 and an entry will be found -- if -- it proceeds to processing of step SP88.

[0158]In step SP88, the update date check frequency of an applicable entry is acquired.

[0159]And in step SP89, it is judged with update date check frequency whether an updating date check is required, If necessary, it will proceed to processing of step SP45 of Fig.16 via step SP91, and if an updating date is unnecessary, it will proceed to processing of step SP51 of Fig.16 via step SP92.

[0160]Thus, it investigates whether the check of an update date is required according to a remote file individual, and processes.

[0161]2.7.2 A trust site configuration file is shown in individual cash-out check Fig.22. This trust site configuration file is a file which registers the remote site which can be trusted, An administrator creates, and it stores in the master file memory server 9, and is made as [download / this / at the time of a system startup, etc. / to the file temporary memory 6 / the file transfer control part 4]. This file is used to judge whether description of the site cache configuration file of a specific remote site, etc. is trusted as it is, and refer to it for the file transfer control part 4 or the script interpreter execution part 5. In the example of this Fig.22, the remote site denoted by the URL "http://master.jp/a/" and "http://test.jp/d/" is registered as a site which can be trusted.

[0162]When deleting the file which is not used from a file cache, the procedure of performing the life check previously set up for every file is shown in Fig.23. This flow chart is inserted between step SP64 in Fig.17, and step SP65, and it assumes performing.

[0163]In this Fig.23, remote file URL of the local file which it is going to delete from the cache is first acquired from a remote file management file by step SP101.

[0164]It is searched with the following step SP102 whether remote site URL corresponding to this remote file URL is registered into the cache setting-out correspondence file.

[0165]next -- if it investigates whether search of remote site URL was successful in step SP103 and is not registered -- if, although it shifts to processing of step SP65 of Fig.17 via step SP110 and a local file is deleted, If registered, it will proceed to processing of following step SP104.
[0166]A site cache configuration file applicable from a cache setting-out correspondence file is specified, and a remote file name is searched with step SP104 from the file.
[0167]if it investigates whether search of the file name was completed in the following step SP105 and the entry of a remote file is not found by this search -- if -- if it is moved and found in processing of step SP65 of Fig.17 via step SP110 -- if -- it proceeds to processing of step SP106.
[0168]The file life time of an applicable entry is acquired in step SP106.
[0169]Setting out of file life time in step SP107 Next, permanent preservation etc., It is not the usual setting out and investigates whether it is setting out which is not deleted yet, when it is setting out which is not deleted yet, it proceeds to processing of step SP108, but it shifts to processing of step SP65 of Fig.17 via step SP110.
[0170]In order to investigate whether I may trust the contents of the site cache configuration file, a remote site applicable from a trust site configuration file is searched with step SP108.
[0171]In the following step SP109, it is investigated whether search of remote site URL was successful, if a remote site is not found as a result of the search -- if -- if it is moved and found in processing of step SP65 of Fig.17 via step SP110 -- if -- it shifts to processing of step SP68 of Fig.17 via step SP111, and a file is not deleted.
[0172]In step SP110, although it proceeds to processing of step SP65 of Fig.17, if the file to delete is a site cache configuration file, the processing which deletes an entry applicable from a cache setting-out correspondence file will be added.
[0173]Thus, the timing deleted from a cache in consideration of the life of the file previously set up for every file can be adjusted.
[0174]The file transfer control part 4 shows the file which became unnecessary, or the procedure investigated and deleted to Fig.24 at the time of the end of local file access, etc. It assumes that the flow chart of this Fig.24 is inserted after step SP73 of Fig.18, and is performed.
[0175]In this Fig.24, first, by step SP121, it investigates whether the counter was set to 0 during access in a local cache management file about the file which carried out the end of access, and if it is not 0, processing will be ended. On the other hand, if a counter is set to 0 during access, it will proceed to processing of step SP122.
[0176]At the subsequent step 123, the same processing as step SP101 of Fig.23 and step SP102 is performed to step SP122 and it. That is, the entry of the remote site where a cache setting-out correspondence file corresponds is searched.
[0177]if an entry is not found without investigating whether search of remote site URL was successful, and being able to refer to the following step SP124 -- if -- if processing is ended and found -- if -- it proceeds to processing of following step SP125.
[0178]In step SP125, the same processing as step SP104 of Fig.23 is performed. That is, the entry of a remote file applicable from a site cache configuration file is searched.
[0179]In the following step SP126, it investigates whether search of the file name was successful, and if there is no file name and processing will be ended and found, it will shift to processing of step SP127.
[0180]The file life time of an applicable entry is acquired in step SP127.
[0181]Next, the life of the file is coming by step SP128 by setting out of file life time, That is, when it investigates whether setting out of the date which it leaves to setting out which it does not leave to a cache, and a cache has already passed under access and one script has become setting out to delete, it proceeds to processing of following step SP129, otherwise, processing is ended.
[0182]By subsequent step SP130, like step SP65 of Fig.17, and step SP66, an entry is deleted from each management file to step SP129 and it, and the local file itself is deleted to them. Processing is ended after that.
[0183]Thus, it becomes possible to delete individually the file no longer needing at any time in the time of the end of a script, etc. from a file cache.
[0184]2.8 Although the executed result of a remote file, the master file 9, or a server program is downloaded according to the demand of the script interpreter execution part 5, the detailed file

transfer control part 4 of prediction of a downloaded file, Since communication using the Internet 2 is performed, download takes time rather than the system constituted within LAN (LocalArea Network) in many cases. Since the user who has accessed the server 1 using the telephone terminal 15 etc. will be kept waiting each time when it is downloading each time in the portion which instructs download of the file in a script file, there is a convenience top problem.
[0185]Then, he is trying to eliminate the above-mentioned problem mostly at this embodiment, because it is made to perform download of a file in a script in parallel with other processings before the portion instructed explicitly.
[0186]For example, while performing sound reproduction etc. according to the script to the user who accesses the server 1 using the telephone terminal 15, the file which may be downloaded after that is downloaded previously.
[0187]When performing a script, the procedure in which the script interpreter execution part 5 performs processing which predicts a file is shown in Fig.25.
[0188]In the flow chart of this Fig.25, first, by step SP141, before performing a script, the file name which may be downloaded in that script is acquired.
[0189]I send the acquired file name to the file transfer control part 4, and have download of those files started in the following step SP142. According to the procedure of a script, it actually performs from next.
[0190]The first command of a script is read in step SP143.
[0191]In the following step SP144, if the command is a command of download, or a command investigated and downloaded, it will proceed to processing of step SP145, and if it is the other command, it shifts to processing of step SP147.
[0192]In step SP145, the file name to download investigates whether it is already the file to which download was started by step SP142, if it is the file, it will shift to processing of step SP150, and if it is not the file, it will proceed to processing of step SP146.
[0193]I send the file name to the file transfer control part 4, and have download started in step SP146.
[0194]On the other hand, in step SP147, it investigates whether it is a command using downloaded files, such as reproduction of a voice file, among commands other than the command to download, and if different, it will shift to processing of step SP149 and each command will be executed. On the other hand, if it is the command, it will shift to processing of step SP148.
[0195]In step SP148, it waits until it will download, if it investigates whether the file downloaded to the file temporary memory 6 and has not yet downloaded to it.
[0196]If download is made in step SP148, it will shift to processing of **** and step SP149, and the command will be executed.
[0197]Finally, in step SP150, if it investigates whether the script was completed or not and has not ended yet, after shifting to processing of step SP151 and reading the following command from a script, it returns to processing of step SP144 and the same processing is repeated.
[0198]On the other hand, if a script is completed in step SP150, execution of the script will be finished.
[0199]Next, the example of actual operation is described using Fig.26 and Fig.27.
[0200]The description procedure of a script itself [which downloads two voice files in order as an example, and is reproduced] is shown in Fig.26.
[0201]In this Fig.26, voice file A is first downloaded from the file memory server 10 by step SP161 as contents of the script.
[0202]Downloaded voice file A is reproduced in the following step SP162.
[0203]Similarly, voice file B is downloaded and downloaded voice file B is reproduced by step SP164 step SP163.
[0204]The procedure in which the script interpreter execution part 5 actually performs the script of Fig.26 is shown in Fig.27.
[0205]In this Fig.27, the file name (voice file A and voice file B) of the file which may be downloaded from the script of Fig.26 is first extracted by step SP171.This corresponds to processing of step SP141 of Fig.25.
[0206]Next, the extracted file name (voice file A and voice file B) is sent to the file transfer control part 4, and step SP172 requires download. This corresponds to processing of step SP142 of Fig.25.

[0207]Next, in step SP173, step SP161 of the Fig.26 which is a head command of a script is read, and since it is moreover already download request settled by a download request command, it proceeds to the following command. This corresponds to processing of step SP143 to step SP145 of Fig.25, and processing of step SP150 to step SP151. Since it is a command using a download request finishing file (voice file A), it waits for step SP162 of Fig.26 to the file temporary memory 6 until the file carries out the completion of download. This corresponds to processing of step SP147 to step SP144 of Fig.25, and step SP148.
[0208]And I have voice file A which download completed played step SP174 by the voice recording and the regenerating section 7B of the telephone network connection part 7. This corresponds to processing of step SP149 of Fig.25.
[0209]Step SP175 and step SP176 as well as step SP173 and step SP174 reproduce voice file B, and end execution of a script.
[0210]
[Effect of the Invention]The function of the cache used when acquiring information via the Internet etc. can be set as a user according to a demand by acquiring via a computer network and making the memorized information individually, in the present invention, clearly, by the above description, as it is controllable.

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　JP 2005-18773 A 2005.1.20
(11)特許出願公開番号
特開2005-18773
(Ｐ２００５－１８７７３Ａ)
(43)公開日　平成17年1月20日(2005.1.20)

(51)Int.Cl.[7]	Ｆ Ｉ	テーマコード(参考)
Ｇ０６Ｆ　12/00	Ｇ０６Ｆ　12/00　５４６Ｋ	５Ｂ０８２

審査請求　未請求　請求項の数31　ＯＬ　（全21頁）

(21)出願番号　特願2004-185643(P2004-185643)
(22)出願日　平成16年6月23日(2004.6.23)
(31)優先権主張番号　10/602,122
(32)優先日　平成15年6月23日(2003.6.23)
(33)優先権主張国　米国(US)

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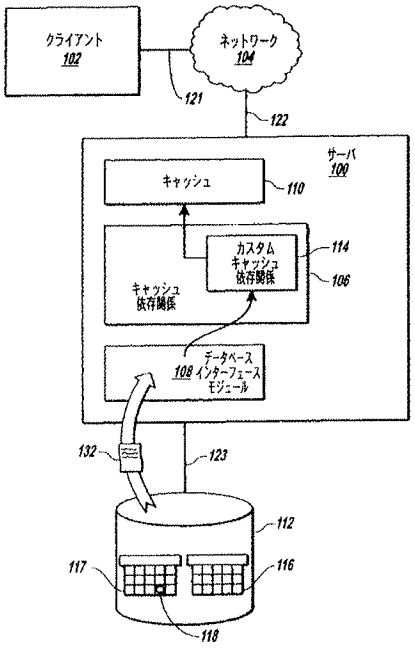
最終頁に続く

(54)【発明の名称】キャッシュエントリを無効化する汎用依存関係モデル

(57)【要約】
【課題】　カスタムキャッシュ依存関係を派生させるシステム、方法、およびコンピュータプログラムを提供する。
【解決手段】　あるカスタム条件でキャッシュエントリを無効化するカスタムキャッシュ依存関係クラスを派生するのに使用することができる拡張可能キャッシュ依存関係ベースクラスを含むフレームワークを開示する。いくつかの実施形態で、ウェブページサーバに、キャッシュと、拡張可能キャッシュ依存関係ベースクラスを含むフレームワークが含まれる。キャッシュエントリをカスタマイズされたキャッシュ依存関係に依存させる方法、およびカスタマイズされたキャッシュ依存関係に基づいてキャッシュエントリを無効化する方法を開示する。たとえば、キャッシュエントリを、データベーステーブルおよびウェブサービスに対する依存関係に依存させ、これに基づいてキャッシュエントリを消去することができる。
【選択図】　図１



【特許請求の範囲】
【請求項１】
要求元クライアントコンピュータシステムにウェブページを供給するサーバコンピュータシステムであって、前記ウェブページは、潜在的に前記サーバコンピュータシステムの外部の記憶位置からのコンテンツを含み、前記サーバコンピュータは、前記サーバコンピュータシステムの外部の記憶位置から前に受け取ったキャッシングされるコンテンツの部分を保管するキャッシュを含む、サーバコンピュータシステムにおいて、キャッシュエントリに、カスタマイズされた依存関係に依存させる方法であって、
拡張可能キャッシュ依存関係ベースクラスにアクセスする動作と、
前記拡張可能キャッシュ依存関係ベースクラスからカスタマイズされたキャッシュ依存関係クラスを派生させる動作であって、前記カスタマイズされたキャッシュ依存関係クラスは、前記カスタマイズされた依存関係を実施するためのものである、動作と、
クライアントコンピュータシステムに配信されるコンテンツの部分にアクセスする動作と、
前記カスタマイズされた依存関係をコンテンツの前記アクセスされた部分に関連付けるキャッシュエントリを作成する動作と、
前記キャッシュエントリの有効性が前記カスタマイズされた依存関係に依存するように、前記キャッシュエントリをキャッシュに挿入する動作と
を含むことを特徴とする方法。
【請求項２】
拡張可能キャッシュ依存関係ベースクラスにアクセスする前記動作は、キャッシュ依存関係ベースクラスから派生するクラスは依存関係変更通知メソッドを呼び出すことによって前記キャッシュ依存関係ベースクラスの消去機能を実施できるように、前記依存関係変更通知メソッドを含む前記キャッシュ依存関係ベースクラスにアクセスする動作を含むことを特徴とする請求項１に記載の方法。
【請求項３】
拡張可能キャッシュ依存関係ベースクラスにアクセスする前記動作は、キャッシュ依存関係ベースクラスから派生するクラスは依存関係処置メソッドを呼び出すことによってキャッシュエントリによって占められたリソースを解放できるように、前記依存関係処置メソッドを含む前記キャッシュ依存関係ベースクラスにアクセスする動作を含むことを特徴とする請求項１に記載の方法。
【請求項４】
前記拡張可能キャッシュ依存関係ベースクラスからカスタマイズされたキャッシュ依存関係クラスを派生させる前記動作は、キャッシュエントリをデータベーステーブルに依存させるために実施することができるカスタマイズされたキャッシュ依存関係クラスを派生する動作を含むことを特徴とする請求項１に記載の方法。
【請求項５】
前記拡張可能キャッシュ依存関係ベースクラスからカスタマイズされたキャッシュ依存関係クラスを派生させる前記動作は、キャッシュエントリをウェブサーバに依存させるために実施することができるカスタマイズされたキャッシュ依存関係クラスを派生する動作を含むことを特徴とする請求項１に記載の方法。
【請求項６】
クライアントコンピュータシステムに配信されるコンテンツの部分にアクセスする前記動作は、ウェブページに含まれるコンテンツの部分にアクセスする動作を含むことを特徴とする請求項１に記載の方法。
【請求項７】
クライアントコンピュータシステムに配信されるコンテンツの部分にアクセスする前記動作は、データベーステーブルからのコンテンツの部分にアクセスする動作を含むことを特徴とする請求項１に記載の方法。
【請求項８】

クライアントコンピュータシステムに配信されるコンテンツの部分にアクセスする前記動作は、ウェブサービスからのコンテンツの部分にアクセスする動作を含むことを特徴とする請求項１に記載の方法。

【請求項９】

前記カスタマイズされた依存関係をコンテンツの前記アクセスされる部分に関連付けるキャッシュエントリを作成する前記動作は、データベーステーブルからのコンテンツを前記データベーステーブルに依存させるキャッシングされたエントリを作成する動作を含むことを特徴とする請求項１に記載の方法。

【請求項１０】

前記カスタマイズされた依存関係をコンテンツの前記アクセスされる部分に関連付けるキャッシュエントリを作成する前記動作は、データベーステーブルからのコンテンツを集約依存関係に依存させるキャッシングされたエントリを作成する動作を含むことを特徴とする請求項１に記載の方法。

【請求項１１】

前記カスタマイズされた依存関係をコンテンツの前記アクセスされる部分に関連付けるキャッシュエントリを作成する前記動作は、ウェブサービスからのコンテンツを前記ウェブサービスに依存させるキャッシングされたエントリを作成する動作を含むことを特徴とする請求項１に記載の方法。

【請求項１２】

前記キャッシュエントリの前記有効性が前記カスタマイズされた依存関係に依存するように前記キャッシュエントリをキャッシュに挿入する前記動作は、データベーステーブルに依存するキャッシュエントリを挿入する動作を含むことを特徴とする請求項１に記載の方法。

【請求項１３】

前記キャッシュエントリの前記有効性が前記カスタマイズされた依存関係に依存するように前記キャッシュエントリをキャッシュに挿入する前記動作は、集約依存関係に依存するキャッシュエントリを挿入する動作を含むことを特徴とする請求項１に記載の方法。

【請求項１４】

前記拡張可能キャッシュ依存関係ベースクラスの機能を呼び出すために開始時刻プロパティをセットする必要がないことを特徴とする請求項１に記載の方法。

【請求項１５】

要求元クライアントコンピュータシステムにウェブページを供給するサーバコンピュータシステムであって、前記ウェブページは、潜在的に前記サーバコンピュータシステムの外部の記憶位置からのコンテンツを含み、前記サーバコンピュータは、前記サーバコンピュータシステムの外部の記憶位置から前に受け取ったキャッシングされるコンテンツの部分を保管するキャッシュを含む、サーバコンピュータシステムにおいて、キャッシュエントリを消去する方法であって、

カスタマイズされたキャッシュ依存関係に関連する１つまたは複数のカスタム依存関係条件を監視する動作と、

前記１つまたは複数のカスタム依存関係条件が満足されたかどうかを判定する動作と、

前記１つまたは複数のカスタム依存関係条件が満足されたことの指示を受け取る動作と、

前記表示の受け取りに応答して前記サーバコンピュータシステムでキャッシュエントリを消去する動作と

を含むことを特徴とする方法。

【請求項１６】

カスタマイズされたキャッシュ依存関係のインスタンスに関連する１つまたは複数のカスタム依存関係条件を監視する前記動作は、データベーステーブル依存関係を監視する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項１７】

カスタマイズされたキャッシュ依存関係のインスタンスに関連する１つまたは複数のカスタム依存関係条件を監視する前記動作は、ウェブサービス依存関係を監視する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項１８】

カスタマイズされたキャッシュ依存関係のインスタンスに関連する１つまたは複数のカスタム依存関係条件を監視する前記動作は、集約依存関係を監視する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項１９】

前記１つまたは複数のカスタム依存関係が満足されたかどうかを判定する動作は、フラグエントリが増分されたかどうかを判定する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項２０】

前記１つまたは複数のカスタム依存関係が満足されたかどうかを判定する動作は、集約依存関係に関連する依存関係条件が満足されたかどうかを判定する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項２１】

前記１つまたは複数のカスタム依存関係が満足されたかどうかを判定する動作は、カスタマイズされたキャッシュ依存関係クラスのインスタンスによって指定されるイベントの発生時に依存関係変更通知メソッドを呼び出すことを含むことを特徴とする請求項１５に記載の方法。

【請求項２２】

前記１つまたは複数のカスタム依存関係が満足されたことの指示を受け取る動作は、前記１つまたは複数のカスタム依存関係条件が満足されたことの表示を依存関係変更通知メソッドから受け取る動作を含むことを特徴とする請求項１５に記載の方法。

【請求項２３】

前記表示の受け取りに応答して前記サーバコンピュータシステムでキャッシュエントリを消去する前記動作は、データベーステーブルに依存するキャッシュエントリを消去する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項２４】

前記表示の受け取りに応答して前記サーバコンピュータシステムでキャッシュエントリを消去する前記動作は、ウェブサービスに依存するキャッシュエントリを消去する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項２５】

前記表示の受け取りに応答して前記サーバコンピュータシステムでキャッシュエントリを消去する前記動作は、集約依存関係に依存するキャッシュエントリを消去する動作を含むことを特徴とする請求項１５に記載の方法。

【請求項２６】

さらに、

前記消去されたキャッシュエントリを維持するために消費されたリソースを解放する動作

を含むことを特徴とする請求項１５に記載の方法。

【請求項２７】

前記消去されたキャッシュエントリを維持するために消費されたリソースを解放する前記動作は、カスタマイズされたキャッシュ依存関係に関連するＤｅｐｅｎｄｅｎｃｙＤｉｓｐｏｓｅ（依存関係処置）メソッドを呼び出す動作を含み、前記カスタマイズされたキャッシュ依存関係は、拡張可能キャッシュ依存関係ベースクラスから派生することを特徴とする請求項２６に記載の方法。

【請求項２８】

要求元クライアントコンピュータシステムにウェブページを供給するサーバコンピュータシステムで使用されるコンピュータプログラムであって、前記ウェブページは、潜在的

に前記サーバコンピュータシステムの外部の記憶位置からのコンテンツを含み、前記サーバコンピュータは、前記サーバコンピュータシステムの外部の記憶位置から前に受け取ったキャッシングされるコンテンツの部分を保管するキャッシュを含み、前記コンピュータプログラムは、キャッシュエントリに、カスタマイズされた依存関係に依存させる方法を実施し、前記コンピュータプログラムは、プロセッサによって実行される時に前記サーバコンピュータシステムに、

拡張可能キャッシュ依存関係ベースクラスにアクセスすることと、

前記カスタマイズされたキャッシュ依存関係クラスは、前記カスタマイズされた依存関係を実施するための、前記拡張可能キャッシュ依存関係ベースクラスからカスタマイズされたキャッシュ依存関係クラスを派生させることと、

クライアントコンピュータシステムに配信されるコンテンツの部分にアクセスすることと、

前記カスタマイズされた依存関係をコンテンツの前記アクセスされた部分に関連付けるキャッシュエントリを作成することと、

前記キャッシュエントリの有効性が前記カスタマイズされた依存関係に依存するように、前記キャッシュエントリをキャッシュに挿入することと

を実行させるコンピュータ実行可能命令を含むことを特徴とするコンピュータプログラム。

【請求項２９】

要求元クライアントコンピュータシステムにウェブページを供給するサーバコンピュータシステムで使用されるコンピュータプログラムであって、前記ウェブページは、潜在的に前記サーバコンピュータシステムの外部の記憶位置からのコンテンツを含み、前記サーバコンピュータシステムは、前記サーバコンピュータシステムの外部の記憶位置から前に受け取ったキャッシングされるコンテンツの部分を保管するキャッシュを含み、前記コンピュータプログラムは、キャッシュエントリを消去する方法を実施し、前記コンピュータプログラムは、プロセッサによって実行される時に前記サーバコンピュータシステムに、

カスタマイズされたキャッシュ依存関係のインスタンスに関連する１つまたは複数のカスタム依存関係条件を監視することと、

前記１つまたは複数のカスタムキャッシュ依存関係条件が満足されたかどうかを判定することと、

前記１つまたは複数のカスタム依存関係条件が満足されたことの指示を受け取ることと、

前記指示の受け取りに応答して前記サーバコンピュータシステムでキャッシュエントリを消去することと

を実行させるコンピュータ実行可能命令を含むことを特徴とするコンピュータプログラム。

【請求項３０】

ウェブページサーバであって、

プロセッサと、

１つまたは複数のコンピュータ可読媒体であって、キャッシュと、フレームワークとを保管された１つまたは複数のコンピュータ可読媒体と

を含み、

前記フレームワークは、カスタム依存関係クラスを派生する拡張可能キャッシュ依存関係ベースクラスであって、前記カスタム依存関係クラスは、その発生が前記キャッシュに含まれるキャッシュエントリの消去を引き起こす少なくとも１つのイベントで定義されるように適合される、拡張可能キャッシュ依存関係ベースクラスを含むことを特徴とするウェブページサーバ。

【請求項３１】

請求項２８または２９に記載の前記コンピュータ実行可能命令が格納されていることを特徴とする１つまたは複数のコンピュータ可読媒体。

【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、全般的にはキャッシングされたコンテンツの管理に関する。具体的には、本発明は、開発者がカスタムキャッシュ依存関係（ｃａｃｈｅ　ｄｅｐｅｎｄｅｎｃｙ）を作成できるようにキャッシュ依存関係クラスを拡張することに関する。
【背景技術】
【０００２】
近代のコンピュータシステムおよびネットワークシステムでは、データキャッシングが、データのそれを要求する人への配信を高速化する効果的なツールである。一般に、データキャッシングは、頻繁に要求されるデータを、そのデータをすばやく取り出せる記憶位置に保管することが含まれる。１例で、コンピュータシステムの物理メモリに保管されたデータを、コンピュータシステムのハードドライブに保管されたデータよりすばやく取り出すことができる。これは、部分的に、ハードドライブが通常は物理メモリと比較してより大きいデータ検索待ち時間を有することに起因する。同様に、サーバコンピュータシステムのハードドライブまたはメモリ内に保管されたデータには、リモートデータベースに保管されたデータより効率的にアクセスすることができる。さらに、キャッシングされたデータの使用によって、要求するクライアントコンピュータシステムへの配信のためにコンテンツを生成するのに必要な計算の数を減らすことができる。
【０００３】
近代ネットワークによって、さまざまな記憶位置との間でディジタル情報をあまねく転送する能力が実現された。トランスポートのためにデータを使用可能にする形の１つが、ＨＴＭＬファイルなどの、サーバからそれを表示できるクライアントコンピュータシステムにダウンロードすることができる静的ファイルを作成することによるものである。静的ファイルは、サーバコンピュータシステム、地域データベースを含むさまざまな記憶位置でまたはクライアントコンピュータシステムでローカルにキャッシングすることができる。コンピュータシステム静的ファイルがクライアントコンピュータシステムに保管される時に、すべての実用目的に関するクライアントコンピュータによる取り出しおよび表示は、瞬間的である。静的ファイルが、クライアントコンピュータシステムに接続されたサーバコンピュータシステムに直接に保管される時であっても（一般に出力キャッシングと称する）、キャッシングされたコンテンツの取出は、比較的すばやく行うことができる。さらに、この静的な性質のゆえに、静的ファイルを、長期間、本質的に無期限にキャッシングすることができる。
【０００４】
残念ながら、静的ファイルに、リアルタイムコンテンツまたはカスタムコンテンツを含めることはできない。しばしば、周期的に変化するか他のコンテンツの計算または操作から形成されるコンテンツを提示することが望ましい。そのようなコンテンツをキャッシングすることはできるが、コンテンツのキャッシングされる値は、限られた持続時間の間に限って有効である。したがって、キャッシュをリフレッシュして、データが有効であることを保証しなければならない。
【０００５】
ウェブページおよびウェブサイトの作成でウェブ開発者を助けた技術の１つが、たとえばＩｎｔｅｒｎｅｔ　Ｉｎｆｏｒｍａｔｉｏｎ　Ｓｅｒｖｅｒなどのウェブページサーバで動作する、スクリプトまたはコンピュータ実行可能コードのモジュール的部分である。スクリプトを、他のＨＴＭＬタグの間に埋め込んで、ダイナミックでカスタマイズ可能なウェブページを作成することができる。Ｖｉｓｕａｌ　Ｂａｓｉｃ、Ｊａｖａ（登録商標）Ｓｃｒｉｐｔ、およびＣ＃などで記述されたプログラム内でオブジェクトを呼び出すことができるのと同様に、同一のオブジェクトをこれらおよび他の言語に基づくスクリプトで呼び出すことができる。
【０００６】

クラスは、ＡＳＰ．ＮＥＴフレームワークなどのプログラミングフレームワーク内のオブジェクトである。ＡＳＰ．ＮＥＴフレームワークに、ウェブページ開発者がウェブページを開発するのに使用できる数千個のクラスが含まれる。ディレクトリパスを介するファイルのアクセスに似た形で、特定の名前空間への参照によってクラスにアクセスすることができる。たとえば、名前空間Ｓｙｓｔｅｍ．ＷｉｎＦｏｒｍｓ．Ｆｏｒｍへの参照によって、特定のクラスの記憶位置の表示がもたらされる。クラスは、プロパティ、イベント、およびメソッドに関連付けることができる。プロパティは、変数割当または対応するクラスでの設定（たとえば、ｘ＝５）と見なすことができる。イベントは、イベントの発生時に発生するフラグである。イベントを、他のクラスまたは他のアプリケーションによって読み取って、ある動作を行うことができる。メソッドによって、対応するクラスの機能を呼び出して、動作を実行することができる（たとえば、表示デバイスにデータを出力する）。メソッドによって、その機能を外部コンポーネントに提供する方法が定義される。

【０００７】

コンテンツのキャッシングを実現し、したがってウェブページサーバの性能を改善するために、プログラミングフレームワークに、たとえばファイル、データベース、およびウェブサーバなどのさまざまな記憶位置からデータを取り出すクラスおよびさまざまな動作を介してデータを操作するクラスを含めることができる。一部の環境で、これらのクラスにアクセスできるウェブページサーバコンピュータシステム（たとえばＡＳＰサーバ）によって、リアルタイムコンテンツに基づいてＨＴＭＬコードを作成し、保管することができ、このＨＴＭＬコードは、出力キャッシングシナリオでクライアントコンピュータシステムに送信される。他の環境で、ウェブページサーバコンピュータシステムは、ＸＭＬファイルなどのコンテンツをウェブページサーバコンピュータシステムでローカルにキャッシングでき、その結果、そのコンテンツを含むウェブページが要求されるたびにそのコンテンツを取り出すか再計算する必要がなくなる。

【０００８】

一部のプログラミングフレームワークでは、ウェブ開発者が、実行される時にコンテンツをキャッシュに保管させる命令を作成することが許可される。たとえば、エントリをキャッシュに挿入するために、下記の命令を実行することができる：Ｃａｃｈｅ．Ｉｎｓｅｒｔ（［ｋｅｙ］、［ｖａｌｕｅ］、［ｄｅｐｅｎｄｅｎｃｙ］）。ここで、ｋｅｙは、キャッシュエントリの参照識別子、ｖａｌｕｅは、キャッシュエントリに置かれる値（またはコンテンツ）、ｄｅｐｅｎｄｅｎｃｙは、キーの値をキャッシュから消去しなければならない時を定義するオプション引数である。ｄｅｐｅｎｄｅｎｃｙは、たとえばＣａｃｈｅＤｅｐｅｎｄｅｎｃｙ（キャッシュ依存関係）クラスなど、キャッシュ値を特定のイベントの発生に依存させるのに使用することができるクラスのインスタンスである。

【０００９】

一部のプログラミングフレームワークは、キャッシュ値を時刻、ファイル、またはキーのいずれかに依存するものにするキャッシュ依存関係をサポートする。時間キャッシュ依存関係によって、特定の依存関係に関連するエントリが、指定された時間期間の満了の後に消去される。たとえば、Ｃａｃｈｅ．Ｉｎｓｅｒｔ命令を次のように実施して、データを時間依存にすることができる：

```
Cache.Insert(strCacheKey、dataset、nothing、DateTime.Now.AddMinutes(60)、
TimeSpan.Zero、CacheItemPriority.High)。
```

【００１０】

具体的に言うと、DateTime.Now.AddMinutes(60)命令によって、キャッシュ内のエントリが、６０分後にキャッシュから消去される。あまりに短くセットされる時間キャッシュ依存関係によって、キャッシュの頻繁すぎる消去と、データベースからの頻繁なデータフェッチの追加コストまたはキャッシュに保管されるデータの計算のコストがもたらされる可能性がある。時間値が長すぎる場合には、キャッシュに保管されたデータが、要求元のクライアントコンピュータシステムに配信された時に無効になる危険性がある。

【００１１】

Cache.Insert命令を使用して、特定のファイルに変更がある場合にキャッシュエントリを消去させるファイルキャッシュ依存関係を実施することもできる。さらに、Cache.Insert命令を使用して、メモリに保管された他のキャッシュ値が変化する時に１つまたは複数のキャッシュエントリを消去させるキー依存関係を実施することができる。キー依存関係を使用すると、あるキャッシュ値の変化によって、複数の依存キャッシュ値をキャッシュから消去させることができる。

【００１２】

上で説明した３つのキャッシュ依存関係：時間、ファイル、およびキーは、キャッシュに保管される値を新鮮に保つのに有用であるが、これらの依存関係を実施するクラスは、通常は封印（ｓｅａｌｅｄ）されている。したがって、ウェブ開発者は、通常は、キャッシュエントリを他のタイプのイベント依存にする手だてを持たない。これによって、キャッシュの管理をより効率的にすることができるさまざまな他のタイプのキャッシュ依存関係を使用できなくなる。

【発明の開示】

【発明が解決しようとする課題】

【００１３】

したがって、キャッシュエントリを無効化するのに使用できる依存関係のタイプを拡張する機構を有することが有利である。

【課題を解決するための手段】

【００１４】

従来技術の状態に関する上述の課題は、本発明の原理によって克服される。本発明の原理は、開発者がカスタムキャッシュ依存関係を作成できるようにキャッシュ依存関係クラスを拡張する、方法、システム、およびコンピュータプログラムを対象とする。サーバコンピュータシステム（たとえば、ウェブページサーバを含む）によって、拡張可能キャッシュ依存関係ベースクラスにアクセスし、拡張可能キャッシュ依存関係ベースクラスから、カスタマイズされたキャッシュ依存関係を派生させる。カスタマイズされたキャッシュ依存関係によって、たとえば、データベーステーブル（たとえばＳＱＬテーブル）またはウェブサービスの変化に依存するキャッシュエントリをもたらすことができる。

【００１５】

カスタマイズされたキャッシュ依存関係に、キャッシュエントリが複数のイベントに依存するように、集約依存関係（ａｇｇｒｅｇａｔｅ　ｄｅｐｅｎｄｅｎｃｙ）を含めることができる。いくつかの実施形態で、カスタマイズされたキャッシュ依存関係の機能によって、拡張可能キャッシュ依存関係ベースクラスの機能がオーバーライドされる。拡張可能キャッシュ依存関係ベースクラスに、イベント（たとえばデータベーステーブルの変更）を監視し、イベントが発生した時にサーバコンピュータシステムに通知する、依存関係変更通知（ｎｏｔｉｆｙ　ｄｅｐｅｎｄｅｎｃｙ　ｃｈａｎｇｅｄ）メソッドを含めることができる。拡張可能キャッシュ依存関係ベースクラスに、キャッシュエントリがキャッシュから除去される時にリソースを解放する、依存関係処置（ｄｅｐｅｎｄｅｎｃｙ　ｄｉｓｐｏｓｅ）メソッドも含めることができる。

【００１６】

サーバコンピュータシステムによって、たとえばデータベースまたはウェブサービスから、クライアントコンピュータシステムに配信されるコンテンツがアクセスされる。サーバコンピュータシステムによって、カスタマイズされたキャッシュ依存関係をアクセスされるコンテンツに関連付けるキャッシュエントリが作成される。サーバコンピュータシステムによって、キャッシュにキャッシュエントリが挿入され、キャッシュエントリ（したがってアクセスされるコンテンツ）の有効性が、カスタマイズされた依存関係に依存するようになる。サーバコンピュータシステムによって、カスタマイズされたキャッシュ依存関係のインスタンスである依存関係を指定するＣａｃｈｅ．Ｉｎｓｅｒｔメソッドを使用してキャッシュにキャッシュエントリが挿入される。

【００１７】

キャッシュエントリが、カスタマイズされたキャッシュ依存関係に基づいて無効化される場合がある。サーバコンピュータシステム（たとえば、ウェブページサーバを含む）によって、監視されるイベントが発生したことの通知が受け取られる。この通知は、カスタマイズされたキャッシングされる依存関係の作成の結果として実行され、カスタマイズされたキャッシングされる依存関係に関連するイベントの発生を監視する依存関係変更通知メソッドから発する可能性がある。この通知に応答して、サーバコンピュータシステムによって、そのキャッシュエントリが無効化される（かつ、除去される）。サーバコンピュータシステムによって、依存関係処置メソッドが呼び出されて、キャッシュエントリによって使用されたすべてのリソースが解放される。

【００１８】

本発明の追加の特徴および長所は、以下の説明で示され、部分的にこの説明から明白であり、あるいは、本発明の実践によって習得することができる。本発明の特徴および長所は、請求項で特に指摘される機器及び組合せによって実現し、得ることができる。

【００１９】

本発明の上記および他の長所および特徴を得ることができる方法を説明するために、上で短く説明した本発明のより具体的な説明を、添付図面に示された特定の実施形態に関して説明する。これらの図面が、本発明の典型的な実施形態を示すのみであり、したがって、本発明の範囲を制限すると解釈してはならないことを理解して、本発明を、添付図面の使用を介してさらに具体的かつ詳細に説明する。

【発明を実施するための最良の形態】

【００２０】

本発明によって、カスタムキャッシュ依存関係を開発者が作成できるように、キャッシュ依存関係クラスを拡張するシステム、方法、およびコンピュータプログラムが拡張される。本発明の実施形態によって、開発者が開発者自体のカスタムキャッシュ依存関係を開発できるように、キャッシュ依存関係が拡張可能な形に拡張される。サーバコンピュータシステム（たとえば、ウェブページサーバを含む）によって、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスがアクセスされ、このクラスから、他のカスタマイズ可能なＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラスを派生させることができる。カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラスによって、とりわけ、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスのキャッシュ管理機能を使用することができる。拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生したカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙＣｌａｓｓを作成することによって、開発者は、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスの有利な特徴を使用するために、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスがどのように実施されるかの知識を、あるとしてもほとんど必要としない。拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスによって、実装の詳細が開発者から抽象化される。

【００２１】

さらに、開発者は、キャッシュ同期化およびキャッシュリソース管理を扱うことができる拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスのメソッドにアクセスすることができる。さらに、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスは、下位互換性を有することができ、その結果、既存のＡＰＩを、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスおよびこれから派生するすべてのクラスと共に使用することができる。そのようなＡＰＩの例に、Ｃａｃｈｅ．Ｉｎｓｅｒｔ、Ｃａｃｈｅ．Ａｄｄ、およびＢａｓｅＰａｒｔｉａｌＣａｃｈｉｎｇＣｏｎｔｒｏｌ．Ｄｅｐｅｎｄｅｎｃｙが含まれる。さらに、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙ（キャッシュ依存関係）ベースクラスから派生するカスタムキャッシュ依存関係の実装によって、キャッシュの監視を開始しなければならない時を合図するのにＳｔａｒｔＴｉｍｅプロパティ（属性）を指定する必要から開発者が解放される。開発者は、このプロパティを実施することができるが、これは必須ではない。

【００２２】

拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスには、パブリックに使用可能な２つの追加メソッドが含まれ、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙの開発者が、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスの消去機能を呼び出すことができる。第１のメソッドが、ＮｏｔｉｆｙＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄ（依存関係変更通知）メソッドである。このメソッドは、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生したクラスによって、依存関係アイテムが変化したことを拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラスに知らせるために呼び出される。第２の新しいメソッドが、ＤｅｐｅｎｄｅｎｃｙＤｉｓｐｏｓｅメソッドである。このメソッドは、派生クラスに固有のロケーションクリーンアップを提供する仮想メソッドである。具体的に言うと、このメソッドによって、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙでない場合に拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスのＤｉｓｐｏｓｅ（処置）メソッドが普通に配置される命令の記憶位置が提供される。したがって、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙによって使用されるリソースを、そのリソースにアクセスする必要を有する他のモジュールによる使用のために解放することができる。

【００２３】

ＮｏｔｉｆｙＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄメソッドは、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから依存するカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙによって呼び出すことができる。したがって、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラスによって、キャッシュエントリを、データベースの変化、ウェブサービスのデータ、または他の理由に依存するようにすることができる。この形で、キャッシュによって、無効化キャッシュエントリキーを認識でき、そのキー（および対応するコンテンツ）をキャッシュから除去することができる。

【００２４】

１つの例示的な例では、開発者が、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生するカスタムクラス「ＳｑｌＣａｃｈｅＤｅｐｅｎｄｅｎｃｙ」を作成して、データベースに対する変更が行われたかどうかを判定するためにＳＱＬデータベースをポーリングする。ＳｑｌＣａｃｈｅＤｅｐｅｎｄｅｎｃｙは、プログラミングフレームワーク内に存在する拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生される。したがって、クラスＳｑｌＣａｃｈｅＤｅｐｅｎｄｅｎｃｙによって、サーバコンピュータシステムが依存キャッシュエントリを消去させるように、ＮｏｔｉｆｙＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄのメソッドを呼び出すことができる。

【００２５】

本発明の一実施形態を使用すると、下記の命令を使用して、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙのインスタンスを実装することができる。

```
10  If  (Cache  [''Product'']  ==  null  ) {
20      SqlConnection  Connection  =  new  SqlConnection  ([connection
details]);
...
30      SqlDataAdapter  ds  =  new  SqlDataAdapter  (''Product_GetProducts'',
connection);
40      SqlCacheDependency  dep  =  new  SqlCacheDependency  (''NorthWind'',
''Products'');
50      Cache.Insert(''Product",  ds,  dep);
}
```

【００２６】

上のコードの行１０で、エントリ「Ｐｒｏｄｕｃｔ」が既にキャッシュ内にあるかどうかを調べている。エントリがキャッシュにない場合には、「ｉｆ」ステートメントの関数が実行される。行２０で、データベースへの接続を確立し、このデータベースからコンテンツを取り出す。行３０で、メソッド「Ｐｒｏｄｕｃｔ＿ＧｅｔＰｒｏｄｕｃｔｓ」を使

用してデータベースからデータを取り出し、変数「ｄｓ」にデータを保管する。行４０で、変数「ｄｓ」を、「ＮｏｒｔｈＷｉｎｄ」データベースの「Ｐｒｏｄｕｃｔｓ」テーブルに対する依存関係として割り当てる。この依存関係は、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生したカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙである。行５０で、変数「ｄｓ」のデータが、キー「Ｐｒｏｄｕｃｔ」によって参照されるキャッシュエントリに挿入され、このキャッシュエントリが、「ｄｅｐ」に依存するようになる。

【００２７】

この例では、ＳｑｌＣａｃｈｅＤｅｐｅｎｄｅｎｃｙが、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生されたカスタマイズされたキャッシュ依存関係である。拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生されるクラスが、依存関係として使用される時に、サーバコンピュータシステムは、そのクラスを、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙのインスタンスであるかのように処理する。したがって、サーバコンピュータシステムは、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスによって示される類似する挙動に応答することができると同時に、内部的に、派生クラスによって、データベース照会が変化する時に通知を受けるなど、それ自体の独自の機能を実施することができる。カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙ、この例ではＳｑｌＣａｃｈｅＤｅｐｅｎｄｅｎｃｙによって、所望の機能を達成するのに必要な、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスの任意のメソッドをオーバーライドすることができる。この例では、ＳｑｌＣａｃｈｅＤｅｐｅｎｄｅｎｃｙが、データベース照会変化について通知される時に、ｂａｓｅ．Ｎｏｔｉｆｙ．ＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄメソッドを呼び出して、サーバコンピュータシステムに、キー「Ｐｒｏｄｕｃｔ」によって参照されるキャッシュエントリを除去させる。

【００２８】

この例を、データベース変更依存関係に関して説明したが、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスの拡張可能性によって、ウェブ設計者が想像できる事実上すべてのキャッシュ依存関係の作成が許可されることに留意することが重要である。拡張可能なモデルがあれば、ウェブ開発者は、複数の依存関係に基づく集約依存関係を含むあらゆる種類のカスタム依存関係を構築することができる。たとえば、キャッシュエントリを、ファイルとＳＱＬテーブルの両方に依存するものとすることができる。下記の命令に、集約依存関係の実施形態を示す。

```
70  if  (Cache  [''(Product-List'']  ==  null)  {
80      SqlConnection  Connection  =  new  SqlConnection  ([connection
details]);
90      SqlDataAdapter  ds  =  new  SqlDataAdapter  (''Product_GetProducts'',
connection);
100     SqlCacheDependency  sqlDep  =  new  SqlCacheDependency  (''NorthWind'',
''Products'');
120     CachDependency  dep  =  new  AggregateCacheDependency(
Server.MapPath(''sales.xml''),  sqlDep);
130     Cache.Insert(''Product-List,  ds,  dep);
}
```

【００２９】

このコードは、行１２０を除いて、行１０から５０という符号を付された上のコードに類似する。総合キャッシュ依存関係は、ＡｇｇｒｅｇａｔｅＣａｃｈｅＤｅｐｅｎｄｅｎｃｙという名のＣａｃｈＤｅｐｅｎｄｅｎｃｙの派生クラスによって実装される。これは、キャッシュ内のエントリを、ファイル（ｓａｌｅｓ．ｘｍｌ）および、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生したカスタマイズされたＳｑｌＣａｃｈｅＤｅｐｅｎｄｅｎｃｙの両方に依存するようにするのに使用することができる。拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスから派生されるクラスによって、追加の

カスタマイズ機能も提供することができる。すなわち、派生クラスを開発して、カスタマイズされた機能を実装するのに使用されるイベント、メソッド、およびプロパティを処理することができる。たとえば、開始時刻（たとえば、ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙが変化について監視を開始しなければならない時を指定する）、依存関係の総合をサポートする能力、コールバック機構のサポートなどに対する派生クラスを開発することができる。したがって、開発者は、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスに固有のイベント、メソッド、およびプロパティに制限されない。

【００３０】

図１を参照すると、本発明の諸態様を実施できる適切な環境が示されている。図１には、それぞれ対応するリンク１２１および１２２によってネットワークに接続されたサーバ１００およびクライアント１０２が示されている。サーバ１００およびクライアント１０２は、ＨＴＴＰを含むさまざまなプロトコルを使用して、ネットワーク１０４を介して通信することができる。サーバ１００は、ＡＳＰ．ＮＥＴサーバとすることができ、ダイナミックウェブページの形のダイナミックコンテンツをクライアント１０２に配信することができる。サーバには、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１０６およびカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙ１１４を含むさまざまなクラスおよびモジュールが含まれる。サーバ１００には、サーバ１００の物理メモリ内または他の普通の記憶位置に配置することができるキャッシュ１１０も含まれる。

【００３１】

サーバ１００は、リンク１２３によってデータベース１１２に結合される。データベース１１２は、たとえばＳＱＬデータベースまたはＯｒａｃｌｅデータベースなどの適切なデータベースとすることができる。本発明の他の実施形態では、データベース１１２によって、ＸＭＬサービスまたは他のデータの供給源を表すことができる。

【００３２】

実例として、クライアント１０２によって、あるコンテンツをサーバ１００に要求する。たとえば、クライアント１０２は、サーバ１００にウェブページを要求するＵＲＬにアクセスすることができる。サーバ１００は、キャッシュ１１０を調べて、要求されたコンテンツ（たとえば、ウェブページ内のデータ）がキャッシュ１１０にあるかどうかを判定する。コンテンツがキャッシュ１１０にない場合には、データベースインターフェースモジュール１０８によって、データベース１１２にそのコンテンツが要求される。適当な時に、たとえばコンテンツ１３２などのコンテンツが、取り出され、データベースインターフェースモジュール１０８に返される。

【００３３】

代替案では、要求されたコンテンツを、ある計算される値またはデータベース１１２などのデータベースから取り出されたコンテンツのある操作とすることができる。データベースインターフェースモジュール１０８によって、適当にコンテンツが計算または操作される場合がある。その後、コンテンツは、たとえば１つまたは複数のＨＴＴＰメッセージで、クライアント１０２に送信される。コンテンツを、Ｃａｃｈｅ．Ｉｎｓｅｒｔメソッドを使用してキャッシュ１１０に追加することもできる。Ｃａｃｈｅ．Ｉｎｓｅｒｔメソッドでは、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラス１０６から派生されたカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４によって定義されるカスタム依存関係を指定する。

【００３４】

コンテンツがキャッシュ１１０に残っている間は、そのコンテンツを要求するすべてのクライアントに、そのコンテンツをより効率的に配信することができる。コンテンツは、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４によってＮｏｔｉｆｙＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄメソッドなどのメソッドが呼び出されるまで、キャッシュ１１０内に残っている。コンテンツは、ＮｏｔｉｆｙＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄメソッドの呼出し時にキャッシュから消去される。クライアントによるそのコンテンツに関する後続の要求は、そのコンテンツが、データベース１１２から再フェッチさ

れ、かつ／またはデータベースインターフェースモジュール１０８によって再計算されることを必要とする。

【００３５】

カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４によって、データベース１１２に変更がある時に、キャッシュ１１０を消去させることができる。この例では、データベース１１２からのデータのフェッチがリソース集中型になる可能性があるが、その一方で、変更に関するデータベース１１２のポーリングでは、より少ないリソースが使用される。データベース１１２に、データベーステーブル１１６などのデータベース１１２内の情報を保管するデータベーステーブルを含めることができる。もう１つのデータベーステーブル１１７に、さらに、データベーステーブル１１６内の情報に対する変更が行われたかどうかを示すフラグエントリ１１８を含めることができる。データベーステーブル１１７に、データベース内の、カスタム依存関係を有する他のテーブルのフラグを含めることができる。一実施形態で、フラグエントリ１１８を増分式とし、データベーステーブル１１６内の各変更によって、フラグエントリ１１８の値が増分式に増やされるようにすることができる。フラグエントリ１１８の増加が検出される時にキャッシュエントリを除去するように、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙ１１４を設計することができる。

【００３６】

図２を参照すると、依存関係エントリを挿入する方法を示す流れ図が示されている。図２の方法には、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスにアクセスする動作が含まれる（動作２０２）。動作２０２に、サーバコンピュータシステムによって拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラス１０６にアクセスすることを含めることができる。たとえば、サーバ１００によって、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１０６にアクセスすることができる。サーバ１００は、ウェブページ開発者によって開発された命令実行の結果として、他のソフトウェア開発者によって開発された命令の実行の結果として、またはあるプログラムモジュールの一部として、ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１０６にアクセスすることができる。

【００３７】

図２の方法には、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスからカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラスを派生することが含まれる（動作２０４）。動作２０４に、サーバコンピュータシステムによって拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙベースクラスからカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラスを派生することを含めることができる。たとえば、サーバ１００によって、拡張可能ＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１０６からカスタマイズされたキャッシュ依存関係１１４を派生することができる。サーバ１００は、ウェブページ開発者によって開発された命令実行の結果として、他のソフトウェア開発者によって開発された命令の実行の結果として、またはあるプログラムモジュールの一部として、カスタマイズされたキャッシュ依存関係１１４を派生させて、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙを作成することができる。サーバ１００によって、温度計など、条件が変化した時に必ずイベントをトリガする、コンピュータに接続された外部センサ、試合の得点が変化する時に必ず変化をトリガするスポーツスコアボードプログラム、ネットワーク構成が変化する（コンピュータがネットワークに追加されるか除去されるなど）時にかならずイベントをトリガするネットワーク管理プログラム、ディレクトリが変化する（人が追加または除去されるなど）時にかならずイベントをトリガするディレクトリプログラムなどを含むがこれに制限されない複数のソースからカスタマイズされたキャッシュ依存関係１１４を派生させることもできる。

【００３８】

図２の方法に、コンテンツへのアクセスが含まれる（動作２０６）。動作２０６に、クライアントコンピュータシステムへの配信のためにウェブページに含まれるコンテンツにサーバコンピュータシステムによってアクセスすることを含めることができる。たとえば

、サーバ１００によって、クライアント１０２に配信されるウェブページに含まれるコンテンツにアクセスすることができる。コンテンツのアクセスに、コンテンツの作成または操作を含めることができる。コンテンツは、たとえばデータベースおよびウェブサービスからなど、さまざまな異なる記憶位置からアクセスすることができる。たとえば、サーバによって、データベース１１２に保管されたデータにアクセスすることができる。データベースインターフェースモジュール１０８または他の適切なモジュールによって、ウェブページに含めるためにデータを適当にフォーマットすることができる。

【００３９】

図２の方法に、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙに関連するキャッシュエントリを作成する動作が含まれる（動作２０８）。動作２０８に、サーバコンピュータシステムによって、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙに関連するキャッシングされるエントリを作成することを含めることができる。たとえば、サーバ１００によって、カスタマイズされたキャッシュ依存関係１１４に関連するキャッシュエントリを作成することができる。キャッシュエントリは、一実施形態で、サーバ１００によって行われる変数定義ステートメント（たとえば、上で説明した命令の行５０に似たもの）によって作成される。

【００４０】

図２の方法に、キャッシュエントリをキャッシュに挿入する動作が含まれる（動作２１０）。動作２１０に、サーバコンピュータシステムによって、キャッシングされるエントリをサーバコンピュータシステムに配置されたキャッシュに挿入することを含めることができる。たとえば、サーバ１００によって、キャッシュエントリをキャッシュ１１０に挿入することができる。キャッシュエントリをキャッシュに挿入し、キャッシングされるエントリ（したがって、キャッシングされるコンテンツ）の有効性が、カスタマイズされた依存関係に依存するようにすることができる。たとえば、サーバ１００によって、カスタマイズされたキャッシュ依存関係１１４から生ずる依存関係に依存するキャッシュエントリをキャッシュ１１０に挿入することができる。

【００４１】

図３を参照すると、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙを使用してキャッシュエントリを無効化する方法が示されている。図３の方法には、カスタマイズされたキャッシュ依存関係のインスタンスによってセットされたカスタム依存関係条件を監視する動作が含まれる（動作３０２）。動作３０２に、サーバコンピュータシステムによって、サーバコンピュータシステムで実装されるカスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラスのインスタンスによってセットされるカスタム依存関係条件を監視することを含めることができる。たとえば、サーバ１００によって、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４のインスタンスによってセットされるカスタム依存関係条件を監視することができる。カスタマイズされた依存関係条件は、たとえばデータベースの内容の変化、ウェブサービスによって提供されるコンテンツの変化などのイベントの発生とすることができる。たとえば、サーバ１００によって、データベーステーブル１１６の内容の変化についてフラグエントリ１１８を監視することができる。カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４が、集約依存関係に関連する時には、複数のカスタム依存関係条件を監視することができる。

【００４２】

図３の方法には、カスタム依存関係条件が満足されたかどうかを判定する動作が含まれる（動作３０４）。動作３０４に、サーバコンピュータシステムによって、カスタマイズされたキャッシュ依存関係に関連するカスタム依存関係条件が満足されたかどうかを判定することを含めることができる。たとえば、サーバ１００によって、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４に関連するカスタム依存関係条件が満足されたかどうかを判定することができる。カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４が、集約依存関係に関連する時には、サーバ１００によって、複数のカスタム依存関係条件の各カスタム依存関係条件が満足されたかどうかを判定することがで

きる。

【００４３】

いくつかの実施形態で、サーバ１００によって、保管されたフラグエントリを現在のフラグエントリと比較することによって、カスタム依存関係条件が満足されたかどうかが判定される。たとえば、サーバ１００によって、フラグエントリ１１８の前に取り出され、保管された値を、フラグエントリ１１８の現在の値と比較することができる。フラグエントリ１１８が増分的である時に、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４によって、現在データベーステーブル１１７内にあるフラグエントリ１１８を、ある前の時にデータベーステーブル１１７に存在したフラグエントリと比較することができる。現在テーブル内にあるフラグエントリ１１８が、前の時にデータベーステーブル１１７に存在したフラグエントリより大きい場合に、カスタム依存関係条件（データベーステーブル１１６の内容の変化）が満足される。

【００４４】

カスタム依存関係条件が満足されない場合（動作３０４のＮＯ）、サーバ１００によって、カスタム依存関係条件をもう一度監視することができる。カスタム依存関係条件の監視は、指定された間隔（たとえば、５秒ごと）で、カスタム依存関係条件が満足されるまで、たとえば監視されるイベントが発生するまで（動作３０４のＹＥＳ）繰り返すことができる。

【００４５】

図３の方法には、カスタム依存関係条件が満足されたことを示すことが含まれる（動作３０６）。動作３０６に、カスタム依存関係条件が満足されたことをサーバコンピュータシステムに示すＮｏｔｉｆｙＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄメソッドを含めることができる。たとえば、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４のＮｏｔｉｆｙＤｅｐｅｎｄｅｎｃｙＣｈａｎｇｅｄメソッドによって、データベーステーブル１１６の内容が変化した時をサーバ１００に通知することができる。カスタム依存関係条件が満足されたことの通知によって、キャッシュエントリを消去しなければならないことをサーバ１００に示すことができる。

【００４６】

図３の方法に、キャッシュを消去することが含まれる（動作３０８）。動作３０８に、サーバコンピュータシステムによって、サーバコンピュータシステムでキャッシュエントリを消去することを含めることができる。たとえば、サーバ１００によって、キャッシュ１１０からキャッシュエントリを消去することができる。キャッシングされたエントリは、カスタマイズされたキャッシュ依存関係に関連するカスタム依存関係条件が満足されたことの通知の受け取りに応答して消去することができる。たとえば、サーバ１００によって、フラグエントリ１１８が増分されたことの通知の受け取りに応答して、データテーブル１１６に依存するキャッシュエントリを消去することができる。キャッシュエントリが消去される時に、コンピュータシステム１００によって、そのキャッシュエントリを維持するために消費されていたリソース（たとえば、システムメモリ）を解放することができる。たとえば、サーバコンピュータシステム１００によって、カスタマイズされたＣａｃｈｅＤｅｐｅｎｄｅｎｃｙクラス１１４に関連するＤｅｐｅｎｄｅｎｃｙＤｉｓｐｏｓｅメソッドを呼び出して、データベーステーブル１１６からの内容が保管されたキャッシュエントリに関するリソースを解放することができる。

【００４７】

本発明の実施形態に、下で詳細に述べるように、さまざまなコンピュータハードウェアを含む特殊目的または汎用のコンピュータを含めることができる。本発明の範囲内の実施形態に、コンピュータ実行可能命令またはデータ構造を担持するかこれを保管されたコンピュータ可読媒体も含めることができる。そのようなコンピュータ可読媒体は、汎用コンピュータまたは特殊目的コンピュータによってアクセス可能な使用可能な媒体とすることができる。たとえば、制限ではなく、そのようなコンピュータ可読媒体に、ＲＡＭ、ＲＯＭ、ＥＥＰＲＯＭ、ＣＤ－ＲＯＭまたは他の光学ディスクストレージ、磁気ディスクスト

レージまたは他の磁気ストレージデバイス、あるいは、コンピュータ実行可能命令の形の所望のプログラムコード手段またはデータ構造を担持するか保管するのに使用することができ、汎用コンピュータまたは特殊目的コンピュータによってアクセス可能な任意の他の媒体を含めることができる。情報が、ネットワークまたは別の通信接続（ハードワイヤド、無線、あるいはハードワイヤドまたは無線の組合せのいずれか）を介してコンピュータに転送または供給される時に、コンピュータは、その接続をコンピュータ可読媒体と正しく見なす。したがって、そのような接続のすべてを、正しくコンピュータ可読媒体と称する。上記の組合せも、コンピュータ可読媒体の範囲に含まれなければならない。コンピュータ実行可能命令に、たとえば、汎用コンピュータ、特殊目的コンピュータ、または特殊目的処理デバイスに、ある機能または機能の群を実行させる命令およびデータが含まれる。

【００４８】

図４および以下の説明は、本発明を実施できる適切なコンピューティング環境の短い全般的な説明を提供することを意図されたものである。必要ではないが、本発明を、ネットワーク環境内のコンピュータによって実行される、プログラムモジュールなどのコンピュータ実行可能命令の全般的な文脈で説明する。一般に、プログラムモジュールには、特定のタスクを実行するか特定の抽象データ型を実施するルーチン、プログラム、オブジェクト、コンポーネント、データ構造などが含まれる。コンピュータ実行可能命令、関連するデータ構造、およびプログラムモジュールによって、本明細書で開示される方法のステップを実行するプログラムコード手段が表される。そのような実行可能命令の特定のシーケンスまたは関連するデータ構造によって、そのようなステップで説明された機能を実施する対応する動作の例が表される。

【００４９】

本発明を、パーソナルコンピュータ、ハンドヘルドデバイス、マルチプロセッサシステム、マイクロプロセッサベースまたはプログラマブルな家庭電化、ネットワークＰＣ、ミニコンピュータ、メインフレームコンピュータ、および類似物を含む多数のタイプのコンピュータシステム構成と共にネットワークコンピューティング環境で実践できることを、当業者は諒解するであろう。本発明は、通信ネットワークを介してリンクされた（ハードワイヤドリンク、無線リンク、またはハードワイヤドリンクと無線リンクの組合せのいずれかによって）ローカルおよびリモートの処理デバイスによってタスクが実行される分散コンピューティング環境で実践することもできる。分散コンピューティング環境では、プログラムモジュールを、ローカルとリモートの両方のメモリストレージデバイスに配置することができる。

【００５０】

図４に関して、本発明を実施する典型的システムに、普通のコンピュータ４２０の形の汎用コンピューティングデバイスが含まれ、コンピュータ４２０には、処理ユニット４２１、システムメモリ４２２、およびシステムメモリ４２２を含むさまざまなシステム構成要素を処理ユニット４２１に結合するシステムバス４２３が含まれる。システムバス４２３は、メモリバスまたはメモリコントローラ、周辺バス、およびさまざまなバスアーキテクチャのいずれかを使用するローカルバスを含む、複数のタイプのバス構造のいずれかとすることができる。システムメモリに、読取専用メモリ（ＲＯＭ）４２４およびランダムアクセスメモリ（ＲＡＭ）４２５が含まれる。起動中などにコンピュータ４２０内の要素の間での情報転送を助ける基本ルーチンを含む基本入出力システム（ＢＩＯＳ）４２６を、ＲＯＭ４２４に保管することができる。

【００５１】

コンピュータ４２０に、磁気ハードディスク４３９から読み取り、これに書き込む磁気ハードディスクドライブ４２７、取外し可能磁気ディスク４２９から読み取るか、これに書き込む磁気ディスクドライブ４２８、ＣＤ－ＲＯＭまたは他の光学媒体などの取外し可能光ディスク４３１から読み取るか、これに書き込む光ディスクドライブ４３０も含めることができる。磁気ハードディスクドライブ４２７、磁気ディスクドライブ４２８、およ

び光ディスクドライブ４３０は、それぞれハードディスクドライブインターフェース４３２、磁気ディスクドライブインターフェース４３３、および光ドライブインターフェース４３４によってシステムバス４２３に接続される。ドライブおよびそれに関連するコンピュータ可読媒体によって、コンピュータ４２０のコンピュータ実行可能命令、データ構造、プログラムモジュール、および他のデータの不揮発性ストレージがもたらされる。本明細書に記載の典型的実施形態では、磁気ハードディスク４３９、取外し可能磁気ディスク４２９、および取外し可能光ディスク４３１が使用されるが、磁気カセット、フラッシュメモリカード、ディジタル多用途ディスク、ベルヌーイカートリッジ、ＲＡＭ、ＲＯＭ、および類似物を含む、データを保管する他のタイプのコンピュータ可読媒体を使用することができる。

【００５２】

オペレーティングシステム４３５、１つまたは複数のアプリケーションプログラム４３６、他のプログラムモジュール４３７、およびプログラムデータ４３８を含む１つまたは複数のプログラムモジュールを含むプログラムコード手段を、ハードディスク４３９、磁気ディスク４２９、光ディスク４３１、ＲＯＭ４２４、またはＲＡＭ４２５に保管することができる。ユーザは、キーボード４４０、ポインティングデバイス４４２、または、マイクロホン、ジョイスティック、ゲームパッド、衛星パラボラアンテナ、スキャナ、または類似物などの他の入力デバイス（図示せず）を介して、コンピュータ４２０にコマンドおよび情報を入力することができる。これらおよび他の入力デバイスは、しばしば、システムバス４２３に結合されたシリアルポートインターフェース４４６を介して処理ユニット４２１に接続される。代替案では、入力デバイスを、パラレルポート、ゲームポート、またはｕｎｉｖｅｒｓａｌ　ｓｅｒｉａｌ　ｂｕｓ（ＵＳＢ）などの他のインターフェースによって接続することができる。モニタ４４７または別のディスプレイデバイスも、ビデオアダプタ４４８などのインターフェースを介してシステムバス４２３に接続される。モニタのほかに、パーソナルコンピュータには、通常は、スピーカおよびプリンタなどの他の周辺出力デバイス（図示せず）が含まれる。

【００５３】

コンピュータシステム４２０は、たとえば、オフィス全体または会社全体のコンピュータネットワーク、イントラネット、および／またはインターネットなどのネットワークに接続可能である。コンピュータシステム４２０によって、そのようなネットワークを介して、たとえばリモートコンピュータシステム、リモートアプリケーション、および／またはリモートデータベースなどの外部ソースとデータを交換することができる。

【００５４】

コンピュータシステム４２０に、ネットワークインターフェース４５３が含まれ、これを介して、コンピュータシステム４２０は、外部ソースからデータを受信し、かつ／または外部ソースにデータを送信する。図４からわかるように、ネットワークインターフェース４５３によって、リンク４５１を介してリモートコンピュータ４８３とのデータの交換が実現される。リンク４５１は、ネットワークの一部を表し、リモートコンピュータ４８３は、ネットワークのノードを表す。たとえば、リモートコンピュータシステム４８３によって、コンピュータシステム４２０で構成されるウェブページのコンテンツを提供するデータベースを維持することができる。その一方で、コンピュータシステム４８３を、コンピュータシステム４２０で維持されるデータベースにコンテンツを要求したサーバコンピュータとすることができる。

【００５５】

同様に、コンピュータシステム４２０に、シリアルポートインターフェース４４６が含まれ、これを介して、コンピュータシステム４２０が、外部ソースからデータを受信し、かつ／または外部ソースにデータを送信する。シリアルポートインターフェース４４６は、モデム４５４に接続され、これを介して、コンピュータシステム４２０が、外部ソースからデータを受信し、かつ／または外部ソースにデータを送信する。その代わりに、モデム４５４を、適当なインターフェースを介してコンピュータシステム４２０に接続される

Ｄａｔａ Ｏｖｅｒ Ｃａｂｌｅ Ｓｅｒｖｉｃｅ Ｉｎｔｅｒｆａｃｅ Ｓｐｅｃｉｆｉｃａｔｉｏｎ（「ＤＯＣＳＩＳ」）モデムまたはディジタル加入者回線（「ＤＳＬ」）モデムとすることができる。しかし、図４からわかるように、シリアルポートインターフェース４４６およびモデム４５４によって、リンク４５２を介するリモートコンピュータシステム４９３とのデータの交換が実現される。リンク４５２は、ネットワークの一部を表し、リモートコンピュータシステム４９３は、ネットワークのノードを表す。たとえば、リモートコンピュータシステム４９３を、コンピュータシステム４２０にウェブページを要求するクライアントコンピュータシステムとすることができる。その一方で、コンピュータシステム４９３を、コンピュータシステム４２０にウェブページを供給するサーバコンピュータシステムとすることができる。

【００５６】

本発明を、その趣旨または本質的な特徴から逸脱せずに、他の特定の形で実施することができる。説明した実施形態は、すべての点で例示としてのみ解釈されねばならず、制限的に解釈されてはならない。したがって、本発明の範囲は、前述の説明によるのではなく、請求項によって示される。請求項の同等物の意味および範囲に含まれるすべての変更が、その範囲に含まれなければならない。

【図面の簡単な説明】

【００５７】

【図１】サーバサイドスクリプティングおよびカスタムキャッシュ依存関係を実施するウェブページサーバの例を示す図である。

【図２】キャッシュエントリをカスタム依存関係に依存させる方法の一実施形態を示す例の流れ図である。

【図３】カスタムキャッシュ依存関係に基づいてキャッシュエントリを消去する方法の一実施形態を示す例の流れ図である。

【図４】本発明の諸態様を実践することができる１つの適切な環境を示す絵図である。

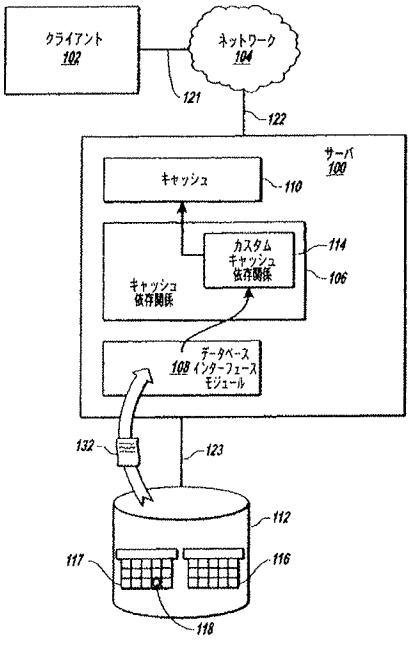
【符号の説明】

【００５８】

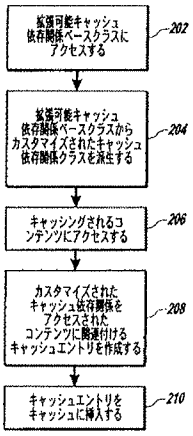
１０２　クライアント
１０４　ネットワーク
１００　サーバ
１１０　キャッシュ
１１４　カスタムキャッシュ依存関係
１０６　キャッシュ依存関係
１０８　データベースインターフェースモジュール
４２４　ＲＯＭ
４２６　ＢＩＯＳ
４２５　ＲＡＭ
４３５　オペレーティングシステム
４３６　アプリケーションプログラム
４３７　他のプログラムモジュール
４３８　プログラムデータ
４２１　処理ユニット
４４８　ビデオアダプタ
４４７　モニタ
４２３　システムバス
４３２　ハードディスクドライブインターフェース
４３３　磁気ディスクドライブインターフェース
４３４　光ドライブインターフェース
４４６　シリアルポートインターフェース
４５３　ネットワークインターフェース

４３５　オペレーティングシステム
４３６　アプリケーションプログラム
４３７　他のプログラムモジュール
４３８　プログラムデータ
４４０　キーボード
４５４　モデム
４９３　リモートコンピュータ
４８３　リモートコンピュータ

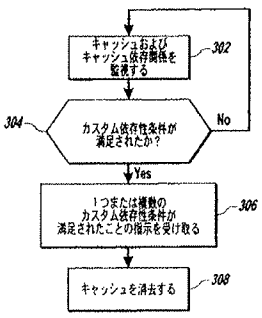
【図１】



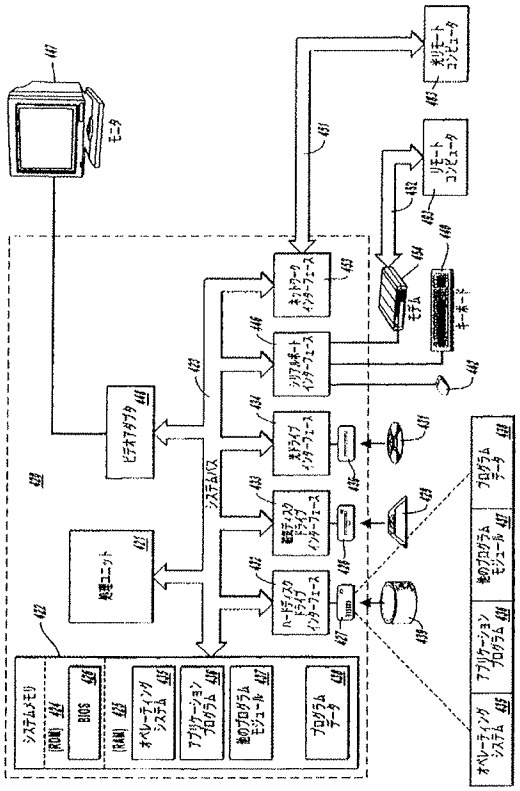
【図２】



【図３】



【図４】



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Ｆターム(参考) 5B082 HA02 HA08

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3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
The present invention relates to the management of contents by which the cash advance was carried out generally. Specifically, the present invention relates to extending a cache dependency class so that a developer can create a custom-made cache dependency (cache dependency).
[Background of the Invention]
[0002]
In a modern computer system and network system, a data cash advance is an effective tool which accelerates distribution to those who demand it of data. Generally, it is included that a data cash advance stores the data demanded frequently to the memory site which can take out the data quickly. By one example, the data stored by the physical memory of the computer system can be taken out more quickly than the data stored by the hard drive of the computer system. This originates in a hard drive usually having larger data retrieval waiting time as compared with a physical memory partially. Similarly, the data stored in the hard drive of a server computer system or the memory can be accessed more efficiently than the data stored by the remote database. The number of calculations required to generate contents by use of data by which the cash advance was carried out for distribution to the client computer system to demand can be reduced.
[0003]
Capability to transmit digital information universally among various memory sites was realized by the modern network. One of the forms which make data usable for transport is because a static file downloadable to the client computer system which can display it from servers, such as an HTML file, is created. Static files are various memory sites containing a server computer system and a local database, or a cash advance can be locally carried out with a client computer system. When a computer system static file is kept by the client computer system, extraction and the display by the client computer about all the practical use purposes are momentary. Even if a static file is a time of being directly kept by the server computer system connected to the client computer system (an output cash advance is generally called), extraction of contents by which the cash advance was carried out can be performed comparatively quickly. The cash advance of the static file can be intrinsically carried out to because of that of this static property indefinitely for a long period of time.
[0004]
Though regrettable, real time contents or custom-made contents cannot be included in a static file. It is desirable to show the contents which often change periodically or are formed from calculation or operation of other contents. Although the cash advance of such contents can be carried out, the value of contents by which a cash advance is carried out is effective only within between the limited temporal duration. Therefore, a cache must be refreshed and it must guarantee that data is effective.
[0005]
one of the technology which helped the web development person by creation of the web page and the website is a module portion of a script or a computer executable code which operates, for example by web page servers, such as Internet Information Server. A script can be embedded

among other HTML tags and a dynamic and customizable web page can be created. The same object can be called in these and the script based on other languages the same with the ability of an object to be called within the program described by Visual Basic, Java(registered trademark) Script, C#, etc.
[0006]
A class is an object within programming frameworks, such as an ASP.NET framework. Thousands of classes which can be used for a web page developer developing a web page are contained in an ASP.NET framework. In the form similar to access of the file through a directory path, a class can be accessed by the reference to a specific name space. For example, the display of the memory site of a specific class is brought about by the reference to name-space System.WinForms.Form. A class can be related with a property, an event, and a method. It can be considered that a property is setting out (for example, x= 5) in the class which variable-assigns or corresponds. An event is a flag generated at the time of generating of an event. An event can be read with other class or other applications, and a certain operation can be performed. By a method, the function of a corresponding class can be called and operation can be performed (for example, data is outputted to a display device). The method of providing an external component with the function is defined by the method.
[0007]
In order to realize the cash advance of contents, therefore to improve the performance of a web page server, The class which operates data to a programming framework via the class and various operations which take out data, for example from various memory sites, such as a file, a database, and a web server, can be included. In a part of environments, with the web page server computer system (for example, ASP server) which can access these classes. A HTML code can be created and kept based on real time contents, and this HTML code is transmitted to a client computer system in an output cash advance scenario. In other environments, a web page server computer system, It becomes unnecessary to re-calculate whether the contents are taken out whenever the web page which the cash advance of the contents, such as an XML file, can be locally carried out with a web page server computer system, and contains the contents as a result is required.
[0008]
In some programming frameworks, creating the command in which he makes a cache keep contents when a web development person is performed is permitted. For example, :Cache.Insert which can execute the following command in order to insert an entry in a cache ([key], [value], [dependency]). Here, the value (or contents) and dependency by which the reference identifier of a cache entry and value are put on a cache entry for key are an option argument which defines the time of having to eliminate the value of a key from a cache. dependency is an instance of classes which can use a cache value for making it dependent on generating of a specific event, such as a CacheDependency (cache dependency) class, for example.
[0009]
Some programming frameworks support the cache dependency which makes a cache value the thing depending on either time, a file or a key. The entry relevant to a specific dependency is eliminated after expiration of the specified time period by the time cache dependency. For example, a Cache.Insert command can be carried out as follows and data can be made into a time-dependent. :
Cache.Insert (strCacheKey, dataset, nothing, DateTime.Now.AddMinutes (60))
TimeSpan.Zero, CacheItemPriority.High.
[0010]
Speaking specifically, eliminating the entry in a cache from a cache in 60 minutes with a DateTime.Now.AddMinutes (60) command. By the time cache dependency set too much short, the cost of calculation of too frequent elimination of a cache and the data stored by the additional cost of the frequent data fetch from a database or cache may be brought about. When time value is too long, and the data stored by the cache is distributed to the client computer system of a source of request, there is a danger of becoming invalid.
[0011]
When a Cache.Insert command is used and there is change to a specific file, the file cache dependency which makes a cache entry eliminate can also be carried out. A Cache.Insert

command is used, and when other cache values kept by the memory change, the key dependency which makes one or more cache entries eliminate can be carried out. If a key dependency is used, two or more dependence cache values can be made to eliminate from a cache by a certain cache value change.
[0012]
Three cache dependencies described in the top: Time, the file, and the key are useful although the value kept by cache is kept fresh, but it is usually sealed in the class which carries out these dependencies (sealed). Therefore, a web development person does not usually have the means which make a cache entry event dependence of other types. It becomes impossible to use the cache dependency various type [other] which can make management of a cache more efficient by this.
[Description of the Invention]
[Problem to be solved by the invention]
[0013]
Therefore, it is advantageous to have a mechanism which extends the type of the dependency which can be used for cancelling a cache entry.
[Means for solving problem]
[0014]
The above-mentioned problem about the state of a prior art is conquered by the principle of the present invention. The principle of the present invention is aimed at the method, system, and computer program which extend a cache dependency class so that a developer can create a custom-made cache dependency. An extensible cache dependency base class is accessed and the customized cache dependency is made to derive from an extensible cache dependency base class with a server computer system (for example, a web page server is included). According to the customized cache dependency, the cache entry depending on change of a database table (for example, SQL table) or web service can be brought about, for example.
[0015]
An intensive dependency (aggregate dependency) can be included in the customized cache dependency so that a cache entry may be dependent on two or more events. By some embodiments, the override of the function of an extensible cache dependency base class is carried out by the function of the customized cache dependency. To an extensible cache dependency base class, an event (for example, change of a database table) is supervised, When an event occurs, the dependency Notification-of-the-Recording-of-Change (notify dependency changed) method notified to a server computer system can be included. When a cache entry is removed from a cache by the extensible cache dependency base class, the dependency treatment (dependency dispose) method which releases a resource can also be included.
[0016]
By a server computer system, the contents distributed to a client computer system are accessed, for example from a database or web service. The cache entry which relates the customized cache dependency with the contents accessed with a server computer system is created. With a server computer system, a cache entry is inserted in a cache and the validity of a cache entry (therefore, contents accessed) comes to be dependent on the customized dependency. By a server computer system, a cache entry is inserted in a cache using the Cache.Insert method which specifies the dependency which is an instance of the customized cache dependency.
[0017]
A cache entry may be cancelled based on the customized cache dependency. The notice of the event supervised having occurred with the server computer system (for example, a web page server is included) is received. This notice may be emitted from the dependency Notification-of-the-Recording-of-Change method which is performed as a result of the customized creation of a dependency by which a cash advance is carried out, and supervises generating of the event relevant to the customized dependency by which a cash advance is carried out. It responds to this notice and that cache entry is cancelled by a server computer system (and removed). A dependency treatment method is called by a server computer system, and all the resources used by the cache entry are released.
[0018]

The characteristics and the strong point of an addition of the present invention are shown by the following descriptions, are partially clear from this description, or can be mastered by practice of the present invention. Especially the characteristics and the strong point of the present invention can be realized and acquired with the apparatus and the combination which are pointed out by a claim.

[0019]

In order to describe the method that the above, other strong points, and the characteristics of the present invention can be acquired, the more specific description of the present invention described short is described in a top about the specific embodiment shown in the accompanying drawing. He is only that the typical embodiment of the present invention is shown, therefore these Drawings understand that it must not be interpreted as restricting the range of the present invention, and describe the present invention still more specifically and in detail via use of an accompanying drawing.

[Best Mode of Carrying Out the Invention]

[0020]

The system, method, and computer program which extend a cache dependency class are extended by the present invention so that a developer can create a custom-made cache dependency. A cache dependency is extended to an extensible form by the embodiment of the present invention so that a developer can develop the developer's itself custom-made cache dependency. An extensible CacheDependency base class is accessed and the CacheDependency class in which other customization is possible can be made to derive from this class with a server computer system (for example, a web page server is included). By the customized CacheDependency class, it can divide and the cache controlling function of an extensible CacheDependency base class can be used. By creating customized CacheDependencyClass which was derived from the extensible CacheDependency base class, a developer, In order to use the advantageous characteristics of an extensible CacheDependency base class, the knowledge of how an extensible CacheDependency base class is carried out is hardly needed, though it is. The details of mounting are abstracted from a developer by the extensible CacheDependency base class.

[0021]

The developer can access the method of the extensible CacheDependency base class which can treat cache synchronization and cache resource management. An extensible CacheDependency base class can be used with all the classes which can have downward compatibility and derive the existing API as a result an extensible CacheDependency base class and after this. Cache.Insert, Cache.Add, and BasePartialCachingControl.Dependency are contained in the example of such API. By mounting of the custom-made cache dependency derived from an extensible CacheDependency (cache dependency) base class, A developer is released from the necessity of specifying a StartTime property (attribute) that it signs the time of having to start the surveillance of a cache. This is not indispensable although the developer can carry out this property.

[0022]

In an extensible CacheDependency base class, Two usable additional methods are contained publicly and the developer of customized CacheDependency can call the elimination function of an extensible CacheDependency base class. A first method is a NotifyDependencyChanged (dependency Notification of the Recording of Change) method. This method is called in order to tell an extensible CacheDependency class about the dependency item having changed by the class derived from the extensible CacheDependency base class. A second new method is a DependencyDispose method. This method is a virtual method which provides a location cleanup peculiar to an inherited class. Speaking specifically, the memory site of the command in which the Dispose (treatment) method of an extensible CacheDependency base class is arranged ordinarily being provided by this method, when it is not customized CacheDependency. Therefore, it is releasable for use by other modules which have the necessity of accessing the resource used by customized CacheDependency at the resource.

[0023]

A NotifyDependencyChanged method can be called by customized CacheDependency which depends from an extensible CacheDependency base class. Therefore, it can depend for a cache

entry on change of a database, the data of web service, or other Reasons by the customized CacheDependency class. In this form, with a cache, a cancellation cache entry key can be recognized and that key (and corresponding contents) can be removed from a cache.
[0024]
In one example of illustration, a developer creates the custom-made class "SqlCacheDependency" derived from an extensible CacheDependency base class, An SQL database is polled in order to judge whether a change to a database was made. SqlCacheDependency is derived from the extensible CacheDependency base class which exists in a programming framework. Therefore, the method of NotifyDependencyChanged can be called so that a server computer system may make a dependence cache entry eliminate by the class SqlCacheDependency.
[0025]
If one embodiment of the present invention is used, the following command can be used and the instance of customized CacheDependency can be mounted.

```
10 If (Cache ["Product"] == null){
20 SqlConnection Connection = new SqlConnection ([connection
details]);
...
30 SqlDataAdapter ds = new SqlDataAdapter ("Product_GetProducts",
connection);
40 SqlCacheDependency dep = new SqlCacheDependency ("NorthWind",
"Products");
50 Cache.Insert("Product", ds, dep);
}
```

[0026]
In the line 10 of the upper code, it is being investigated whether an entry "Product" is already in a cache. When there is no entry in a cache, the function of the "if" statement is performed. In the line 20, connection with a database is established and contents are taken out from this database. In the line 30, data is picked out from a database using a method "Product_GetProducts", and data is stored to a variable "ds." In the line 40, the variable "ds" is assigned as a dependency over the "Products" table of the "NorthWind" database. This dependency is customized CacheDependency which was derived from the extensible CacheDependency base class. In the line 50, the data of a variable "ds" is inserted in the cache entry referred to by a key "Product", and this cache entry comes to be dependent on "dep."
[0027]
In this example, SqlCacheDependency is the customized cache dependency derived from the extensible CacheDependency base class. When the class derived from an extensible CacheDependency base class is used as a dependency, the server computer system processes the class as if it was an instance of extensible CacheDependency. Therefore, a server computer system, Original functions of itself, such as being able to respond to the action which is [which it is shown by an extensible CacheDependency base class] similar, simultaneously receiving a notice internally, when data base inquiries change with inherited classes, can be carried out. In customized CacheDependency and this example, the override of any method of an extensible CacheDependency base class required to attain a desired function can be carried out by SqlCacheDependency. In this example, when SqlCacheDependency is notified about data-base-inquiries change, a base.Notify.DependencyChanged method is called, A server computer system is made to remove the cache entry referred to by a key "Product."
[0028]
Although this example was described about the database change dependency, it is important to care about the thing which a web designer can imagine and for which creation of all the cache dependencies is permitted as a matter of fact by the extensibility of an extensible CacheDependency base class. If there is an extensible model, the web development person can build all kinds including the intensive dependency based on two or more dependencies of custom-made dependency. For example, it shall depend for a cache entry on both a file and an SQL table. The embodiment of an intensive dependency is shown in the following command.

```
70 if (Cache ["(Product-List"] == null) {
```

```
80 SqlConnection Connection = new SqlConnection ([connection
details]);
90 SqlDataAdapter ds = new SqlDataAdapter ("Product_GetProducts",
connection);
100 SqlCacheDependency sqlDep = new SqlCacheDependency ("NorthWind",
"Products");
120 CachDependency dep = new AggregateCacheDependency(
Server.MapPath("sales.xml"), sqlDep);
130 Cache.Insert("Product-List, ds, dep);
}
```

[0029]
This code is similar to the code after a code called the lines 10-50 is attached except for the line 120. A comprehensive cache dependency is mounted by the inherited class of CachDependency of the name of AggregateCacheDependency. This can be used for depending for the entry in a cache on both customized SqlCacheDependenc(ies) which were derived from the file (sales.xml) and the extensible CacheDependency base class. An additional customization feature can also be provided by the class derived from an extensible CacheDependency base class. That is, the event, method, and property which are used for developing an inherited class and mounting the customized function can be processed. For example, the inherited class to the support of start time (for example, the time of CacheDependency having to start surveillance about change is specified), the capability to support synthesis of a dependency, and a call-back mechanism, etc. can be developed. Therefore, a developer is not restricted to an event peculiar to an extensible CacheDependency base class, a method, and a property.
[0030]
Reference of Fig.1 shows the suitable environment where the modes of the present invention can be carried out. The server 100 and the client 102 which were connected to the network by the links 121 and 122 corresponding, respectively are shown in Fig.1. The server 100 and the client 102 can use various protocols containing HTTP, and can communicate via the network 104. The server 100 can be made into an ASP.NET server and can distribute the dynamic contents of the form of a dynamic web page to the client 102. The various classes and modules containing the extensible CacheDependency class 106 and CacheDependency114 which were customized are contained in a server. The cache 110 which can be arranged to the inside of the physical memory of the server 100 or other ordinary memory sites is also included in the server 100.
[0031]
The server 100 is combined with the database 112 by the link 123. The database 112 can be used as a database with suitable SQL database or Oracle database etc., for example. The database 112 can express the supply source of XML service or other data in other embodiments of the present invention.
[0032]
As an example, a certain contents are required of the server 100 by the client 102. For example, the client 102 can access URL which requires a web page of the server 100. It is judged whether the server 100 investigates the cache 110 and the demanded contents (for example, data in a web page) are in the cache 110. When there are no contents in the cache 110, the contents are required of the database 112 by the database interface module 108. At the suitable time, contents, such as the contents 132, are taken out and returned to the database interface module 108, for example.
[0033]
In an alternative, the demanded contents can be considered as operation with the contents taken out from some databases calculated, such as a value or the database 112. By the database interface module 108, contents may be calculated or operated suitably. Then, contents are one or more HTTP messages, and are transmitted to the client 102, for example. Contents can also be added to the cache 110 using a Cache.Insert method. The custom-made dependency defined by a Cache.Insert method by the customized CacheDependency class 114 which was derived from the extensible CacheDependency base class 106 is specified.
[0034]
While contents remain in the cache 110, the contents can be more efficiently distributed to all

the clients which require the contents. Contents remain in the cache 110 until methods, such as a NotifyDependencyChanged method, are called by the customized CacheDependency class 114. Contents are eliminated from a cache at the time of the call of a NotifyDependencyChanged method. The demand of the succession about the contents by a client needs to re-fetch the contents from the database 112, and to re-calculate them by/or the database interface module 108.

[0035]

When there is change to the database 112, the cache 110 can be made to eliminate by the customized CacheDependency class 114. In this example, although fetch of the data from the database 112 may become a resource concentration type, on the other hand by polling of the database 112 about change, fewer resources are used. The database table which keeps the information in the databases 112, such as the database table 116, can be included in the database 112. The flag entry 118 which shows further whether a change to the information in the database table 116 was made in another database table 117 can be included. The flag of other tables which have a custom-made dependency in a database can be included in the database table 117. By one embodiment, the flag entry 118 is made into an increment type, and the value of the flag entry 118 can be increased by each change in the database table 116 at an increment type. CacheDependency114 customized can be designed to remove a cache entry, when the increase in the flag entry 118 is detected.

[0036]

Reference of Fig.2 shows the flow chart showing how to insert a dependency entry. The operation which accesses an extensible CacheDependency base class is included in the method of Fig.2 (operation 202). It can include accessing the extensible CacheDependency base class 106 with a server computer system in the operation 202. For example, the extensible CacheDependency class 106 can be accessed by the server 100. The server 100 as a result of the instruction execution developed by the web page developer, The CacheDependency class 106 can be accessed as the result of execution of the command developed by other software developers, or a part of a certain program module.

[0037]

Deriving the CacheDependency class customized from the extensible CacheDependency base class is included in the method of Fig.2 (operation 204). It can include deriving the CacheDependency class customized from the extensible CacheDependency base class by the server computer system in the operation 204. For example, the cache dependency 114 customized from the extensible CacheDependency class 106 can be derived by the server 100. The server 100 as a result of the instruction execution developed by the web page developer, The customized cache dependency 114 can be made to be able to derive as the result of execution of the command developed by other software developers, or a part of a certain program module, and customized CacheDependency can be created. By the server 100, when conditions, such as a thermometer, change, the trigger of the event is certainly carried out, A sport scoreboard program which certainly carries out the trigger of the change when the score of the external sensor connected to the computer and a game changes, A network management program which certainly carries out the trigger of the event when network composition changes (it is removed whether a computer is added to a network), When a directory changes (people are added or removed), the directory program etc. which certainly carry out the trigger of the event are included, but the cache dependency 114 customized from two or more sources which are not restricted to this can also be made to derive.

[0038]

Access to contents is included in the method of Fig.2 (operation 206). It can include accessing the contents contained in the operation 206 at a web page for distribution to a client computer system with a server computer system. For example, the contents contained in the web page distributed to the client 102 by the server 100 can be accessed. Creation or operation of contents can be included in access of contents. contents -- from a database and web service -- etc. -- it can access from various different memory sites. For example, the data stored by the database 112 can be accessed by a server. With the database interface module 108 or other suitable modules, in order to include in a web page, data can be formatted suitably.

[0039]

The operation which creates the cache entry relevant to customized CacheDependency is included in the method of Fig.2 (operation 208). It can include creating the entry relevant to customized CacheDependency by which a cash advance is carried out with a server computer system in the operation 208. For example, the cache entry relevant to the customized cache dependency 114 can be created by the server 100. A cache entry is one embodiment and is created by the variable-definition statement (for example, thing similar to the line 50 of the command described in the top) performed by the server 100.
[0040]
The operation which inserts a cache entry in a cache is included in the method of Fig.2 (operation 210). It can include inserting the entry by which a cash advance is carried out to the operation 210 with a server computer system in the cache arranged at a server computer system. For example, a cache entry can be inserted in the cache 110 by the server 100. A cache entry is inserted in a cache and the validity of the entry (therefore, contents by which a cash advance is carried out) by which a cash advance is carried out can depend for it on the customized dependency. For example, the cache entry depending on the dependency produced from the customized cache dependency 114 by the server 100 can be inserted in the cache 110.
[0041]
Reference of Fig.3 shows the method of cancelling a cache entry using customized CacheDependency. The operation which supervises the custom-made dependency conditions set by the instance of the customized cache dependency is included in the method of Fig.3 (operation 302). It can include supervising the custom-made dependency conditions set by the instance of the customized CacheDependency class which is mounted in the operation 302 with a server computer system by a server computer system. For example, the custom-made dependency conditions set by the instance of the CacheDependency class 114 customized by the server 100 can be supervised. The customized dependency conditions can be considered, for example as generating of events, such as change of the contents of the database, and change of the contents provided by web service. For example, the flag entry 118 can be supervised about change of the contents of the database table 116 by the server 100. When the customized CacheDependency class 114 relates to an intensive dependency, two or more custom-made dependency conditions can be supervised.
[0042]
The operation which judges whether custom-made dependency conditions were satisfied is included in the method of Fig.3 (operation 304). It can include judging whether it was satisfied with the operation 304 of the custom-made dependency conditions relevant to the customized cache dependency with the server computer system. For example, it can be judged whether the custom-made dependency conditions relevant to the customized CacheDependency class 114 were satisfied by the server 100. When the customized CacheDependency class 114 relates to an intensive dependency, it can be judged by the server 100 whether each custom-made dependency conditions of two or more custom-made dependency conditions were satisfied.
[0043]
It is judged whether it was satisfied with some embodiments of custom-made dependency conditions by comparing the kept flag entry with the present flag entry by the server 100. For example, it is taken out by the server 100 before the flag entry 118, and the kept value can be compared with the present value of the flag entry 118 by it. When the flag entry 118 is increment-like, by the customized CacheDependency class 114, The flag entry 118 in the present database table 117 can be compared with the flag entry which existed in the database table 117 at the time of a certain front. When the flag entry 118 in the present table is larger than the flag entry which existed in the database table 117 at the last time, custom-made dependency conditions (change of the contents of the database table 116) are satisfied.
[0044]
When custom-made dependency conditions are not satisfied (NO of the operation 304), custom-made dependency conditions can be supervised once again by the server 100. The surveillance of custom-made dependency conditions is the specified interval (every [for example,] 5 seconds), and it is repeatable until the event supervised, for example until custom-made dependency conditions are satisfied occurs (YES of the operation 304).
[0045]

It is included in the method of Fig.3 that it is shown that custom-made dependency conditions were satisfied (operation 306). The NotifyDependencyChanged method which shows that it was satisfied with the operation 306 of custom-made dependency conditions to a server computer system can be included. For example, the NotifyDependencyChanged method of the customized CacheDependency class 114 can notify the time of the contents of the database table 116 changing to the server 100. The notice of custom-made dependency conditions having been satisfied can show to the server 100 that a cache entry must be eliminated.
[0046]
Eliminating a cache is included in the method of Fig.3 (operation 308). It can include eliminating a cache entry with a server computer system in the operation 308 with a server computer system. For example, a cache entry is eliminable from the cache 110 by the server 100. The entry by which the cash advance was carried out can respond to the receipt of a notice of the custom-made dependency conditions relevant to the customized cache dependency having been satisfied, and can be eliminated. For example, it can respond to the receipt of a notice of the increment of the flag entry 118 having been carried out by the server 100, and the cache entry depending on the data table 116 can be eliminated. When a cache entry is eliminated, the resource (for example, system memory) currently consumed by the computer system 100 in order to maintain the cache entry can be released. For example, the DependencyDispose method relevant to the customized CacheDependency class 114 is called with the server computer system 100, The resource about the cache entry by which the contents from the database table 116 were kept is releasable.
[0047]
The special purpose or the general-purpose computer containing various computer hardwares can be included so that it may state to the embodiment of the present invention in detail in the bottom. The computer readable medium which supported the computer executable instruction or the data structure to the embodiment of the present invention within the limits, or had this kept can also be included. Such a computer readable medium can be used as an accessible usable medium by the general purpose computer or special purpose computer. Not to restriction but to such a computer readable medium, for example, RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage, or other magnetic storage devices, Or it can be used for whether the program code means or data structure of a formal request of a computer executable instruction is supported, and keeping it, and other accessible arbitrary media can be included by the general purpose computer or special purpose computer. When information passes a network or another communication interface (either of the combination of hard WAIYADO, radio, hard WAIYADO, or radio) and is transmitted or supplied to a computer, as for a computer, it is considered correctly that the connection is a computer readable medium. Therefore, such all connection is correctly called a computer readable medium. The above-mentioned combination must also be included in the range of a computer readable medium. The command and data which perform a general purpose computer and a special purpose computer to a computer executable instruction, and, for example, make a special purpose processing device perform the group of a certain function or a function are contained.
[0048]
Fig.4 and the following descriptions have it meant to provide the short general description of suitable computing environment which can carry out the present invention. Although it is not required, the present invention is described in the general context of computer executable instructions executed by computer within a network environment, such as a program module. Generally, the routine which performs a specific task or carries out a specific abstract data type, a program, an object, a component, a data structure, etc. are included in a program module. A program code means to perform the step of the method disclosed on these Descriptions by the computer executable instruction, the related data structure, and a program module is expressed. The example of the corresponding operation which carries out the function described at such a step by the specific sequence or the related data structure of such an executable instruction is expressed.
[0049]
The present invention A personal computer, a handheld computer device, a multiprocessor system, A micro processor base or programmable domestic electrification, network PC, The

person skilled in the art will understand that it can practice by network computing environment with the many type containing a mini-computer, a mainframe computer, and a prototype of computer system configuration. the present invention was linked via the communication network (a hard wire drink --) It can also practice by the distributed computing environment by which a task is performed with a local and a remote processing device with either of the combination of a radio link or a hard wire drink, and a radio link. In a distributed computing environment, a program module can be arranged to the memory storage device of a local and remote both.
[0050]
It is contained in the typical system which carries out the present invention by the general-purpose computing device of the form of the ordinary computer 420 about Fig.4, and to the computer 420, The system bath 423 which combines with the handling unit 421 various system components containing the handling unit 421, the system memory 422, and the system memory 422 is contained. The system bath 423 can be made into either of the bus structures of two or more types containing a memory bus or a memory controller, a peripheral bus, and the local bus that uses either of various bus architectures. The read only memory (ROM) 424 and the random access memory (RAM) 425 are contained in a system memory. The basic input/output system (BIOS) 426 which contains during a startup etc. the basic routine which helps the information transfer between the elements in the computer 420 can be kept to ROM424.
[0051]
. [whether it reads in the magnetic hard disk 439 to the computer 420, and reads in the magnetic hard disk drive 427 written in this, and the magnetic disk 429 which can be removed, and] The optical disk drive 430 which is read in the optical discs 431 which are written in this, and which can be removed, such as the magnetic disk drive 428, CD-ROM, or other optical media, or is written in this can also be included. The magnetic hard disk drive 427, the magnetic disk drive 428, and the optical disk drive 430, It is connected to the system bath 423 by the hard disk drive interface 432, the magnetic disk drive interface 433, and the optical drive interface 434, respectively. By a drive and the computer readable medium relevant to it, the computer executable instruction of the computer 420, a data structure, a program module, and the nonvolatile storage of other data are brought about. Although the magnetic hard disk 439, the magnetic disk 429 which can be removed, and the optical disc 431 which can be removed are used for this Description in the typical embodiment of a description, The computer readable medium of other types which store data containing a magnetic cassette, flash memory card, a digital multi-purpose disk, the Bernouilli cartridge, RAM, ROM, and a prototype can be used.
[0052]
The program code means containing the operating system 435, one or more application programs 436, other program modules 437, and one or more program modules containing the program data 438, It can be kept to the hard disk 439, the magnetic disk 429, the optical disc 431, ROM424, or RAM425. A user The keyboard 440, the pointing device 442, Or a command and information can be input into the computer 420 via other input devices (not shown), such as a microphone, a joy stick, a gamepad, a satellite parabolic antenna, a scanner, or a prototype. These and other input devices are often connected to the handling unit 421 via the serial port interface 446 combined with the system bath 423. In an alternative, an input device is connectable with other interfaces, such as a parallel port, a game port, or universal serial bus (USB). The monitor 447 or another display device is also connected to the system bath 423 via the interface of the video adapter 448 etc. The periphery output device (not shown) of others usually, such as a loudspeaker and a printer, other than a monitor is contained in a personal computer.
[0053]
The computer system 420 is connectable with networks, such as a computer network of an entire office or the whole company, intranet, and/or the Internet, for example. With the computer system 420, the external source and data of a remote computer system, remote application, a remote database, etc. are exchangeable via such a network.
[0054]
The network interface 453 is contained in the computer system 420, and the computer system 420 receives data from an external source via this, and data is transmitted to/or an external source. Exchange of data with the remote computer 483 is realized by the network interface 453 via the link 451 so that Fig.4 may show. The link 451 expresses network [a part of], and the

remote computer 483 expresses a network node. For example, the database which provides the contents of the web page which comprises the computer system 420 by the remote computer system 483 is maintainable. It can be considered as the server computer which required contents of the database maintained with the computer system 420 in the computer system 483 on the other hand.
[0055]
Similarly, the serial port interface 446 is included in the computer system 420, and the computer system 420 receives data from an external source via this, and data is transmitted to/or an external source. It is connected to the modem 454, and the computer system 420 receives data from an external source via this, and the serial port interface 446 transmits data to/or an external source. Instead, the modem 454, Via a suitable interface. It can be considered as the Data Over Cable Service Interface Specification ("DOCSIS") modem or digital subscriber's line ("DSL") modem connected to the computer system 420. However, exchange of data with the remote computer system 493 through the link 452 is realized by the serial port interface 446 and the modem 454 so that Fig.4 may show. The link 452 expresses network [a part of], and the remote computer system 493 expresses a network node. For example, the remote computer system 493 can be used as the client computer system which requires a web page of the computer system 420. On the other hand, the computer system 493 can be used as the server computer system which supplies a web page to the computer system 420.
[0056]
The present invention can be carried out in other specific forms, without deviating from the meaning or essential characteristics. At no points, the described embodiment must be interpreted only as illustration and must be interpreted restrictively. Therefore, the range of the present invention is shown by the claim rather than is based on the above-mentioned description. All the change included in the meaning and range of an equivalent of a claim must be included in the range.
[Brief Description of the Drawings]
[0057]
[Drawing 1]It is a figure showing the example of the web page server which carries out server side scripting and a custom-made cache dependency.
[Drawing 2]It is a flow chart of an example showing one embodiment of a method which makes it depend for a cache entry on a custom-made dependency.
[Drawing 3]It is a flow chart of an example showing one embodiment of the method of eliminating a cache entry based on a custom-made cache dependency.
[Drawing 4]It is a pictorial map showing one suitable environment where the modes of the present invention can be practiced.
[Explanations of letters or numerals]
[0058]
102 Client
104 Network
100 Server
110 Cache
114 Custom-made cache dependency
106 Cache dependency
108 Database interface module
424 ROM
426 BIOS
425 RAM
435 Operating system
436 Application program
437 Other program modules
438 Program data
421 Handling unit
448 Video adapter
447 Monitor
423 System bath

432 Hard disk drive interface
433 Magnetic disk drive interface
434 Optical drive interface
446 Serial port interface
453 Network interface
435 Operating system
436 Application program
437 Other program modules
438 Program data
440 Keyboard
454 Modem
493 Remote computer
483 Remote computer

[Translation done.]

(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2001－265645
（Ｐ２００１－２６５６４５Ａ）
(43)公開日　平成13年９月28日(2001.9.28)

(51)Int.Cl.[7]	識別記号	Ｆ Ｉ		テーマコード（参考）
G06F 12/00	546	G06F 12/00	546	R
			546	K
13/00	550	13/00	550	L
15/00	310	15/00	310	A
H04N 7/173	610	H04N 7/173	610	Z

審査請求　未請求　請求項の数52　ＯＬ　（全21頁）

(21)出願番号　特願2001－6926（Ｐ2001－6926）
(22)出願日　平成13年１月15日(2001.1.15)
(31)優先権主張番号　０９／４８３６８２
(32)優先日　平成12年１月14日(2000.1.14)
(33)優先権主張国　米国（ＵＳ）

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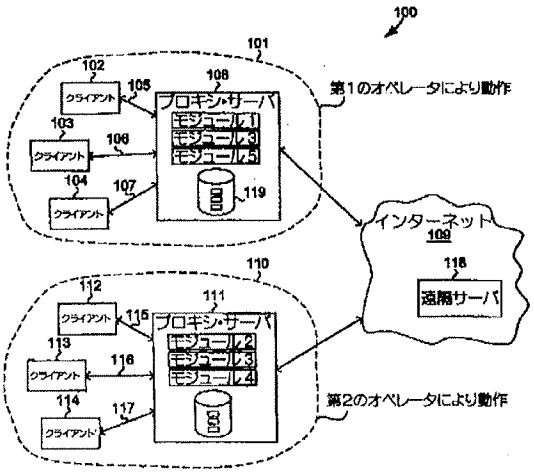
最終頁に続く

(54)【発明の名称】モジュラー・プロキシ・サーバによるリフォーマット方法

(57)【要約】
【課題】　ウェブ・コンテンツをリフォーマットするように容易に修正されカスタマイズされるプロキシ・サーバ・プラットフォームを提供すること。
【解決手段】　プロキシ・サーバ１０８は、オペレータにより変更可能な規則を評価し、要求側クライアントの能力や要求変数に基いて、要求側クライアントに適するようウェブ・コンテンツをリフォーマットする方法を決定する。プラットフォームは、コンテンツのリフォーマッティングを行うモジュール１０２、１０３、１０４を有する。モジュールは、稼働時に、実行するプロキシ・サーバ・プラットフォームのソフトウエアへ動的にリンク可能である。プラットフォームは、他のモジュールに影響を及ぼすことなくモジュールの加除が可能であるため、オペレータにより容易にカスタマイズ可能である。



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【特許請求の範囲】

【請求項１】　第１のモジュールと第２のモジュールとを含むプロキシ・サーバで、遠隔サーバからコンテンツを回収するステップと、

前記第１のモジュールを用い且つ前記第２のモジュールは用いずに、前記コンテンツをリフォーマットして第１のリフォーマットされたコンテンツを得るステップと、

前記第２のモジュールを用い且つ第１のモジュールは用いずに、前記コンテンツをリフォーマットして第２のリフォーマットされたコンテンツを得るステップと、

第１のクライアントからのコンテンツに対する要求を前記プロキシ・サーバで受取るステップと、

前記プロキシ・サーバから前記第１のクライアントへ前記第１のリフォーマットされたコンテンツを供給するステップと、

第２のクライアントからのコンテンツに対する要求を前記プロキシ・サーバで受取るステップと、

前記プロキシ・サーバから前記第２のクライアントへ前記第２のリフォーマットされたコンテンツを供給するステップと、を含む方法。

【請求項２】　前記第１のモジュールが、前記プロキシ・サーバの稼働中に該プロキシ・サーバに動的にリンクされる実行可能コードの一部であり、前記第２のモジュールが、前記プロキシ・サーバの稼働中に該プロキシ・サーバに動的にリンクされる実行可能コードの一部である、請求項１記載の方法。

【請求項３】　前記プロキシ・サーバから前記第１のクライアントに前記第１のリフォーマットされたコンテンツを供給するステップが、該第１のリフォーマットされたコンテンツを、前記第１のクライアントのクライアント能力を表わし且つ該第１のクライアントからの要求に存在する情報に少なくとも部分的に基いて第１のクライアントへ供給することを決定するステップを含み、

前記プロキシ・サーバから前記第２のクライアントに前記第２のリフォーマットされたコンテンツを与える前記ステップが、該第２のリフォーマットされたコンテンツを、前記第２のクライアントのクライアント能力を表わし且つ該第２のクライアントからの要求に存在する情報に少なくとも部分的に基いて前記第２のクライアントへ供給することを決定するステップを含む、請求項２記載の方法。

【請求項４】　前記第１のクライアントのクライアント能力が該第１のクライアントにおけるメモリの記憶スペース量の表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントにおけるメモリの記憶スペース量の表示を含む、請求項３記載の方法。

【請求項５】　前記第１のクライアントのクライアント能力が該第１のクライアントにおけるディスクの記憶スペース量の表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントにおけるディスク

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の記憶スペース量の表示を含む、請求項３記載の方法。

【請求項６】　前記第１のクライアントのクライアント能力が該第１のクライアントのディスプレイの解像度の表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントのディスプレイの解像度の表示を含む、請求項３記載の方法。

【請求項７】　前記第１のクライアントのクライアント能力が該第１のクライアントに対する接続の性能の表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントに対する接続の性能の表示を含む、請求項３記載の方法。

【請求項８】　前記第１のクライアントに対する接続がダイアルアップ接続であり、前記第２のクライアントに対する接続がダイアルアップ接続である、請求項７記載の方法。

【請求項９】　前記第１のクライアントに対する接続がＤＳＬ接続であり、前記第２のクライアントに対する接続がＤＳＬ接続である、請求項７記載の方法。

【請求項１０】　前記第１のクライアントに対する接続がケーブル・モデム接続であり、前記第２のクライアントに対する接続がケーブル・モデム接続である、請求項７記載の方法。

【請求項１１】　前記第１のクライアントのクライアント能力が該第１のクライアントにおけるキャッシュのメモリ量の表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントにおけるキャッシュのメモリ量の表示を含む、請求項３記載の方法。

【請求項１２】　前記第１のクライアントのクライアント能力が該第１のクライアントが特定のイメージ・データ・フォーマットに対して動作可能にされることの表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントが特定のイメージ・データ・フォーマットに対して動作可能にされることの表示を含む、請求項３記載の方法。

【請求項１３】　前記第１のクライアントのクライアント能力が該第１のクライアントが特定のオーディオ・データ・フォーマットに対して動作可能にされることの表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントが特定のオーディオ・データ・フォーマットに対して動作可能にされることの表示を含む、請求項３記載の方法。

【請求項１４】　前記第１のクライアントのクライアント能力が該第１のクライアントのプロセッサのクロック速度の表示を含み、前記第２のクライアントのクライアント能力が該第２のクライアントのプロセッサのクロック速度の表示を含む、請求項３記載の方法。

【請求項１５】　前記プロキシ・サーバから前記第１のクライアントに前記第１のリフォーマットされたコンテンツを供給する前記ステップが、該第１のリフォーマットされたコンテンツを、前記第１のクライアントからの

要求の要求変数に少なくとも部分的に基いて、該第１のクライアントへ供給することを決定するステップを含み、
前記プロキシ・サーバから前記第２のクライアントに前記第２のリフォーマットされたコンテンツを供給する前記ステップが、該第２のリフォーマットされたコンテンツを、前記第２のクライアントからの要求の要求変数に少なくとも部分的に基いて、該第２のクライアントへ供給することを決定するステップを含む、請求項２記載の方法。

【請求項１６】　第１のクライアントと、第２のクライアントと、プロキシ・サーバと、遠隔サーバとを含むコンピュータ・ネットワーク・システムにおける方法であって、
前記遠隔サーバからのコンテンツに対する前記第１のクライアントからの第１の要求を前記プロキシ・サーバで受取るステップと、
前記第１のクライアントの能力を表わす第１の情報を取得するステップと、
前記プロキシ・サーバから前記第１のクライアントへ、第１の方法でリフォーマットされたコンテンツを供給するステップと、
前記遠隔サーバからのコンテンツに対する前記第２のクライアントからの第２の要求を前記プロキシ・サーバで受取るステップと、
前記第２のクライアントの能力を表わす第２の情報を取得するステップと、
前記プロキシ・サーバから前記第２のクライアントへ、第２の方法でリフォーマットされたコンテンツを供給するステップと、を含む方法。

【請求項１７】　前記プロキシ・サーバが、動的にリンク可能な実行可能コードの第１のモジュールと、動的にリンク可能な実行可能コードの第２のモジュールとを含み、
更に、
前記第１の方法でフォーマットされたコンテンツを生成するように前記遠隔サーバからのコンテンツをリフォーマットするため前記第１のモジュールを用いるが、前記第１の方法でリフォーマットされたコンテンツを生成するためには前記第２のモジュールを用いないステップと、
前記第２の方法でフォーマットされたコンテンツを生成するように前記遠隔サーバからのコンテンツをリフォーマットするため前記第２のモジュールを用いるが、前記第２の方法でリフォーマットされたコンテンツを生成するためには前記第１のモジュールを用いないステップと、を含む、請求項１６記載の方法。

【請求項１８】　前記第１の情報が第１のソフトウエア作成番号を含み、前記第２の情報が第２のソフトウエア作成番号を含む、請求項１７記載の方法。

【請求項１９】　前記第１の情報がソフトウエアのバージョン番号を含み、ぜんき第２の情報が第２のソフトウエアのバージョン番号を含む、請求項１７記載の方法。

【請求項２０】　前記プロキシ・サーバは、前記第１の情報の他に、前記第１の要求と関連するコンテンツ・タイプの表示を受取って、前記第１のモジュールを用いて前記第１の方法でコンテンツをリフォーマットすることを決定するために前記コンテンツ・タイプの表示を用い、
前記プロキシ・サーバは、前記第２の情報の他に、前記第２の要求と関連するコンテンツ・タイプの表示を受取って、前記第２のモジュールを用いて前記第２の方法でコンテンツをリフォーマットすることを決定するために前記コンテンツ・タイプの表示を用いる、請求項１７記載の方法。

【請求項２１】　前記第１の要求と関連するコンテンツ・タイプの表示は遠隔サーバからの応答においてプロキシ・サーバにより受取られ、前記第２の要求と関連するコンテンツ・タイプの表示は遠隔サーバからの応答においてプロキシ・サーバにより受取られる、請求項２０記載の方法。

【請求項２２】　前記プロキシ・サーバは、前記第１のクライアントの能力を表わす情報を用いて第１のクライアントのクライアント能力を決定し、該プロキシ・サーバは前記第１の要求と関連する要求変数情報を受取り、該プロキシ・サーバは、前記第１のモジュールを用いて前記遠隔サーバからのコンテンツをリフォーマットすることを決定するために前記クライアント能力と前記要求変数情報とを用い、
前記プロキシ・サーバは、前記第２のクライアントの能力を表わす情報を用いて前記第２のクライアントのクライアント能力を決定し、該プロキシ・サーバは前記第２の要求と関連する要求変数の情報を受取り、該プロキシ・サーバは、前記第２のモジュールを用いて前記遠隔サーバからのコンテンツをリフォーマットすることを決定するために前記クライアント能力と前記要求変数情報とを用いる、請求項１７記載の方法。

【請求項２３】　前記第１の要求と関連する前記要求変数情報がコンテンツ・タイプであり、前記第２の要求と関連する要求変数の情報がコンテンツ・タイプである、請求項２２記載の方法。

【請求項２４】　前記第１の要求と関連する前記要求変数情報がコンテンツ長であり、前記第２の要求と関連する前記要求変数情報がコンテンツ長である、請求項２２記載の方法。

【請求項２５】　前記第１の情報が前記第１のクライアントのクライアント能力を含み、前記第２の情報が前記第２のクライアントのクライアント能力を含む、請求項１７記載の方法。

【請求項２６】　前記第１の情報が前記第１のクライア

ントとの接続の接続速度の表示を含み、前記第２の情報が前記第２のクライアントとの接続の接続速度の表示を含む、請求項１７記載の方法。

【請求項２７】　前記第１の情報が前記第１のクライアントのディスプレイの解像度の表示を含み、前記第２の情報が前記第２のクライアントディスプレイの解像度の表示を含む、請求項１７記載の方法。

【請求項２８】　前記第１の情報が前記第１のクライアントにおけるメモリ量の表示を含み、前記第２の情報が前記第２のクライアントにおけるメモリ量の表示を含む請求項１７記載の方法。

【請求項２９】　前記プロキシ・サーバがトークナイザ・モジュールとトークナイザ・サブモジュールとを含み、

前記プロキシ・サーバは、

トークンを出力するよう前記トークナイザ・モジュールにコンテンツを処理させるステップと、前記トークナイザ・サブモジュールにトークンを操作させるステップとにより、前記第１の方法で、リフォーマットされたコンテンツを生成する、請求項１６記載の方法。

【請求項３０】　プロキシ・サーバであって、

第１の方法でコンテンツをリフォーマットする第１の動的にリンク可能なモジュールと、

第２の方法でコンテンツをリフォーマットする第２の動的にリンク可能なモジュールと、

クライアントにより遠隔サーバから要求されるコンテンツを回収し、第１のモジュールと第２のモジュールのどちらを用いて、要求されたコンテンツをリフォーマットするかを決定するための手段であって、要求変数とクライアント能力とからなる群の１つに少なくとも部分的に基いて前記の決定を行う手段と、を備えるプロキシ・サーバ。

【請求項３１】　前記手段が、前記群の１つを用いて、１組の規則を評価し、且つ、前記遠隔サーバからの要求されるコンテンツのリフォーマットに用いられるモジュールのリストを生成する、請求項３０記載のプロキシ・サーバ。

【請求項３２】　前記規則を、前記第１のモジュール又は前記第２のモジュールを変更或いは再コンパイルすることなく、変更することができる、請求項３１記載のプロキシ・サーバ。

【請求項３３】　前記群の１つがクライアント能力である、請求項３２記載のプロキシ・サーバ。

【請求項３４】　前記群の１つが、コンテンツ長、コンテンツ・タイプ及びユーザ・エージェントからなる群から得られる要求変数である、請求項３２記載のプロキシ・サーバ。

【請求項３５】　プロキシ・サーバであって、

クライアントにより要求されるコンテンツをリフォーマットする複数の方法のうちのどれかを決定するため規則のく身を評価する手段と、

前記規則の組を評価する前記手段を再コンパイルすることなく、前記規則の組を変更する手段と、を備えるプロキシ・サーバ。

【請求項３６】　前記変更する手段が、規則情報を含むテキスト・ファイルを受取り、該変更する手段は、前記規則の組が変更されるように前記評価する手段へ前記規則情報を送る、請求項３５記載のプロキシ・サーバ。

【請求項３７】　更に、

実行時に第１の方法でコンテンツをリフォーマットする第１の動的にリンク可能なモジュールと、

実行時に第２の方法でコンテンツをリフォーマットする第２の動的にリンク可能なモジュールと、を備え、

前記評価する手段が、前記第１の動的にリンク可能なモジュール或いは前記第２の動的にリンク可能なモジュールが、クライアントにより要求されるコンテンツをリフォーマットするかどうかを決定する、請求項３５記載のプロキシ・サーバ。

【請求項３８】　インターネットに結合され且つ第１のオペレータにより動作される第１のモジュラー・プロキシ・サーバであって、制御部と第１の組の規則と複数の動的にリンク可能なモジュールとを備え、前記制御部が、前記第１の組の規則の評価に基いて、前記複数の動的にリンク可能なモジュールのうちのどれが特定のウェブ・コンテンツを処理するかを決定する第１のモジュラー・プロキシ・サーバと、

インターネットに結合されて第２のオペレータにより動作される第２のモジュラー・プロキシ・サーバであって、制御部と第２の組の規則と複数の動的にリンク可能なモジュールとを備え、前記制御部が、前記第２の組の規則の評価に基いて、前記第１のモジュラー・プロキシ・サーバには存在しない動的にリンク可能なモジュールを含む前記複数の動的にリンク可能なモジュールのうちのどれが特定のウェブ・コンテンツを処理するか、及びそれが実質的に同じであるかを決定する第２のモジュラー・プロキシ・サーバと、を備えるシステム。

【請求項３９】　前記第２の組の規則が前記第１の組の規則とは異なり、前記第２のオペレータが，前記第２の組の規則を変更し且つ前記第１の組の規則は変更しない、請求項３８記載のシステム。

【請求項４０】　前記第１のモジュラー・プロキシ・サーバの前記複数の動的にリンク可能なモジュールの１つが、前記第２のモジュラー・プロキシ・サーバの前記複数の動的にリンク可能なモジュールの１つと同じであり、

前記第１のモジュラー・プロキシ・サーバの前記複数の動的にリンク可能なモジュールの別のモジュールが前記第２のモジュラー・プロキシ・サーバの前記複数の動的にリンク可能なモジュールのいずれとも同じでない、請求項３８記載のシステム。

【請求項４１】　前記第１のモジュラー・プロキシ・サーバが、トークナイザ・モジュールとトークナイザ・サブモジュールとを含み、前記トークナイザ・モジュールがウェブ・コンテンツをトークンへ変換し、前記トークナイザ・サブモジュールが前記トークン上で動作する、請求項３８記載のシステム。

【請求項４２】　モジュラー・プロキシ・サーバをカスタマイズする方法であって、前記モジュラー・プロキシ・サーバが、制御部と複数の動的にリンク可能なモジュールとを備え、該複数の動的にリンク可能なモジュールの第１のモジュールが第１の方法でコンテンツをリフォーマットし、前記複数の動的にリンク可能なモジュールの第２のモジュールが第２の方法でコンテンツをリフォーマットする方法において、

前記第１及び第２の動的にリンク可能なモジュールが前記モジュラー・プロキシ・サーバに存在した後に第３の動的にリンク可能なモジュールを生成するステップと、

前記第３の動的にリンク可能なモジュールを、前記制御部と前記第１の動的にリンク可能なモジュールと前記第２の動的にリンク可能なモジュールと共に前記モジュラー・プロキシ・サーバに存在するように、前記モジュラー・プロキシ・サーバへロードするステップと、

前記制御部により、前記第３の動的にリンク可能なモジュールを用いて、前記モジュラー・プロキシ・サーバのクライアントにより要求されるコンテンツをリフォーマットするステップと、を含む方法。

【請求項４３】　更に、（ａ）前記第３の動的にリンク可能なモジュールの生成前に、前記制御部と前記第１及び第２の動的にリンク可能なモジュールの少なくとも一方を用いてコンテンツをリフォーマットするステップを含み、

前記第３の動的にリンク可能なモジュールを生成する前記ステップが、前記制御部をコンパイルすることなく前記第３の動的にリンク可能なモジュールを取得するようにコードをコンパイルすることを含み、

前記制御部により、前記第３の動的にリンク可能なモジュールを使用する前記ステップが、前記ステップ（ａ）において実行された同じ制御部を実行することを含み、該制御部が前記ステップ（ａ）後にはコンパイルされない、請求項４２記載の方法。

【請求項４４】　プロキシ・サーバであって、

複数のモジュールであって、該モジュールのうちの第１のモジュールが第１の方法でコンテンツをリフォーマットし、前記モジュールのうちの第２のモジュールが第２の方法でコンテンツをリフォーマットするモジュールと、

要求する第１のクライアントのクライアント能力に基いて、前記複数のモジュールのどれを前記第１のクライアントにより要求されるコンテンツのリフォーマットにおいて用いるかを決定するソフトウエアと、

前記複数のモジュールのどれが前記第１のクライアントにより要求されたコンテンツのリフォーマットにおいて用いられたかの表示と共に、前記要求されたコンテンツを含むキャッシュと、を備えるプロキシ・サーバ。

【請求項４５】　第２の要求側のクライアントのクライアント能力に基いて、前記複数のモジュールのどれを前記第２のクライアントにより要求されたコンテンツのリフォーマットにおいて用いるかを決定するソフトウエアを更に備え、該ソフトウエアもまた、前記第２のクライアントにより要求されたコンテンツのリフォーマットに用いる前記複数のモジュールが、前記複数のモジュールのどれが前記第１のクライアントにより要求されたコンテンツのリフォーマットにおいて使用されたかの格納された表示と一致するかを決定し、これが一致するならば、プロキシ・サーバがキャッシュされたコンテンツを前記第２の要求側のクライアントへ返すが、一致しなければ、前記プロキシ・サーバは、要求された前記コンテンツを遠隔サーバから回収し、該回収されたコンテンツをリフォーマットし、次に回収されたコンテンツを前記第２のクライアントへ返す、請求項４４記載のプロキシ・サーバ。

【請求項４６】　前記第１のクライアントにより要求されたコンテンツのリフォーマットにおいて用いられたモジュールの動作を制御する入力制御パラメータが、前記第１のクライアントのクライアント能力に基いて決定され、これら入力制御パラメータが、要求されたコンテンツと、前記複数のモジュールのどれが前記第１のクライアントにより要求されたコンテンツのリフォーマットにおいて用いられたかの表示と共に、キャッシュに格納される、請求項４５記載のプロキシ・サーバ。

【請求項４７】　前記第２のクライアントにより要求されたコンテンツのリフォーマットにおいて前記複数のモジュールのどれを用いるかを決定する前記ソフトウエアが、前記第２のクライアントの要求と関連する入力制御パラメータを決定し、前記第２のクライアントの要求に対して決定された前記入力制御パラメータがキャッシュに格納された入力制御パラメータと一致するならば、キャッシュされた前記コンテンツのみが前記第２の要求側のクライアントへ返される、請求項４６記載のプロキシ・サーバ。

【請求項４８】　プロキシ・サーバにおいて、１組の規則の評価を実施して、第１のクライアントにより要求されるコンテンツのリフォーマットにおいて複数のモジュールのどれを用いるかを決定するステップと、

前記第１のクライアントにより要求されたコンテンツと関連して前記プロキシ・サーバにおけるキャッシュに格納される前記１組の規則の評価の結果を表わす情報を格納するステップと、

前記プロキシ・サーバにおいて、前記１組の規則の第２の評価を実施して、前記複数のモジュールのどれを第２

のクライアントにより要求されるコンテンツのリフォーマットにおいて用いるかを決定するステップと、
前記１組の規則の前記第２の評価の結果を表わす情報を取得するステップと、
前記第２の評価の結果を表わす前記情報を、前記キャッシュに格納された結果の評価を表わす情報と比較するステップと、を含み、
前記比較が、前記第２の評価の結果を表わす情報が前記キャッシュに格納された評価を表わす情報と同じであることを示すならば、該キャッシュに格納されたコンテンツが前記第２のクライアントへ与えられるが、前記比較が、前記第２の評価の結果を表わす情報が前記キャッシュに格納された評価を表わす情報と同じでないことを示すならば、前記プロキシ・サーバが、前記第２の評価を表わす情報と一致するコンテンツをリフォーマットし、このようにリフォーマットされた該コンテンツを前記第２のクライアントへ返す、方法。

【請求項４９】　第１のフォーマットにおける添付書類は解読できないが第２のフォーマットにおける添付書類は解読することできるクライアントへ宛てられる第１のフォーマットにおける添付書類を持つイーメール・メッセージをイーメール・サーバにおいて受取るステップと、
前記クライアントのクライアント能力を表わす情報をクライアントからイーメール・サーバにおいて受取るステップと、を含み、
前記イーメール・サーバが、クライアント能力を表わす情報を用いて添付書類を前記第２のフォーマットへリフォーマットし、
前記イーメール・サーバが、前記イーメール・メッセージと前記第２のフォーマットにおける添付書類とをクライアントへ与える、
方法。

【請求項５０】　第１のフォーマットにおける添付書類は解読できず、第２のフォーマットにおける添付書類は解読することができるクライアントのクライアント能力を表わす情報に基いて、イーメールの添付書類を第１のフォーマットから第２のフォーマットへリフォーマットする手段と、
前記第２のフォーマットにおけるイーメール・添付書類をクライアントへ与える手段と、を備えるイーメール・サーバ。

【請求項５１】　前記リフォーマット手段がページ・パッチャ・モジュールである、請求項５０記載のイーメール・サーバ。

【請求項５２】　前記リフォーマット手段が、トークナイザ・モジュールとトークナイザ・サブモジュールとを含み、前記トークナイザ・モジュールが添付書類をトークンへ変換し、前記トークナイザ・サブモジュールが前記トークン上で動作する、請求項５０記載のイーメール・サーバ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、モジュラー・プロキシ・サーバ及びそのリフォーマット方法に関する。

【０００２】

【従来の技術】図１（従来技術）は、ウェブＴＶサーバ６を介するインターネット５に対する複数のウェブＴＶクライアント２－４のアクセスを行う、ウェブＴＶネットワークとして公知であるシステム１の図である。ウェブＴＶクライアント２－４は、米国カリフォルニア州Ｍｏｕｎｔａｉｎ　ＶｉｅｗのＷｅｂＴＶ　Ｎｅｔｗｏｒｋｓ社から入手可能なウェブＴＶ・セット・トップ・ボックス・インターネット端末である。ウェブＴＶサーバ６は、インターネットにアクセスする目的のためクライアント２－４のために「プロキシ・サーバ」として機能する。プロキシ・サーバを含むこのようなウェブＴＶネットワークの詳細については、米国特許第５，９１８，０１３号及び同第５，９３５，２０７号に記載されている。

【０００３】１つの運用例において、クライアント２が、インターネットの遠隔サーバ７に置かれたウェブ・コンテンツ（例えば、ＨＴＭＬドキュメント）にアクセスしようと試みる。クライアント２は、ウェブＴＶサーバ６に対して所望のＨＴＭＬドキュメントを識別する要求を発する。要求されたＨＴＭＬドキュメントがウェブＴＶサーバにおけるプロキシ・キャッシュ８に記憶されると、ウェブＴＶサーバ６がそのプロキシ・キャッシュ８に記憶されるような要求されたＨＴＭＬドキュメントを再びクライアント２へ送ることによってクライアント２に応答する。クライアント２におけるブラウザは、ＨＴＭＬドキュメントがクライアント２のディスプレイに表示されるようにさせる。このような意味で、ウェブＴＶサーバ６はプロキシ・サーバである。

【０００４】一方、要求されたＨＴＭＬドキュメントがプロキシ・キャッシュ８になければ、ウェブＴＶサーバ６が遠隔サーバ７に対してＨＴＭＬドキュメント要求を発する。遠隔サーバ７は、ＨＴＭＬドキュメントをウェブＴＶサーバ６へ戻すことにより応答する。ウェブＴＶサーバ６は、更に、最初に要求を行ったクライアント２へＨＴＭＬドキュメントを送る。次いで、クライアント２におけるブラウザが、ＨＴＭＬドキュメントをクライアント２のディスプレイに表示されるようにする。このＨＴＭＬドキュメントがクライアント２－４により頻繁にアクセスされることが多いドキュメントであるならば、ウェブＴＶサーバ６がこのＨＴＭＬドキュメントのコピー９をプロキシ・キャッシュ８に記憶する。

【０００５】ウェブＴＶサーバ６はまた、ウェブ・コンテンツをリフォーマットするように働く。一例において、クライアント２が遠隔サーバ７からイメージ・デー

タにアクセスしようとする。しかし、イメージ・データは、クライアント２に不適正なイメージ・フォーマットである。例えば、遠隔サーバ７における要求されたイメージ・データが、クライアント２が解読表示できないフォーマットであるという意味で不適正である。クライアント２がこのようなイメージ・データを表示しようとするならば、クライアント２はこのイメージの表示に失敗するか或いは表示することができないことになる。

【０００６】或いはまた、このイメージ・データが必要以上に高い解像度であるという意味において不適正である。クライアント２は、例えば、ディスプレイ装置としてテレビジョン・スクリーンを使用しているかもしれない。通常のテレビジョンは、一般に多くのコンピュータのモニターの場合より低いピクセル解像度を持っている。インターネットにおけるイメージ・データの多くがコンピュータのモニターで表示するためのものであるから、インターネットにおける多くのイメージはクライアント２－４の低解像度ディスプレイに対して転送される必要がない比較的高い解像度のイメージを有する。

【０００７】遠隔サーバ７からのこのような不適正或いは不必要なイメージ・データが同じフォーマットでウェブＴＶサーバ６を単に素通りさせられるならば、クライアント２は不適正或いは不必要なイメージ・データを受取ることになる。クライアント２がこのフォーマットを解読できなければ、クライアント２はこのイメージの表示に失敗するかこれを表示することができない。クライアント２が表示することができない大量の高解像度イメージ・データが存在するものとすると、クライアント２に対するイメージ・データの通信は不必要に多くの時間を要することがあり得る。

【０００８】従って、ウェブＴＶサーバ６は、イメージ・データを不適正なフォーマットから適正なフォーマットへリフォーマットする「トランスコーダ」と呼ばれるソフトウエア１０を含んでいる。クライアント２は、最初に遠隔サーバ７におけるイメージ・データに対する要求をウェブＴＶサーバ６へ発する。イメージ・データがプロキシ・キャッシュ８においてキャッシュされないものとすると、ウェブＴＶサーバ６は遠隔サーバ７に対してイメージ・データの要求を発する。遠隔サーバ７は、不適正なフォーマットにおけるイメージ・データをウェブＴＶサーバ６へ送ることによって応答する。トランスコーダ・ソフトウエア１０は、このイメージ・データをクライアント２が解読できる適正なフォーマットへリフォーマットする。次いで、ウェブＴＶサーバ６はこのリフォーマットされたイメージ・データをクライアント２へ送る。従って、クライアント２は、たとえインターネットにおける遠隔サーバ７で入手可能であるようなイメージ・データがクライアント２が解読表示ができるフォーマットでなくとも、インターネットからイメージ・データにアクセスすることが可能である。

【０００９】ウェブＴＶサーバ６はイメージ・データをリフォーマットするだけでなく、ＨＴＭＬドキュメントのＨＴＭＬをリフォーマット（すなわち、「書き直し」）する。遠隔サーバ７における要求されたウェブ・コンテンツが「バグ」又は「クアーク（ｑｕｉｒｋ）」を含むＨＴＭＬドキュメントであるとする。バグはクライアントのブラウザの障害を生じるおそれがある。クアークは、クライアントのブラウザを破壊することはなくとも、望ましくないか予期しない挙動を生じるおそれがある。従って、ウェブＴＶサーバ６は、このようなバグ及びクアークを排除するよう、ＨＴＭＬの違法部分を書き直す「ＨＴＭＬリライタ」と呼ばれるソフトウエア１１を含んでいる。

【００１０】１つの運用例では、クライアント２は、ウェブＴＶサーバ６に対して所望のＨＴＭＬドキュメントに対する要求を発する。所望のＨＴＭＬドキュメントがプロキシ・キャッシュ８においてキャッシュされないものとすれば、ウェブＴＶサーバ６は遠隔サーバ７からの所望のＨＴＭＬドキュメントに対する要求を発する。遠隔サーバ７は、バグ又はクアークを含むＨＴＭＬドキュメントをウェブＴＶサーバ６へ送り返すことにより応答する。バグ又はクアークを含むＨＴＭＬドキュメントをクライアント２－４へ送り返す代わりに、ＨＴＭＬリライタ・ソフトウエア１１は、バグ又はクアークを排除するようにＨＴＭＬをリフォーマットする（書き直す）。次いで、ウェブＴＶサーバ６は、クライアント２におけるブラウザがＨＴＭＬドキュメントを問題のないものにすることができるように、バグ又はクアークのないリフォーマットされたＨＴＭＬドキュメントをクライアント２へ送り返す。

【００１１】ＨＴＭＬリライタ・ソフトウエア１１はまた、クライアント２のユーザにより時おり経験されるデッドタイム（「知覚される待ち時間」）を短縮或いは除去するようにも機能する。クライアント２におけるブラウザは、ブラウザがイメージに対するサイズ情報を有するならば、イメージを含むウェブ・ページを作るように始動することができる。ブラウザがイメージに対するサイズ情報を持つならば、ブラウザは、以後到着するイメージ・データに対する適切なサイズの空白を残してバックグラウンド・ページのレイアウトを開始することができる。ブラウザがこのようなサイズ情報を持たなければ、クライアント２はウェブ・ページの要求がなされる時からイメージに対するイメージ・データがクライアントに実際に受取られてブラウザがこのページを作り始めるまでのデッドタイム（「知覚される待ち時間」）を経験する。クライアントにおけるこのような知覚される待ち時間を避けるため、ウェブＴＶサーバ６はイメージに関するサイズ情報をキャッシュ８に記憶する。クライアント２がイメージを含むウェブ・ページを要求するとき、ウェブＴＶサーバ６はそのキャッシュからサイズ情

報を回収し、このサイズ情報を含むようにウェブ・ページのＨＴＭＬを書き直し、このＨＴＭＬをクライアント２へ受け渡す。従ってクライアント２におけるブラウザは、バックグラウンド・ページに対するＨＴＭＬを受信すると、ウェブ・ページにおける任意のイメージに対するサイズ情報を用いてウェブ・ページを作り始めることができる。ブラウザは、バックグラウンド・ページのＨＴＭＬを解読し、イメージのタグを識別し、このイメージ・タグにより識別されるイメージ・データに対する要求を発行し、サイズ情報を持つ実際のイメージ・データを受取るまで待つ必要がない。このサイズ情報は、元のＨＴＭＬと共に受取られる。従って、ＨＴＭＬの書き直しの結果が、クライアント２における「知覚される待ち時間」の短縮をもたらす結果となる。

【００１２】

【発明が解決しようとする課題】現在商業的に用いられるウェブＴＶサーバ６のコードは、１つのタイプのクライアント（即ち、特定のソフトウェアを走らせるウェブＴＶインターネット端末）を典型的にはサポートするモノリシック・コードである。このコードは、適応及び改変の融通性がなくまた困難である。例えば、第１のタイプのクライアントを要求するために１つの方法でコンテンツをリフォーマットしながら、第２のタイプのクライアントを要求するために第２の方法でリフォーマットするよう、このコードを適応させることは困難である。このような改変は一般に、ウェブＴＶサーバのコードの多く或いは全てをコンパイルし直すことが必要となる。それには、ウェブＴＶサーバのコードの内部構造をつぶさに知ることを必要とする。従って、ウェブＴＶサーバ６は、独立のオペレータ（モノリシック・コードの内部構造に習熟しないウェブＴＶ以外のオペレータ）による運用、保守及びカスタマイズに充分に適するものとは考えられない。プラットフォーム・ソフトウエアの他の部分を変更することなく、かつプラットフォーム・ソフトウエアの内部構造の詳細な知識を持つ必要もなく、オペレータがプラットフォーム・ソフトウエアの各部を比較的容易に改変、削除及び（又は）追加できるように、このような独立のオペレータにより運用することが可能であるウェブＴＶサーバ・プラットフォームが望まれる。

【００１３】

【課題を解決するための手段】プロキシ・サーバの内部動作に十分習熟していない対話型テレビジョン・サービス・オペレータ（「オペレータ」）により容易に改変、カスタマイズ及び保守が可能であるプロキシ・サーバ・「プラットフォーム」が提供される。このプラットフォームは、コンテンツのリフォーマットが１つ以上の「モジュール」により行われる「モジュラー」アーキテクチャを有する。モジュールは、稼働時に、実行中のプロキシ・サーバ・プラットフォーム・ソフトウエアへ動的にリンク可能である。オペレータは、プロキシ・サーバの動作をカスタマイズするため、モジュールの追加又は削除することができる。一つの実施の形態においては、モジュールは、他のモジュールを改変又は再コンパイルすることなく、個々のモジュールの取外し、交換及び（又は）付加が可能なように、ＣＯＭモジュラー・プログラミング規格に従って書かれる。個々のモジュールはオーサー（ａｕｔｈｅｒ）が異なってもよい。モジュールは、オペレータ又はウェブＴＶ又は他のエンティティによって書かれ得る。モジュールのオーサーとは無関係に、個々のモジュールの実現に際してＣＯＭ規格に従うならば、複数のモジュールをプロキシ・サーバ・プラットフォームにおいて一緒に働くよう作ることができる。

【００１４】一つの態様において、プロキシ・サーバは、要求側のクライアントの「クライアント能力」を表わす情報を用いて、コンテンツが要求側のクライアントへ中継される前に、どのモジュールがコンテンツを処理するかを決定する。第１のクライアントは、遠隔サーバに記憶されたウェブ・コンテンツに対する第１の要求をプロキシ・サーバへ発する。この第１の要求は、第１のクライアントの「クライアント能力」を表わす情報（例えば、第１のクライアントのハードウエア能力、ソフトウエア・バージョン番号及びソフトウエア作成番号）を含む。プロキシ・サーバは、クライアント能力を表わす情報を用いて、第１のクライアントに適する第１のフォーマットを決定する。要求されたウェブ・コンテンツがこの第１のフォーマットにおいてプロキシ・サーバにキャッシュされるならば、プロキシ・サーバがこのウェブ・コンテンツを第１のクライアントへ送る。要求されたコンテンツが第１のフォーマットでキャッシュされなければ、プロキシ・サーバは適切なモジュールを用いてウェブ・コンテンツを第１のフォーマットにリフォーマットする。リフォーマットされると、ウェブ・コンテンツは要求側の第１のクライアントへ送られる。ウェブ・コンテンツがプロキシ・サーバにおいてキャッシュされない場合、或いはキャッシュされたウェブ・コンテンツが他の或る理由（例えば、古すぎ）で使われない場合、プロキシ・サーバはウェブ・コンテンツに対する要求を遠隔サーバへ発し、このウェブ・コンテンツを検索する。このウェブ・コンテンツが第１のフォーマットでなければ、プロキシ・サーバは適切なモジュールを用いてウェブ・コンテンツを第１のフォーマットへリフォーマットする。リフォーマットされると、プロキシ・サーバは、このウェブ・コンテンツを要求側の第１のクライアントへ送り返す。

【００１５】次に、第１のクライアントとは異なるクライアント能力を持つ第２のクライアントが、ウェブ・コンテンツに対する第２の要求をプロキシ・サーバに発する。この第２の要求は、第２のクライアントのクライアント能力を表わす情報を含む。プロキシ・サーバは、この第２の要求を受取って、第２のクライアントに適する

第２のフォーマットを第２のクライアントのクライアント能力を表わす情報を用いて決定する。

【００１６】要求されたウェブ・コンテンツがプロキシ・サーバにおいて第２のフォーマットでキャッシュされると、プロキシ・サーバはウェブ・コンテンツを第２のクライアントへ送る。要求されたコンテンツが第２のフォーマットでキャッシュされなければ、プロキシ・サーバは適切なモジュールを用いてウェブ・コンテンツを第２のフォーマットへリフォーマットする。リフォーマットされると、ウェブ・コンテンツは要求側の第２のクライアントへ送られる。キャッシュされたウェブ・コンテンツが（例えば、古すぎるため）用いられなければ、プロキシ・サーバは遠隔サーバに対してウェブ・コンテンツの要求を発して、ウェブ・コンテンツを検索する。遠隔サーバから検索されたウェブ・コンテンツが第２のフォーマットでなければ、プロキシ・サーバは適切なモジュールを用いてウェブ・コンテンツを第２のフォーマットへリフォーマットする。リフォーマットされると、プロキシ・サーバがウェブ・コンテンツを要求側の第２のクライアントへ送り返す。従って、プロキシ・サーバは、少なくとも部分的には要求側のクライアントのクライアント能力を表わす情報に基いて、ウェブ・コンテンツが要求側のクライアントへ送り返されるフォーマットを決定することが判る。

【００１７】別の態様によれば、プロキシ・サーバは、第１のモジュールと第２のモジュールとを含む。第１のモジュールは第１の方法でコンテンツをリフォーマットし、第２のモジュールは第２の方法でコンテンツをリフォーマットする。第２のモジュールではなく、第１のモジュールが、第１のクライアントへ供給されるウェブ・コンテンツをリフォーマットする。第１のモジュールではなく、第２のモジュールが、第２のクライアントへ供給されるウェブ・コンテンツをリフォーマットする。第１のモジュール及び第２のモジュールは各々、稼働時にプロキシ・サーバに独立的に動的にリンク可能である実行可能コードの一部である。

【００１８】更に別の態様によると、所与の要求側のクライアントへ供給されるリフォーマットされたコンテンツのタイプの決定は、オペレータにより変更可能な規則の組を用いて行われる。最初に、プロキシ・サーバは、ＨＴＴＰヘッダ又は要求のフォーム・データにおいて、クライアント能力を表わす情報を受取る。プロキシ・サーバは、この情報を用いてルックアップ・テーブル又はデータベースからクライアント能力の組を調べる。このように決定されたクライアント能力は、オペレータにより変更可能な規則の以降の評価のための入力として用いられる。規則の評価は、どのモジュールが要求されたウェブ・コンテンツを処理するか、及び（又は）これらモジュールがどのように要求されたウェブ・コンテンツを処理するかを、特定のクライアント能力を持つ要求側クライアントに対して決定する。規則は、比較的理解し易いテキスト形式で書かれる。このテキスト形式の規則は、種々のモジュールの動作がモジュール自体のコードを改変することなく変更されるように、プロキシ・サーバ・ソフトウエアへ読み込まれる。オペレータは、規則を変更し及び（又は）モジュールを追加又は削除するために、モジュールの内部動作の詳細な知識を持つ必要がない。

【００１９】モジュラー・リフォーマット・ソフトウエアは、プロキシ・サーバ・アプリケーション以外のアプリケーションにより用いられる。一態様においては、イーメール・サーバ・アプリケーションは、このリフォーマット・ソフトウエアを用いて、イーメールを受け取るクライアントに対して不適切な第１のフォーマットからイーメールを受け取るクライアントに適する第２のフォーマットへイーメールの添付書類をリフォーマットする。リフォーマットにより、イーメール・クライアントは、添付書類がリフォーマットされなかったならば読むことができなかったイーメール添付書類を読むことができる。リフォーマット・サーバは、クライアントによりサーバへ送られるイーメール・クライアントのクライアント能力を表わす情報を用いて、クライアントに適切なフォーマットになるように、添付書類をリフォーマットする方法を決定する。

【００２０】本発明の他の態様及び他の実施の形態については、以降の詳細な記述において記載される。ここに記載した発明の概要は本発明を限定するものではない。本発明は、頭書の特許請求の範囲によって規定される。

【００２１】

【発明の実施の形態】図２は、本発明の一態様によるシステム１００の図である。システム１００は、複数のクライアント１０２－１０４を含む第１の対話型テレビジョン・ネットワーク１０１を含む。クライアント１０２－１０４は、クライアント／サーバ接続線１０５－１０７と第１のモジュラー・プロキシ・サーバ１０８とを介してインターネット１０９に結合される。クライアント／サーバ接続線１０５－１０７は、ダイアルアップ接続、ＩＳＤＮ接続、Ｔ１接続、ＤＳＬ接続、或いはケーブル・モデム接続を含む任意の適切なタイプのものでよい。第１のプロキシ・サーバ１０８は、第１のオペレータにより動作される。クライアント１０２－１０４のユーザは、典型的には、第１のモジュラー・プロキシ・サーバ１０８を介してインターネット１０９にアクセスする能力を含む、提供される種々のサービスについて第１のオペレータに支払う顧客である。図２の事例においては、第１の対話型テレビジョン・ネットワーク１０１はウェブ・ネットワークであり、クライアント１０２－１０４は米国カルフォルニア州Ｍｏｕｎｔａｉｎ　ＶｉｅｗのＷｅｂＴＶ　Ｎｅｔｗｏｒｋｓ社から入手可能なウェブＴＶセット・トップ・インターネット端末である。

従って、第１のプロキシ・サーバ１０８のオペレータは米国カルフォルニア州Ｍｏｕｎｔａｉｎ　ＶｉｅｗのＷｅｂＴＶ　Ｎｅｔｗｏｒｋｓ社である。ウェブＴＶ　セット・トップ・ボックス・インターネット端末についての更なる情報については、米国特許出願第０９／２９５，７４６号及び同第０９／２３８、１３３号を参照されたい（これら米国特許出願の主題は、参考のため本文に援用される）。クライアント／サーバ対話型テレビジョン・ネットワークの構造及び動作のプロキシ・サーバについての更なる一般的情報については、米国特許第５，９１８，０１３号及び同第５，９３５，２０７号を参照されたい（これら米国特許の主題は参考のため本文に援用される）。

【００２２】本発明の一態様によれば、第２の対話型テレビジョン・ネットワーク１１０が提供される。第２のネットワーク１１０のプロキシ・サーバ１１１におけるソフトウエアは、第１のネットワークのプロキシ・サーバ１０８におけるソフトウエアと高度の共通性を共有するが、第２のネットワーク１１０は第２のオペレータにより動作させられる。第１のネットワーク１０１のプロキシ・サーバ１０８のソフトウエアと、第２のネットワーク１１０のプロキシ・サーバ１１１のソフトウエアとは、適応可能かつカスタマイズ可能なモジュラー・ソフトウエア・プラットフォームであり、このソフトウエア・プラットフォームは、第１のネットワーク１０１における第１のプロキシ・サーバ１０８としての動作に対して第１の方法で適応され且つカスタマイズされ、このソフトウエア・プラットフォームは第２のネットワーク１１０における第２のプロキシ・サーバ１１１としての動作に対して第２の方法で適応され且つカスタマイズされる。

【００２３】同じプラットフォーム・ソフトウエアが２つのネットワーク１０１、１１０のプロキシ・サーバで実行されても、この２つのネットワークは、２つのネットワークのユーザの視点からは、別個の異なるネットワークである。２つのネットワークのプロキシ・サーバの内部構造の共通性は、２つのネットワークのいずれのユーザからも容易に明らかになるものではない。第２のネットワーク１１０のユーザは、第１のオペレータではなく第２のオペレータの顧客である。図２の事例においては、クライアント１１２－１１４は、クライアント１０２－１０４とは異なる製造及び構造の対話型テレビジョン・インターネット端末である。クライアント１１２－１１４は、クライアント／サーバ接続線１１５－１１７と第２のモジュラー・プロキシ・サーバ１１１とを介してインターネット１０９に結合される。

【００２４】図３は、図２のシステム１００の動作に従う方法のフローチャートである。第１のネットワーク１０１のクライアント１０２－１０４は、ウェブ・コンテンツが第１のフォーマットで提供されるときに、遠隔サーバ１１８におけるウェブ・コンテンツを最もよく利用することができるクライアントである。他方、第２のネットワーク１１０のクライアント１１２－１１４は、ウェブ・コンテンツが第２のフォーマットで提供されるときに遠隔サーバ１１８におけるウェブ・コンテンツを最もよく利用できるクライアントである。

【００２５】一例において、クライアント１０２－１０４のディスプレイは、クライアント１１２－１１４のディスプレイよりも低解像度のものである。遠隔サーバ１１８におけるウェブ・コンテンツはイメージのためのイメージ・データであり、このイメージ・データはクライアント１０２－１０４又はクライアント１１２－１１４のディスプレイに表示することができるよりも高解像度のものである。従って、イメージ・データを要求側のクライアントへ転送する必要があるイメージの情報量を減じるために、イメージ・データがクライアント１１２－１１４へ送られる場合よりもクライアント１０２－１０４へ送られる場合の方が、イメージ・データ量が多く低減される。モジュラー・プロキシ・サーバ・ソフトウエア・プラットフォームと共に最初に提供された第１の動的にリンク可能なイメージ・リフォーマット・モジュール（ＭＯＤＵＬＥ　１）は、クライアント１０２－１０４に対する適切な量の低減を行う。従って、第１のネットワーク１０１の第１のオペレータは、このＭＯＤＵＬＥ　１を用いてイメージ・データをリフォーマットする。しかし、このイメージ・データは、第２のオペレータにより当該目的のために特に書かれる動的にリンク可能なイメージ・リフォーマット・モジュール（ＭＯＤＵＬＥ　４）を用いて、第２のネットワーク１１０のクライアント１１２－１１４に対してリフォーマットされる。このプラットフォームにより提供される元のイメージ・リフォーマット・モジュール（ＭＯＤＵＬＥ　１）は第２のプロキシ・サーバ１１１から除去され、その代り、特別に書かれたＭＯＤＵＬＥ４が用いられる。この２つのモジュール（ＭＯＤＵＬＥ　１及びＭＯＤＵＬＥ４）は、ＣＯＭプログラミング規格に従って書かれた動的にリンク可能なモジュールである。

【００２６】第１のステップ２００（図３参照）において、第１のモジュラー・プロキシ・サーバ１０８は、１）遠隔サーバ１１８におけるウェブ・コンテンツに対する第１のクライアント１０２からの要求と、２）第１のクライアントのクライアント能力を表わす情報とを受取る。クライアント能力を表わす情報は、例えば、ＨＴＴＰ要求のヘッダ又はフォーム・データに含まれる。クライアント能力を表わす情報は、クライアントによりプロキシ・サーバ１０８へ送られるクライアント能力であり、或いは、クライアント能力を表わす情報は、クライアント能力を決定するために使用可能な他の情報であり得る。当例においては、当該情報は、第１のクライアント１０２のディスプレイの特定の解像度を表わす情報

（ブラウザのタイプ、ソフトウエアのバージョン番号、及びソフトウエアの作成番号）である。この情報はディスプレイの解像度ではないが、実施の形態によっては解像度であり得る。

【００２７】第２のステップ２０１において、第１のモジュラー・プロキシ・サーバ１０８は、要求されたウェブ・コンテンツをイメージ・リフォーマット・モジュール（ＭＯＤＵＬＥ　１）を用いてリフォーマットすることを決定するため、クライアント１０２の能力を表わす前記情報を用いる。クライアント能力を表わす情報から、当例における第１のプロキシ・サーバ１０８は、第１のクライアントが特定の解像度のディスプレイを持ち、従ってＭＯＤＵＬＥ　１によりリフォーマットされたイメージ・データが最もよく提供されるものと決定する。要求されたウェブ・コンテンツが第１のプロキシ・サーバ１０８に存在しなければ、第１のプロキシ・サーバ１０８は、このウェブ・コンテンツに対する要求を遠隔サーバ１１８に対して発する。遠隔サーバ１１８は、要求されたウェブ・コンテンツ（この場合は、イメージ・データ）を第１のプロキシ・サーバ１０８へ送り返すことにより応答する。

【００２８】次に（ステップ２０２）、第１のプロキシ・サーバ１０８は、第１のモジュール（ＭＯＤＵＬＥ　１）を用い且つ第２のモジュール（ＭＯＤＵＬＥ　４）は用いずに、ウェブ・コンテンツを第１のリフォーマットされたコンテンツにリフォーマットする。当例では、第１のリフォーマットされたコンテンツはクライアント１０２のディスプレイに対して適切な解像度を持つ。次いで（ステップ２０３）、第１のプロキシ・サーバ１０８は、第１のリフォーマットされたコンテンツを要求する第１のクライアント１０２へ送り返す。

【００２９】次に（ステップ２０４）、第２のネットワーク１１０の第２のモジュラー・プロキシ・サーバ１１１は、１）遠隔サーバ１１８におけるウェブ・コンテンツに対する要求を第２のクライアント１１２から受取り、２）第２のクライアント１１２のクライアント能力を表わす情報を受取る。当例では、この情報は要求のヘッダに含まれ、第２のクライアント１１２のディスプレイの解像度を表わしている。

【００３０】次に（ステップ２０５）、第２のモジュラー・プロキシ・サーバ１１１は、第２のクライアント１１２のクライアント能力を表わす情報を用いて、要求されたウェブ・コンテンツを第２のモジュール（ＭＯＤＵＬＥ　４）を用いてリフォーマットすることを決定する。当例では、第２のモジュールが、第２のクライアント１１２のディスプレイの解像度に対する適切な解像度を持つように、要求されたイメージ・データをリフォーマットする。要求されたウェブ・コンテンツが第２のプロキシ・サーバ１１１に存在しなければ、第２のプロキシ・サーバ１１１がウェブ・コンテンツに対する要求を遠隔サーバ１１８に対して発する。遠隔サーバは、要求されたウェブ・コンテンツを第２のプロキシ・サーバ１１１へ送り返すことにより応答する。次いで（ステップ２０６）、第２のモジュラー・プロキシ・サーバ１１１は、第２のモジュール（ＭＯＤＵＬＥ　４）を用い且つ第１のモジュール（ＭＯＤＵＬＥ　１）は用いずに、ウェブ・コンテンツを第２のリフォーマットされたコンテンツにリフォーマットする。次いで（ステップ２０７）、第２のモジュラー・プロキシ・サーバ１１１が、第２のリフォーマットされたコンテンツを第２のクライアント１１２へ与える。従って、第１のネットワーク１０１におけるプロキシ・サーバ・プラットフォームの第１の事例が、特定のモジュール（ＭＯＤＵＬＥ　１）を用いて、要求されたウェブ・コンテンツをリフォーマットし、第２のネットワーク１１０におけるプロキシ・サーバ・プラットフォームの第２の事例が、異なるモジュール（ＭＯＤＵＬＥ　４）を用いて、まさに同じ要求されたウェブ・コンテンツをリフォーマットすることが判る。

【００３１】図４は、図２のシステム１００の動作に従う別の方法のフローチャートである。当該方法においては、ウェブ・コンテンツが、要求側のクライアントの異なるクライアント能力に依存して、同じ対話型テレビジョン・ネットワーク内で異なる方法においてフォーマットされる。

【００３２】第１のステップ（ステップ３００）においては、モジュラー・プロキシ・サーバ１０８が遠隔サーバ１１８におけるウェブ・コンテンツに対する要求を第１のクライアント１０２から受取る。このモジュラー・プロキシ・サーバ１０８もまた、第１のクライアント１０２のクライアント能力を表わす情報を第１のクライアント１０２から受取る。クライアント能力を表わすこの情報は、当例では、要求のヘッダに存在しており、第１のクライアント１０２が第１の圧縮フォーマットで圧縮されたイメージを取扱うよう動作可能にされることを示す。

【００３３】次に（ステップ３０２）、モジュラー・プロキシ・サーバ１０８は、要求されたウェブ・コンテンツを第１のモジュール（ＭＯＤＵＬＥ　１）を用いてリフォーマットすることを決定するため、クライアント能力を表わす情報を用いる。この第１のモジュールは、例えば、イメージ・データを第１の圧縮フォーマットで圧縮されたイメージ・データへリフォーマットする。

【００３４】要求されたウェブ・コンテンツがプロキシ・サーバ１０８に存在しなければ、プロキシ・サーバ１０８はウェブ・コンテンツに対する要求を遠隔サーバ１１８へ発する。遠隔サーバ１１８は、要求されたウェブ・コンテンツをプロキシ・サーバ１０８へ送り返すことにより応答する。次いで（ステップ３０３）、モジュラー・プロキシ・サーバ１０８は、第１のモジュール（M

ＯＤＵＬＥ　１）を用い且つ第２のモジュール（ＭＯＤＵＬＥ　３）は用いずに、ウェブ・コンテンツを第１のリフォーマットされたコンテンツへリフォーマットする。当例では、第１のリフォーマットされたコンテンツは、第１の圧縮フォーマットにおけるイメージ・データである。いったん生成されると、この第１のリフォーマットされたコンテンツは、要求する第１のクライアント１０２へ送り返される。従って、イメージ・データは、第１のクライアント１０２により好まれる第１の圧縮フォーマットをしている。

【００３５】次に、モジュラー・プロキシ・サーバ１０８は、遠隔サーバ１１８における同じウェブ・コンテンツに対する要求をネットワーク１０１の第２のクライアント１０３から受取る。このモジュラー・プロキシ・サーバ１０８もまた、第２のクライアント１０３のクライアント能力を表わす情報を受取る。この情報は再び、要求のヘッダに存在し得る。

【００３６】次いで、モジュラー・プロキシ・サーバ１０８は、ウェブ・コンテンツを第２のモジュール（ＭＯＤＵＬＥ　３）を用いてリフォーマットすることを決定するため、第２のクライアント１０３のクライアント能力を表わす情報を用いる。プロキシ・サーバ１０８によりすでに回収された要求されるウェブ・コンテンツは、サーバ１０８のキャッシュ１１９において（遠隔サーバ１１８に記憶される如き）その元のフォームでキャッシュされ得る。このようにキャッシュされたウェブ・コンテンツが古すぎなければ、プロキシ・サーバ１０８はこのコンテンツを用いるのであり、遠隔サーバ１１８からウェブ・コンテンツを回収する必要はない。さもなければ、プロキシ・サーバ１０８はウェブ・コンテンツに対する要求を遠隔サーバ１１８に対して発する。遠隔サーバ１１８は、要求されたウェブ・コンテンツをプロキシ・サーバ１０８へ送り返すことにより応答する。

【００３７】次に（ステップ３０８）、モジュラー・プロキシ・サーバ１０８は、第２のモジュール（ＭＯＤＵＬＥ　３）を用い且つ第１のモジュール（ＭＯＤＵＬＥ　１）は用いずに、ウェブ・コンテンツを第２のリフォーマットされたコンテンツへリフォーマットする。当例における第２のモジュールは、イメージ・データを、第２のクライアント１０３により好まれる第２の圧縮フォーマットの圧縮イメージ・データへリフォーマットする。第２のリフォーマットされたコンテンツがいったん生成されると、モジュラー・プロキシ・サーバ１０８は、第２のリフォーマットされたコンテンツを第２のクライアント１０３へ与える（ステップ３０９）。

【００３８】従って、当該方法においては、モジュラー・プロキシ・サーバは、ウェブ・コンテンツが第１のクライアント能力を持つ第１のクライアントにより要求されると、第１のモジュールを用いて１つの方法でウェブ・コンテンツをリフォーマットするが、ウェブ・コンテンツが第２のクライアント能力を持つ第２のクライアントにより要求されると、第２のモジュールを用いて第２の方法で同じウェブ・コンテンツをリフォーマットすることが判る。第１のクライアントは、例えば、第２のタイプの圧縮フォーマットをデコードする能力を持たない簡単な装置（例えば、ＰａｌｍＰｉｌｏｔ、パーソナル・オーガナイザ、或いはセルラー電話）でよい。第２のクライアントは、例えば、第２のタイプの圧縮フォーマットをデコードする能力を有するウェブＴＶインターネット端末でよい。

【００３９】図５は、モジュラー・プロキシ・サーバ１０８の動作例を示しており、クライアント１０２は、イメージを含むＨＴＭＬウェブ・ページを要求する。イメージに対するイメージ・データは、第１のクライアント１０２のスクリーンに表示できるよりも高い解像度を持つ。イメージに対するＨＴＭＬイメージ・タグはイメージに対するサイズ情報を含まないので、ＨＴＭＬが欠如サイズ情報なしにクライアント１０２へ送られたならば、バックグラウンド・ページの作成と関連する「知覚される待ち時間」の問題が、クライアント１０２において生じ得る。

【００４０】モジュラー・プロキシ・サーバ１０８は、プロキシ・サーバ・アプリケーション４００、コンテンツ・リフォーマット（ＣＲＦ）・オブジェクト４０１、複数のコンテンツ・リフォーマット・モジュール（ＣＲＭ）・オブジェクト４０２－４０５、及びＣＲＦ管理コンフィギュレーション・インターフェース・システム（ＣＡＣＩＳ）４０６を含む。ＣＲＦ４０１は、コンテンツ・リフォーマット・プロセスを制御する。ＣＲＦ４０１は、コンテンツのリフォーマットが当該サーバにおいてどのように行われるべきかについての情報を記憶する関連コンフィギュレーション・オブジェクト４０７を有する。この情報は、１組の規則４０８と存在するＣＲＭ（及び任意のサブＣＲＭ）のリスト４０９とを含む。

【００４１】規則４０８は、人間が読めるテキスト・ファイル４１０としてのテキスト・フォームで、或いはグラフィカル・ユーザ・インターフェース（ＧＵＩ）４１１を介して、オペレータによりＣＡＣＩＳ４０６へ入れられる。ＣＡＣＩＳ４０６は更に、この規則をコンフィギュレーション・オブジェクト４０７の規則部４０８へロードする。各規則は、条件（ブール代数表現の組）と結果として得る表現とを有する。結果として得る表現は、各ＣＲＭへ進む入力パラメータを持つＣＲＭリスト（通常は１つのみであるが、いくつか存在し得る）である。「真」と評価される全ての規則が実行され、これら規則の実行順序は、これらがテキスト・ファイル４１０に現われる順序に従う。

【００４２】図６は、テキスト・ファイル４１０の一例である。プロキシ・サーバ１０８が初期化されると、ＣＡＣＩＳ４０６がテキスト・ファイル４１０を読出し、

次に規則をコンフィギュレーション・オブジェクト４０７の規則部４０８へロードする。ＣＡＣＩＳ４０６はまた、存在するＣＲＭ４０２－４０５のリストをリスト４０９にロードする。

【００４３】規則部４０８は、動作時間に、入力として要求変数及び（又は）クライアント能力を用いて評価される。要求変数は、コンテンツ長、コンテンツ・タイプ、及びユーザ・エージェントを含む（コンテンツ長及びコンテンツ・タイプは、要求自体から直接生じるのではなく、要求に対する応答から生じるものであるとしても、「要求変数」と見なされる。これらが、要求により要求される情報を記述するという意味で、要求と関連するからである）。クライアント能力は、オペレータが拡張可能である。各変数については、許容値又は値の範囲が存在する。

【００４４】クライアント能力は、或る実施の形態では、要求時にクライアントからプロキシ・サーバへ送ることができるが、ここに述べた実施の形態では、クライアント能力は、クライアント能力データベース（ＣＣＤ）を用いてプロキシ・サーバ・アプリケーション４００により決定される。要求側のクライアントから受取られるクライアント能力を表わす情報（例えば、要求側のクライアントにおいて実行するブラウザに対するブラウザ識別子、ブラウザ・ソフトウエアのソフトウエア・バージョン番号、及びブラウザ・ソフトウエアのソフトウエア作成番号）は、要求側のクライアントの対応クライアント能力を調べるのに用いられる。当例においては、ブラウザ識別子、ソフトウエア改定番号及びソフトウエア作成番号は、クライアント１０２から受取る如き要求のヘッダに存在する。この情報は、ＷｅｂＴＶ－１．２－ＸＸＸＸの形態である。「ＷｅｂＴＶ」部分は、ブラウザ識別子である。他の可能性は、「ネットスケープ」及び「モジラ（Ｍｏｚｉｌｌａ）」を含む。「１．２」部分は、ソフトウエアの改定番号である。「ＸＸＸＸ」部分は、４桁のソフトウエア作成番号である。当例では、プロキシ・サーバ・アプリケーション４００が、クライアント能力を表わす情報から、クライアント１０２が「クライアント能力」、すなわち、ｘ次元（水平次元）におけるディスプレイ解像度、ｙ次元（垂直次元）におけるディスプレイ解像度、カラー方式、ビット深さ、接続速度、接続タイプ、メモリ量、キャッシュ・メモリ量、ディスク・スペース量、プロセッサ速度、サポートされるイメージ・フォーマット、サポートされるオーディオ・フォーマット、クライアントがステレオ音響をサポートするか単にモノ音響だけか、のそれぞれに対する特定値を持つことを決定する。

【００４５】いったんクライアント能力及び要求変数（コンテンツ長、コンテンツ・タイプ及びユーザ・エージェント）が特定の要求に対して判ると、プロキシ・サーバ・アプリケーション４００が、新たな変換のためコンテキスト・オブジェクト（ＣＴＸ）４１３を生成するために前記情報を入力として用いて、メソッド「ＣｒｅａｔｅＮｅｗＣｏｎｔｅｘｔ」４１５を呼出す。（用語「変換」は、リフォーマット操作を示すため用いられる。）ＣＲＦ４０１は、新たなＣＴＸ４１３を照会し、インターフェース・ポインタ（ＣＴＸ４１３に対するハンドル）を取得し、これをプロキシ・サーバ・アプリケーション４００へ与える。生成されると、ＣＴＸ４１３はプロキシ・サーバ・アプリケーション４００が通信するオブジェクトである。

【００４６】当例においては、要求されたＨＴＭＬドキュメントはキャッシュ４１４においてキャッシュされない。従って、プロキシ・サーバ１０８は、ＨＴＭＬドキュメントに対する要求を遠隔サーバ１１８へ発する。遠隔サーバ１１８は、ＨＴＭＬをプロキシ・サーバ１０８へ送り返すことによって応答する。ＨＴＭＬ（データ）がプロキシ・サーバ１０８へ戻り始めると、プロキシ・サーバ・アプリケーション４００が標識によりＣＴＸ４１３における「ＰｕｓｈＤａｔａ」関数４１６を呼出す。この標識は、更に多くのデータが後に続くこと（データ・ストリーミングの場合のように）を示すか、或いは全てのデータがコンテキストへプッシュされたことを示す。ＣＴＸ４１３は、コンフィギュレーション・オブジェクト４０７に対する参照を用い、決定されたクライアント能力及び要求変数を用いて、規則４０８の評価を生じさせる。この規則評価の結果は、１）ＨＴＭＬを処理するのに用いられるＣＲＭの順序付きリスト（順序は、ＣＲＭが用いられる順序を示す）、及び２）ＣＲＭの挙動を制御する各ＣＲＭごとの入力制御パラメータである。個々のＣＲＭの動作は、これに送られる入力制御パラメータにより制御される。

【００４７】当例においてＨＴＭＬの処理のため用いられるＣＲＭは、ページ・パッチャＣＲＭ４０２及びトークナイザ（ｔｏｋｅｎｉｚｅｒ）ＣＲＭ４０３である。ページ・パッチャＣＲＭ４０２に対する入力制御パラメータの１つは、各構造が行われるべき特定のページ・パッチを規定する構造のリストである。トークナイザＣＲＭは、入力制御パラメータを受取らない。

【００４８】ＣＴＸ４１３は、順序付きリストにおける最初のＣＲＭへ進み、ＣＲＭにおけるＣｒｅａｔｅＮｅｗＳｔａｔｅを呼出すことにより１つの状態（図示せず）を生成する。（ＣＲＭにより行われる各動作ごとに新たな状態が存在する。）次いでＣＴＸ４１３は、適切な入力制御パラメータを当該ＣＲＭへ送り、その状態について関数「ｐｒｏｃｅｓｓ　ｄａｔａ」４１７を呼出す。当例においては、順序付きリストにおける最初のＣＲＭはページ・パッチャＣＲＭ４０２である。クライアント１０２が特定のＨＴＭＬシーケンスに問題を有することが判ると、ページ・パッチャＣＲＭ４０２はＨＴＭＬにおける特定の問題となるシーケンスを探し、これを

許容し得るシーケンスで置換する。次に、データはＣＴＸ４１３へ戻る（４１８）。ＣＴＸ４１３は、順序付きリストにおける次のＣＲＭ（この場合、トークナイザＣＲＭ４０３）へ進み、トークナイザＣＲＭ４０３の状態（図示せず）を生成し、トークナイザの状態の関数「ｐｒｏｃｅｓｓ　ｄａｔａ」を呼出す（４１９）。

【００４９】当例においては、遠隔サーバ１１８から受取られる如きＨＴＭＬウェブ・ページにおけるイメージ・タグは、イメージ・サイズ情報を持たない。従って、クライアント１０２は、ＨＴＭＬがクライアント１０２において受取られるときにバックグラウンド・ページを作ろうとすると、「知覚される待ち時間」を経験することになる。クライアント１０２は、そのとき、イメージに対するサイズ情報を持たないからである。一方、ＨＴＭＬがサイズ情報を含んでいたならば、クライアント１０２は、実際にイメージ・データ自体を受取る前に、イメージ・タグにおけるサイズ情報を用いてバックグラウンド・ページを作り始め得る。バックグラウンド・ページの形成時のこのような「知覚される待ち時間」を除去するため、ＨＴＭＬがクライアント１０２へ戻される前に、トークナイザＣＲＭ４０３がサイズ情報をＨＴＭＬへ挿入する。

【００５０】従って、トークナイザの状態はＨＴＭＬタグをイメージ・タグについて探索し、イメージ・タグからイメージ・ネームを取得し、このイメージ・ネームを用いて前に記憶された特定のイメージに対するサイズ情報をキャッシュ４１４において探し、次に文字Ｈ＝＿＿、Ｗ＝＿＿を適切な場所におけるＨＴＭＬのストリームへ付記してイメージ・タグがイメージのサイズを示すようにする。

【００５１】図７は、トークナイザの状態５００のこの動作の図である。トークナイザの状態５００は、変換自体を行うのではなく、トークナイザ５０１を用いてＨＴＭＬテキスト５０２のストリームを概念的トークンのストリーム５０３へ変換する。これらのトークン５０３は一連のトークナイザ・サブモジュール５０４、５０５へ送られ、そこでトークンの修正、挿入、除去及び（又は）作成が行われる。トークナイザ・サブモジュールの組は、ＣＲＭの組と同じ方法で修正し得る演算子である。当例においては、トークナイザ・サブモジュール５０４は、イメージ・ネーム５０６をイメージ・タグからキャッシュ４１４へ送る。このイメージ・ネームは、サブモジュール５０４へ戻される（５０７）イメージに対する記憶されたサイズ情報（高さと幅）を識別する。このサイズ情報は、適切に修正されたトークン・ストリーム５０８を生じるように挿入される。この修正されたトークン・ストリーム５０８は、次に、トークナイザの状態５００のデトークナイザ（ｄｅｔｏｋｅｎｉｚｅｒ）５１０により，修正されたＨＴＭＬテキスト・ストリーム５０９へ変換される。この修正されたＨＴＭＬは、次

にＣＴＸ４１３へ返される（５０９、４２０）。

【００５２】ＣＴＸ４１３は、ＨＴＭＬデータを取り戻すとき、規則４０８を再評価させる。このＣＴＸは、関数「ＰｕｓｈＤａｔａ」の呼出しから戻り、修正されたＨＴＭＬ（この時、イメージのサイズ情報を含んでおり、誤って形成された或いはクアークで生じたＨＴＭＬが除去される）を再びプロキシ・サーバ・アプリケーション４００へ送り返す（４２１）。次に、要求されたＨＴＭＬは要求側のクライアント１０２へ戻される。クライアント１０２は、このＨＴＭＬを受取り、イメージ・タグにおけるサイズ情報を用いてバックグラウンド・ページを作り始める。クライアント１０２は、実際のイメージ・データ自体を受取り或いは要求する前に、バックグラウンド・ページを作り始める。従って、上記の「知覚される待ち時間」の問題は解決される。

【００５３】次いで、クライアント１０２は、イメージ・データに対する要求をプロキシ・サーバ１０８へ発する。プロキシ・サーバ１０８は、キャッシュ４１４を検査し、このイメージ・データがそこにキャッシュされたかどうかを判定する。イメージ・データがキャッシュされると、プロキシ・サーバ１０８は、判定されたクライアント能力に基いて、適切なものとしてリフォーマットされたイメージ・データを戻す。イメージの多くのバージョンがキャッシュされ得、要求側のクライアントに対して適切であるこれらバージョンの１つが、クライアント能力により決定される。

【００５４】或いはまた、イメージ・データの唯一つのバージョンがキャッシュされ、このバージョンが必要に応じてリフォーマットされる。クライアント能力は、リフォーマットが要求側のクライアントに対してどのように行われるべきかを決定するために用いられる。

【００５５】当例においては、プロキシ・サーバ１０８は、要求されたイメージ・データをキャッシュしなかった。従って、プロキシ・サーバ１０８は、遠隔サーバ１１８からのイメージ・データについての要求を発する。遠隔サーバ１１８がイメージ・データに応答すると、プロキシ・サーバ１０８は、イメージ・データ要求に対するコンテンツ長、コンテンツ・タイプ、ユーザ・エージェント及びクライアント能力を通すことにより、別のコンテキストを生成する。次いで、プロキシ・サーバ・アプリケーション４００は、このコンテキストにおける「ＰｕｓｈＤａｔａ」関数を呼出し、その結果を評価して、使用するＣＲＭのリストとリストされたＣＲＭ毎の１組の入力制御パラメータとを生成する。当例においては、１つのＣＲＭすなわちイメージＣＲＭ４０４によって全てのイメージのリフォーマットが行われる。ＣＲＭ４０５は、オーディオ・リフォーマッティングを行う。

【００５６】当例においては、遠隔サーバ１１８から受取られる如きイメージ・データは、要求側のクライアントのディスプレイに表示できるよりも高い解像度のもの

である。イメージＣＲＭ４０４に要求側のクライアント１０２のディスプレイに対して適切な解像度のイメージ・データを出力させる入力パラメータを用いて、イメージＣＲＭ４０４の新たな状態が生成される。コンテキストは、イメージ・データをイメージＣＲＭ状態へ送り、処理されたイメージ・データを再び受取る。コンテキストは、プロキシ・サーバ・アプリケーション４００に対して、処理されたイメージ・データ（要求側のクライアント１０２のディスプレイに適切な解像度である）を送ることによって、「ＰｕｓｈＤａｔａ」関数の呼出しから戻り、アプリケーション４００は要求側のクライアント１０２にイメージ・データを送り返す。クライアント１０２は、このイメージ・データを用いて、イメージに対してバックグラウンド・ページに残された空きスペースを埋め、これにより完成されたウェブ・ページを作る。イメージ・データは、一連の塊りとして処理することができる。個々の塊りはプロキシ・サーバ・アプリケーション、コンテキスト及び適切なＣＲＭを用いて処理されて、先に述べたように再びプロキシ・サーバ・アプリケーションへ戻される。これによりストリーミングが容易になる。

【００５７】リフォーマッティングが完了すると、メソッドＤｅｌｅｔｅＣｏｎｔｅｘｔがプロキシ・サーバ・アプリケーション４００により呼出される。コンテキストは初めから終りまでリフォーマット操作に従うので、使用するプロキシ・サーバ・アプリケーション４００に対するコンテキストに変換統計（総計算時間、二乗平均誤差及び注目条件）を記憶することが可能である。この理由から、プロキシ・サーバ・アプリケーション４００は、コンテキストのライフタイムを完全に制御する。

ＣＲＭ

ＣＲＭは、コンテンツの変換に関係する特化された作業を行う。マシンごとに１つのＣＲＭが例示されているが、複数の線により、同じ事例を複数の変換上で同時に働かせることができる。標準的なプロキシ・サーバ・プラットフォームには４つのＣＲＭが設けられる。第１のＣＲＭはページ・パッチャである。第２のＣＲＭはトークナイザである。第３のＣＲＭはイメージ変換を取扱い、データ・ストリーミングをサポートする。第４のＣＲＭはオーディオ変換を取扱い、データ・ストリーミングをサポートする。これらＣＲＭの挙動は、各ＣＲＭに固有の１組の入力制御パラメータを介して修正可能である。要求ごとのこれら入力制御パラメータの選択は、規則４０８を評価することによって行われる。各ＣＲＭの設計者は、ＣＲＭが規則４０８に含まれるべきであるならば、サポートされる入力制御パラメータのリストを（例えばＸＭＬファイルで）それらのデフォルト値及び許容範囲と共に公開しなければならない。多くの場合におけるこれら入力制御パラメータは、それ自体のＣＲＭを書込む必要なく、オペレータに全ての必要な柔軟性を与える。しかし、（例えば、特定のクライアントに見出されるバグと取り組むため）非常に特化された処理の必要が生じる場合、オペレータはカスタムＣＲＭ（カスタムＣＲＭ及びカスタム・サブＣＲＭ）を書込む選択肢を有する。これらカスタムＣＲＭは、プラットフォームに提供されるＣＲＭの前に置くか、その後に置くか、或いはこれを置換するかのいずれかである。存在するＣＲＭは、リスト４０９に示される。オペレータは、ＣＲＭをリスト４０９へ付加することができる。オペレータはまた、リスト４０９からＣＲＭを削除することもできる。

【００５８】オーディオ・モジュールのようなストリーミングＣＲＭが変換完了前に多数回呼出されるゆえに、状態情報の一時的記憶が必須である。このような状態情報は、モジュール状態オブジェクトに記憶され、コンテキスト自体に保持される。ストリーミング変換はまた、複数のＣＲＭがデータ・ストリームの異なる部分で同時に働く可能性をも生じる。従って、コンテキストはＣＲＭ識別子（割当てられたＩＤ又はＣＲＭポインタ）でアクセスされるモジュール状態のリストを実際に保持する。同様に、ＣＲＭごとにバッファリングが行われ、これらバッファはモジュール状態に記憶される。

【００５９】ＣＲＭインターフェースは、４つの関数、すなわちＤｉｇｅｓｔＰａｒａｍｓ、ＣｒｅａｔｅＮｅｗＳｔａｔｅ、ＤｅｌｅｔｅＳｔａｔｅ及びＩｎｉｔｉａｌｉｚｅを含む。

【００６０】ＨＲＥＳＵＬＴ　ＤｉｇｅｓｔＰａｒａｍｓ（［ｉｎ］ＲａｗＰａｒａｍＴｙｐｅ　ｒａｗＰａｒａｍｓ、［ｏｕｔ］ＩＷｔｖＣＲＭＰａｒａｍＴｙｐｅ＊＊ｄｉｇＰａｒａｍｓ）。この関数「ＤｉｇｅｓｔＰａｒａｍｓ」は、規則がプロキシ・サーバ１０８の初期設定時及び規則４０８がＣＡＣＩＳインターフェース４０６で変更されるときに呼び出される。生のテキストの入力制御パラメータは、タグ値の対の簡単なセミコロンで区切られたストリング即ち他の構成であり、或いは、これら入力制御パラメータはＣＲＭにより他の方法で個々に調べられる。ＣＲＭは、生の入力制御パラメータを構文解析し、これらの生の入力制御パラメータを、形態がそれ自体及びそのモジュール状態に対してのみ知られているコンパクトで最適化された構造へ変換する。このような最適化されたフォーマットは、要約されたパラメータとして知られ、一般ＣＯＭインターフェース・ポインタを介してＣＲＭコンフィギュレーション・オブジェクトへ返される。このように、フレームワークは、要約されたパラメータの内部構造を正確に指定し或いは知ることなく、前記パラメータから（コンテンツをログにダンプするなどの）或るベース・レベルの機能を要求することができる。これら要約されたパラメータは、コンフィギュレーション・オブジェクト４０７の規則部４０８における規則の内部表示（規則ツリー）にＣＲＭポインタと共に記憶される。コンテンツの変換が始められる毎

に、生のパラメータではなく要約されたパラメータが用いられる。従って、入力パラメータの構文解析、圧縮、最適化及び連結済み検査の作業は、システムの始動時に各規則毎に１回だけ行われる。

【００６１】ＨＲＥＳＵＬＴ　ＣｒｅａｔｅＮｅｗＳｔａｔｅｓ（［ｉｎ］ＩＷｔｖＣＲＭＰａｒａｍＴｙｐｅ＊ｐａｒａｍｓ、［ｉｎ］ＩＷｔｖＣＲＭＣｏｎｔｅｘｔ＊ｃｏｎｔｅｘｔ、［ｏｕｔ］ＩＷｔｖＣＲＭＳｔａｔｅｓ＊＊ｍｏｄｕｌｅＳｔａｔｅ）。この関数は、変換に呼出される各ＣＲＭごとに１回コンテキストにより呼出される。このコンテキストは次に、モジュール状態と相互作用してデータを処理する。ＣＲＭは、同じ変換についての複数の呼出しを参照するため、パラメータをモジュール状態に記憶する。

【００６２】ＨＲＥＳＵＬＴ　ＤｅｌｅｔｅＳｔａｔｅ（［ｉｎ］ＩＷｔｖＣＲＭＳｔａｔｅ＊ｍｏｄｕｌｅＳｔａｔｅ）。この関数は、変換が完了してＣＲＭの状態情報がそれ以上必要でないときに呼出される。

ＣＲＭ状態

ＣＲＭ状態は、到達するデータがしばしば塊りで処理されるので，必要なオブジェクトである。このコンテキストは、新たなデータの到着を待ちながら、ＣＲＭの作業状態（例えば、パラメータと一時データ）を記憶する方法を必要とする。ＣＲＭＳｔａｔｅ自体は、変換作業（この作業は図５において行われるように、ＣＲＭの内部要素と見なすことができる）を行う。ＣＲＭＳｔａｔｅインターフェースは４つの機能、すなわち、ＰｒｏｃｅｓｓＤａｔａ、ＩｓＳｔｒｅａｍｉｎｇ、ＭｉｎｉｍｕｍＩｎｐｕｔＤａｔａ、ＧｅｔＳｐｏｏｌ、及びＧｅｔＳｔａｔｅを有する。データは、コンテキストによりＣＲＭＳｔａｔｅを通して送られ、ＰｒｏｃｅｓｓＤａｔａと共にコンテキストへ返される。コンテキストは、２つの関数「ＩｓＳｔｒｅａｍｉｎｇ」及び「ＭｉｎｉｍｕｍＩｎｐｕｔＤａｔａ」を用いて、どのように到来データを最もよくバッファするかを決定する。部分的に到来するデータは、ストリーミングが可能である場合にのみ、且つ利用可能なデータ量がストリーミングのための最小入力データを越える場合に、ＣＲＭＳｔａｔｅへ渡される。さもなければ、コンテキストはより多くのデータが到来するまでデータをバッファする。ＧｅｔＳｐｏｏｌは、コンテキストとモジュール状態間の不要なデータ複写を避ける１つの方法である。要するに、これらデータは有効な方法で同じデータ領域を共有する。ＧｅｔＳｔａｔｅｓは、コンテキストがどんな種類の特定の変換がモジュール状態により行われているかを知らないとしても、一般統計的情報をモジュールの状態から抽出する１つの方法である。この統計は、統計構造に対する或る最小要件（例えば、そのコンテンツをログ・ファイルへ出力すること）を指示する一般ＣＯＭインターフェース・ポインタを介して、コンテキストへ返される。従って、プラットフォーム・ソフトウエアは、プラットフォーム・オペレータ又は第三者のソフトウエア・ベンダにより書かれた変換に対してさえも、計量の計算及び（又は）コンテンツ変換統計の収納が可能である。

コンテキスト

コンテキストは、元の及びその時の要求変数、モジュール状態及びバッファされた入力データを含む特定の変換のための情報を記録する。データはしばしばサーバにより塊りで受取られるので、変換は更に多くのデータが得られるまで留保される。コンテキストは、どのＣＲＭがデータ・ストリームについて働いているかを記録する。これらＣＲＭがストリーミングしているならば、コンテキストはただちにデータを処理のためＣＲＭへ送る。非ストリーミング変換では、コンテキストはＳＴＲＥＡＭ＿ＥＮＤ標識が受取られるまでＣＲＭに対するデータをバッファする。この時点で、コンテキストはＣＲＭを処理のため呼出す。

【００６３】コンテキストは、変換が始まるとき、規則４０８の評価により生成されるＣＲＭリストを維持することによって、変換に関わったＣＲＭを追跡する。このリストは、ポインタと、変換が進行するに伴いコンテキストが更新しなければならない各ポインタごとのフラグとを含む。フラグは、１）ＣＲＭがデータ・ストリームに作用しているが一時停止されることを意味するＶａｌｕｅ　ＷＴＶ＿ＣＲＭＡＣＴＩＶＥ、２）ＣＲＭがストリーム又はデータ・セット全体についての作業を完了したことを意味するＶａｌｕｅ　ＷＴＶ＿ＣＲＭ＿ＦＩＮＩＳＨＥＤ、及び３）将来の呼出しのためにＣＲＭが予定されることを意味するＶａｌｕｅＷＴＶ＿ＣＲＭ＿ＰＥＮＤＩＮＧの値を持つ。

【００６４】規則４０８の評価により生じるリストは、要求変数及び（又は）クライアント能力の関数である。このクライアント能力は、プロキシ・サーバ・アプリケーションにより決定され（プロキシ・サーバはクライアント能力を表わす情報からクライアント能力を決定することができ、或いはクライアント能力自体がクライアントからプロキシ・サーバへ送られ）て、変換中は一定のままであるが、要求変数の一部（すなわち、コンテンツ・タイプ及びコンテンツ長）はリフォーマットの間に変化し得る。要求変数が変化する場合は、規則は評価し直され、これにより、おそらくは異なるＣＲＭリストを生成する。ループイングを阻止するために、コンテキストは新たに生成されるリストからＷＴＶ＿ＣＲＭ＿ＰＥＮＤＩＮＧに等しいフラグによりＣＲＭを呼出すだけである。

【００６５】コンテキスト・インターフェースは、ＰｕｓｈＤａｔａ、Ｉｎｉｔｉａｌｉｚｅ、ＧｅｔＯｒｉｇＣｏｎｔｅｎｔＬｅｎｇｔｈ、ＧｅｔＯｒｉｇＣｏｎｔｅｎｔＴｙｐｅ、ＧｅｔＣｕｒＣｏｎｔｅｎｔＬｅｎｇｔｈ、ＧｅｔＣｕｒＣｏｎｔｅｎｔＴｙｐｅ、ＧｅｔＵ

ｓｅｒＡｇｅｎｔ、ＧｅｔＣｌｉｅｎｔＣａｐａｂｉｌｉｔｉｅｓ、ＳｅｔＣｕｒＣｏｎｔｅｎｔＬｅｎｇｔｈ、及びＳｅｔＣｕｒＣｏｎｔｅｎｔＴｙｐｅの１０の関数を呼出す。

【００６６】ＨＲＥＳＵＬＴ　ＰｕｓｈＤａｔａ（［ｉｎ］ＳｔｒｅａｍＴｙｐｅ＊ｐＩｎＳｔｒｅａｍ、［ｉｎ］ＳｔｒｅａｍＴｙｐｅ＊ｐＯｕｔＳｔｒｅａｍ、ＳｔｒｅａｍＳｔａｔｕｓＴｙｐｅ＊ｓｔｒｅａｍＳｔａｔｕｓ）。この関数は、プロキシ・サーバ・アプリケーションにより呼出されてデータをコンテキストへ送り、データをコンテキストから回収する。変換が非ストリーミングのＣＲＭにより行われるならば、プロキシ・サーバ・アプリケーションは、データを戻す前に（ｓｔｒｅａｍＳｔａｔｕｓ＝ＳＴＲＥＡＭ＿ＥＮＤまで）データを数回プッシュすることを予期し得る。最後のＰｕｓｈＤａｔａ呼出しが戻るとき、ファイル全体が戻されねばならない。ストリーミング変換の場合は、データは呼出し毎にＰｕｓｈＤａｔａへ戻される。ｓｔｒｅａｍＳｔａｔｕｓは、１）更に多くのデータが予期されることを意味するＶａｌｕｅ　ＳＴＲＥＡＭ＿ＣＯＮＴ、２）データの適合性又は予期される終りを示すＶａｌｕｅ　ＳＴＲＥＡＭ＿ＥＮＤ、及び３）データの早すぎるか予期しない終り及び（又は）ネットワークの障害を示すＶａｌｕｅ　ＳＴＲＥＡＭ＿ＥＲＲＯＲの値のうちの１つを持ち得る。

【００６７】ＨＲＥＳＵＬＴ　Ｉｎｉｔｉａｌｉｚｅ（［ｉｎ］ｕｎｓｉｇｎｅｄ　ｉｎｔ　ｃｏｎｔｅｎｔＬｅｎｇｔｈ、［ｉｎ］ＢＳＴＲ　ｃｏｎｔｅｎｔＴｙｐｅ、［ｉｎ］ＢＳＴＲ　ｕｓｅｒＡｇｅｎｔ、［ｉｎ］ＣｌｉｅｎｔＣａｐＴｙｐｅ＊ｃｌｉｅｎｔＣａｐｓ、［ｉｎ］ＣｏｎｆｉｇＴｙｐｅ＊ｃｕｒＣｏｎｆｉｇ）。この関数は、ＣｒｅａｔｅＮｅｗＣｏｎｔｅｘｔ関数により呼出される。コンテキストは、プロキシ・サーバ・アプリケーション及びＣＲＭにより後で使用される先頭の４つの引数を記憶する。各コンテキストは、これが生成されたコンフィギュレーションに対するポインタを保持する。このように、たとえ新たなコンフィギュレーションが変換の過程において生成されても、変換は古いほうのコンフィギュレーションを使用し続けることになる。

【００６８】次の６つの関数、即ち、ＨＲＥＳＵＬＴ　ＧｅｔＯｒｉｇＣｏｎｔｅｎｔＬｅｎｇｔｈ（［ｏｕｔ］ｕｎｓｉｇｎｅｄ　ｉｎｔ＊ｏｒｉｇＣｏｎｔｅｎｔＬｅｎｇｔｈ）；ＨＲＥＳＵＬＴ　ＧｅｔＯｒｉｇＣｏｎｔｅｎｔＴｙｐｅ（［ｏｕｔ］ＢＳＴＲ＊ｏｒｉｇＣｏｎｔｅｎｔＴｙｐｅ）；ＨＲＥＳＵＬＴ　ＧｅｔＣｕｒＣｏｎｔｅｎｔＬｅｎｇｔｈ（［ｏｕｔ］ｕｎｓｉｇｎｅｄ　ｉｎｔ＊ｃｕｒＣｏｎｔｅｎｔＬｅｎｇｔｈ）；ＨＲＥＳＵＬＴ　ＧｅｔＣｕｒＣｏｎｔｅｎｔＴｙｐｅ（［ｏｕｔ］ＢＳＴＲ＊ｃｕｒＣｏｎｔｅｎｔＴｙｐｅ）；ＨＲＥＳＵＬＴ　ＧｅｔＵｓｅｒＡｇｅｎｔ（［ｏｕｔ］ＢＳＴＲ＊ｕｓｅｒＡｇｅｎｔ）及びＨＲＥＳＵＬＴ　ＧｅｔＣｌｉｅｎｔＣａｐａｂｉｌｉｔｉｅｓ（［ｏｕｔ］ＣｌｉｅｎｔＣａｐＴｙｐｅ＊＊ｃｌｉｅｎｔＣａｐｓ）は、元の及び更新された要求変数を取得するためプロキシ・サーバ・アプリケーションにより使用される。下記の２つの関数は、変換中に要求変数を更新するためＣＲＭにより使用される。元の値とは異なる値でこれらの関数を呼出すと、規則の再評価を生じる。ｕｓｅｒＡｇｅｎｔ及びｃｌｉｅｎｔＣａｐｓは、所与の要求に対して変化せず、従ってこれらは類似した「セット」関数を持たない。この２つの関数は、ＨＲＥＳＵＬＴ　ＳｅｔＣｕｒＣｏｎｔｅｎｔＬｅｎｇｔｈ（［ｉｎ］ｕｎｓｉｇｎｅｄ　ｉｎｔ　ｎｅｗＣｏｎｔｅｎｔＬｅｎｇｔｈ）及びＨＲＥＳＵＬＴ　ＳｅｔＣｕｒＣｏｎｔｅｎｔＴｙｐｅ（［ｉｎ］ＢＳＴＲ　ｎｅｗＣｏｎｔｅｎｔＴｙｐｅ）である。要求変数のどれかが変換中に変更されると、この変数は規則の再評価及び保留中のモジュール・リストにおける可能な変更に至る。

適合性の宣言

遠隔サーバ１１８におけるウェブ・コンテンツもまたキャッシュ４１４にキャッシュされる。クライアントがウェブ・コンテンツを要求すると、プロキシ・サーバ・アプリケーション４００は、キャッシュされたウェブ・コンテンツが、遠隔サーバ１１８からウェブ・コンテンツを回収する代わりに要求側のクライアントへ戻すのに、及び、この新たに回収されたウェブ・コンテンツを要求側のクライアントへ戻すのに適するかどうかを判定する。一例では、第１のクライアント１０２がウェブ・コンテンツを要求する。プロキシ・サーバ１０８は、ウェブ・コンテンツを回収し、回収されたウェブ・コンテンツをリフォーマットし、リフォーマットされたウェブ・コンテンツをキャッシュ４１４に格納し、またリフォーマットされたウェブ・コンテンツを再び第１の要求側のクライアント１０２へ送る。第２のクライアント１０３は、同じウェブ・コンテンツをプロキシ・サーバから要求する。このキャッシュされたウェブ・コンテンツが第２のクライアント１０３のクライアント能力に対して適切なフォーマットであるならば、プロキシ・サーバは、このキャッシュされたウェブ・コンテンツを再び第２のクライアント１０３へ戻してウェブ・コンテンツに対する第２のクライアントのアクセスを迅速にする。一方、キャッシュされたウェブ・コンテンツが第２のクライアント１０３に対して不適切なフォーマットであるならば（例えば、第２のクライアント１０３は、キャッシュ４１４にキャッシュされたウェブ・コンテンツの解読及び（又は）使用を試みるものとすると、望ましくない方法で機能することになる）、プロキシ・サーバはキャッシュ時にキャッシュされたウェブ・コンテンツを送るので

はなく、このウェブ・コンテンツを第２の要求側のクライアント１０３に対して適切なフォーマットで送るべきである。プロキシ・サーバは、キャッシュされたウェブ・フォーマットを変形した後、リフォーマットされたウェブ・コンテンツを要求側のクライアントへ送るか、或いはプロキシ・サーバは、ウェブ・コンテンツを遠隔サーバから回収し、新たに回収されたウェブ・コンテンツを適切なフォーマットへリフォーマットし、次いでこのリフォーマットされたコンテンツを要求側のクライアントへ戻す。

【００６９】プロキシ・サーバ・アプリケーション４００は、一つの実施の形態においては、キャッシュされたウェブ・コンテンツに関する特定の情報を記憶することによって、特定のキャッシュされたウェブ・コンテンツが適するかどうかを決定する。第１のクライアントがウェブ・コンテンツを要求し、プロキシ・サーバがこのウェブ・コンテンツをリフォーマットすると、先に述べたように規則が評価される。要求の特定の要求変数及び（又は）この要求に対して決定されたクライアント能力に従って、個々の規則は真であるか、偽であるか評価される。真であると評価された各規則に対しては、リフォーマットにおいて用いられるＣＲＭの順序付きリストとＣＲＭの動作を制御する入力制御パラメータとが、図５に関して先に述べたように生成される。このような情報と評価された特定の規則に対するポインタとは、キャッシュ４１４においてリフォーマットされたウェブ・コンテンツと共にキャッシュされる。

【００７０】第２のクライアント１０３がプロキシ・サーバ・アプリケーションからウェブ・コンテンツを要求すると、第２の要求に対する要求変数及び（又は）クライアント能力が、規則の評価のために用いられる。第１の要求の場合と同様に、ＣＲＭのリスト及び関連した入力制御パラメータが決定される。キャッシュされたウェブ・コンテンツが第２のクライアント１０３に適するか否かを判定するために、プロキシ・サーバ・アプリケーション４００は、真と評価された規則と、ＣＲＭのリストと、キャッシュされた関連する入力制御パラメータとを、第２の要求に対して判定された規則と比較する。同じ規則が用いられ、かつ同じ規則が真と評価されるならば、キャッシュされたウェブ・ページが第２のクライアントへ送るのに適すると判定される。このような場合、第２の要求に対して行われる処理は、第１の要求に対するものと同じである。

【００７１】一方、使用された規則又は真と評価された規則が第１の要求に対する規則と違うならば、ウェブ・コンテンツは第２のクライアントへ送るのに適さないと判定される。従って、ウェブ・コンテンツは、第２の要求に対して決定されたＣＲＭのリスト及び関連する入力制御パラメータに従ってリフォーマットされる。

【００７２】適合性に対するこのような手法は第２の要求に対する規則の再評価を介在させるが、他の手法も可能である。１つの適切な手法では、要求側のクライアントのクライアント能力を用いて、キャッシュされた情報が適切であるかどうかを判定する。例えば、一つの実施の形態においては、第２のクライアント１０３のｘ軸の解像度と、ｙ軸の解像度と、ビット深さのクライアント能力とが用いられて、特定の解像度を持つキャッシュされたイメージが第２のクライアントに適するか、或いはこのイメージが第２のクライアントへ与えられる前にリフォーマットされるべきかが決定される。

イーメール・サーバ・アプリケーション

モジュラーＣＲＦ及びＣＲＭリフォーマット・ソフトウエアが図５におけるプロキシ・サーバ・アプリケーション４００に関して記述されるが、プロキシ・サーバ・アプリケーション以外のアプリケーションも、このモジュラーＣＲＦ及びＣＲＭリフォーマット・ソフトウエアを使用することができる。イーメール・サーバ・アプリケーションは、一つの実施の形態においては、このモジュラーＣＲＦ及びＣＲＭリフォーマット・ソフトウエアを用いて、イーメール・メッセージにおける添付書類をクライアントが解読できるフォーマットへリフォーマットする。

【００７３】第１のステップにおいて、イーメール・メッセージはプロキシ・サーバ１０８で走るメール・アプリケーションにより受取られる。このイーメール・メッセージは、メール記憶部に格納される。次に、クライアントは、サーバ１０８とイーメール・サーバとの接続を確保する。このような接続が確保されると、クライアントはクライアント能力を表わす情報をイーメール・サーバへ送る。実際のクライアント能力がサーバへ送られ、或いはクライアント能力を表わす情報がサーバへ送られるので、サーバはクライアント能力データベース（ＣＣＤ）を用いて、関連するクライアント能力を決定する。イーメール・サーバは、クライアントに対するイーメール・メッセージをメール記憶部から回収し、クライアント能力を入力として用いて規則を評価し、図５に関して先に述べた事例においてＨＴＭＬが処理された方法と類似する方法でイーメール・メッセージを処理する。この場合にのみ、処理がイーメール・メッセージ自体で行われる必要はない。従って、ＣＲＭは呼出されない。イーメール・メッセージは、直ちにはクライアントへ戻されず、処理が添付書類について行われる。イーメール・サーバは、添付書類をイーメール・メッセージから切り離し、その後に添付書類をリフォーマットする。イメージが図５に関して先に述べた事例においてリフォーマットされた方法と同様に、新たなコンテキストが生成され、クライアントのクライアント能力が用いられて、どのＣＲＭが添付書類を処理するか、及びこれらＣＲＭの動作を制御するためどの入力制御パラメータが用いられるかを判定する。添付書類のデータは次に処理のため適切な

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ＣＲＭへ入れられ、処理されたデータはコンテキストへ戻される。いったん添付書類のリフォーマットが完了すると、添付書類はイーメール・メッセージへ再び挿入され、イーメール・メッセージがクライアントへ送られる。例えば、クライアントが第１のイメージ・フォーマットの添付書類を解読することができないが第２のイメージ・フォーマットのイメージは解読できるならば、また、クライアントに対するイーメールが第１のイメージ・フォーマットにおける添付書類を含むイーメール・サーバで受取られるものとすれば、イーメール・サーバは、クライアント能力を用いて、クライアントへイーメールを返送する前に添付書類を第２のイメージ・フォーマットへリフォーマットする。従って、クライアントは、元のリフォーマットされない添付書類は解読できなくても、イーメールの添付書類を解読することができる。一部の実施の形態では、イーメールがリフォーマットされ、イーメール記憶部にリフォーマットされたフォームで格納され、その結果、クライアントが接続を確立してイーメール・メッセージを回収するとき、クライアントはリフォーマットされたイーメール・メッセージを受取る。他の実施の形態においては、イーメールはリフォーマットされたフォーマットでは格納されず、元のフォーマットでイーメール記憶部に格納される。クライアントがイーメールを要求すると、イーメール・メッセージは、クライアントへ返送される直前に回収され、リフォーマットされる。

【００７４】本発明については教示の目的のため特定の実施の形態に関して記述したが、本発明はこれに限定されることはない。一部の実施の形態では、クライアント能力を表わす情報は要求側のクライアントからサーバへ送られる実際のクライアント能力であるが、他の実施の形態においては、クライアント能力を表わす情報は要求

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側のクライアントのクライアント能力を決定するためサーバにより用いられる情報である。一部の実施の形態では、プロキシ・サーバは、クライアントから要求変数（例えば、ユーザ・エージェント）を受取るが、他の要求変数（例えば、コンテンツ長及びコンテンツ・タイプ）は遠隔サーバから受取る。ＣＯＭプログラミング規格以外の従来のプログラミング手法は、本発明の特質によるモジュラー・サーバ・プラットフォームのモジュラー特質を具現するために用いることができる。本発明による方法の諸ステップを実施するソフトウエアは、コンピュータ読み取り可能媒体に格納することができる。コンピュータ可読媒体の事例は、磁気記憶媒体、光学的記憶媒体及び半導体メモリを含む。

【００７５】従って、本文に述べた実施の形態の諸特徴の様々な修正、応用及び組合わせは、頭書の特許請求の範囲に記載される如き発明の範囲から逸脱することなく実施可能である。

【図面の簡単な説明】

【図１】コンテンツをリフォーマットするプロキシ・サーバを含む従来技術のネットワークを示す図である。

【図２】本発明の一特質によるシステム１００を示す図である。

【図３】図２のシステム１００の動作による本発明の方法を示すフローチャートである。

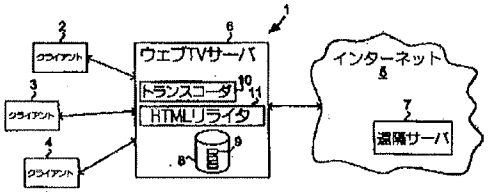
【図４】図２のシステム１００の動作による別の方法を示すフローチャートである。

【図５】図２のシステム１００のモジュラー・プロキシ・サーバ１０８の動作例を示す図である。

【図６】規則のテキスト・ファイルの事例を示す図である。

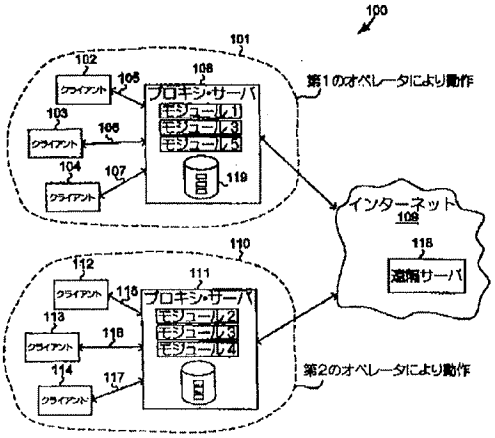
【図７】図５のトークナイザＣＲＭの動作を示す図である。

【図１】

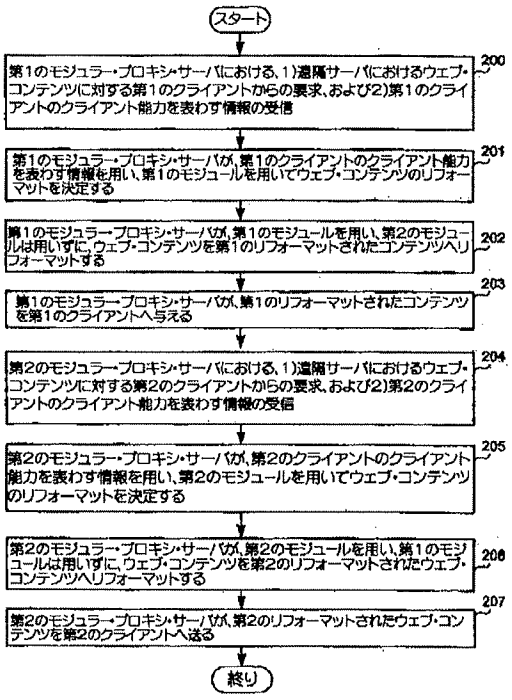


(従来技術)

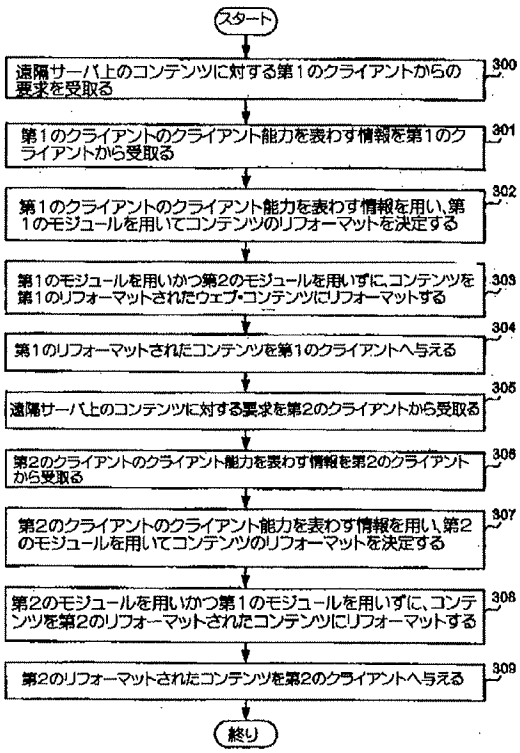
【図２】



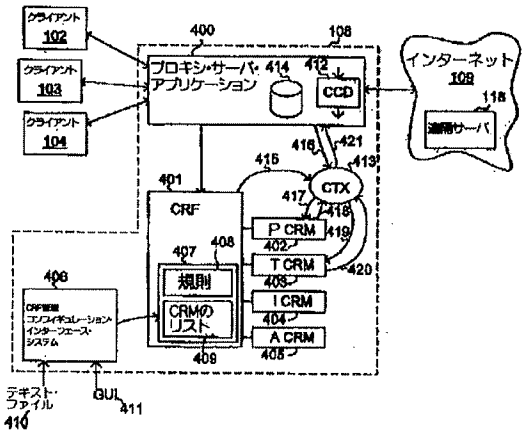
【図３】



【図４】



【図５】



【図６】

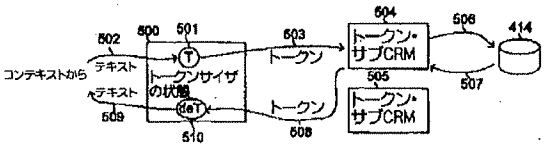
```
if ( content-type = "JPEG" & screen = "TV" )
{
ImageCRM ( jpeg_qualify = 55, jpeg_smooth = TRUE,
xres = 800, yres = 600, jpeg_entropy_optimize = TRUE );
}

if ( content-type = "JPEG" & screen = "monitor" )
{
ImageCRM ( jpeg_quality = 70, jpeg_smooth = FALSE,
xres = 1024, yres = 768, jpeg_entropy_optimize =
 TRUE );
}

if ( content-type = "JPEG" & client = "Foo2.2" )
{
ImageCRM ( forced-format = "GIF" );
// Foo2.2 client has problems with JPEG decoding
}

if ( content-type = "JPEG" & client = "PalmPilot" )
{
ImageCRM ( jpeg_quality = 50, jpeg_colorspace =
"greyscale", xres = 200, yres = 300 );
}
```

【図７】



フロントページの続き

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]The present invention relates to a modular proxy server and a method for reformatting the same.
[0002]
[Description of the Prior Art]Fig. 1 (prior art) is a figure of the system 1 publicly known as a Web TV network which accesses two or more Web TV clients 2-4 which receive the Internet 5 through the Web TV server 6. The Web TV clients 2-4 are available Web TV and set top box Internet terminal from Web TV Networks of California [U.S.] Mountain View. The Web TV server 6 functions as a "proxy server" for the client 2-4 for the purpose of accessing the Internet. About the details of such a Web TV network containing a proxy server, it describes in US,5,918,013,B and 5,935,207.
[0003]In one example of employment, the client 2 tries to access the web contents (for example, HTML document) placed by the remote server 7 of the Internet. The client 2 emits the demand which identifies a desired HTML document to the Web TV server 6. If the demanded HTML document is memorized by the proxy cache 8 in the Web TV server, It responds to the client 2 by sending again a HTML document the Web TV server 6 is remembered to be by the proxy cache 8 and which was demanded to the client 2. It is made to make it the browser in the client 2 displayed on the display of the client 2 in a HTML document. In such a meaning, the Web TV server 6 is a proxy server.
[0004]On the other hand, if there is no demanded HTML document in the proxy cache 8, the Web TV server 6 will emit a HTML document demand to the remote server 7. The remote server 7 responds by returning a HTML document to the Web TV server 6. The Web TV server 6 sends a HTML document to the client 2 which required still more nearly first. Subsequently, the browser in the client 2 is displayed on the display of the client 2 in a HTML document. If this HTML document is a document frequently accessed by the client 2-4 in many cases, the Web TV server 6 will memorize the copy 9 of this HTML document into the proxy cache 8.
[0005]The Web TV server 6 works again so that web contents may be reformatted. In an example, the client 2 tends to access image data from the remote server 7. However, image data is an image format un-proper to the client 2. For example, the demanded image data in the remote server 7 is unsuitable positive in the meaning that the client 2 is the format which does not indicate by decipherment. or [that the client 2 will fail in the display of this image if the client 2 tends to display such image data] -- or it can display.
[0006]Or this image data is unsuitable positive in the meaning that it is resolution high more than needed again. The client 2 may be using the television screen as a display device, for example. Generally the usual television has pixel resolution lower than the case of a monitor of many computers. Since it is for many of image data in the Internet displaying by the monitor of a computer, many images in the Internet have an image of the comparatively high resolution which does not need to be transmitted to the low resolution display of the client 2-4.
[0007]If such image data positive [unsuitable] or unnecessary from the remote server 7 is made to only bypass the Web TV server 6 in the same format, image data positive [with the unsuitable client 2] or unnecessary will be received. If the client 2 cannot decode this format, the client 2 fails in the display of this image, or cannot display this. If a lot of high resolution image data which

cannot display the client 2 shall exist, the communication of the image data to the client 2 can require much time superfluously.
[0008]Therefore, the Web TV server 6 includes the software 10 called the "transformer coder" which reformats image data into a proper format from an un-proper format. The client 2 emits the demand to the image data in the remote server 7 to the Web TV server 6 first. If image data shall not be cached in the proxy cache 8, the Web TV server 6 will emit the demand of image data to the remote server 7. The remote server 7 responds by sending the image data in an un-proper format to the Web TV server 6. The transformer coder software 10 reformats this image data into the proper format which the client 2 can decode. Subsequently, the Web TV server 6 sends this reformatted image data to the client 2. Therefore, as for the client 2, it is [even if] possible for image data which is available at the remote server 7 in the Internet to access image data from the Internet, even if the client 2 is not the format to which a decipherment display is made.
[0009]The Web TV server 6 not only reformats image data, but reformats HTML of a HTML document (namely, "rewriting"). The demanded web contents in the remote server 7 presuppose that it is a HTML document containing a "bug" or "KUAKU (quirk)." A bug has a possibility of producing the obstacle of the browser of a client. There is a possibility of producing the action which does not expect whether KUAKU being desirable even if it does not destroy the browser of a client. Therefore, the Web TV server 6 includes the software 11 called "HTML Rira Ita" which rewrites the illegal portion of HTML so that such a bug and KUAKU may be eliminated.
[0010]In one example of employment, the client 2 emits the demand to a desired HTML document to the Web TV server 6. If a desired HTML document shall not be cached in the proxy cache 8, the Web TV server 6 will emit the demand to the HTML document of the request from the remote server 7. The remote server 7 responds by returning the HTML document containing a bug or KUAKU to the Web TV server 6. Instead of returning the HTML document containing a bug or KUAKU to the client 2-4, the HTML Rira Ita software 11 reformats HTML so that a bug or KUAKU may be eliminated (it rewrites). Subsequently, the Web TV server 6 returns the reformatted HTML document without a bug or KUAKU to the client 2 so that the browser in the client 2 can make a HTML document that satisfactory.
[0011]It functions as the HTML Rira Ita software 11 shortening or removing the dead time ("waiting time perceived") occasionally experienced by the user of the client 2 again. If a browser has the size information over an image, the browser in the client 2 can be put into operation so that a web page including an image may be made. If a browser has the size information over an image, the browser can leave the blank of the suitable size to the image data which arrives henceforth, and can start the layout of a background page. If a browser does not have such size information, The client 2 experiences the dead time ("waiting time perceived") until the image data to an image is actually received by the client since the demand of a web page is made, and a browser begins to make this page. In order to avoid such waiting time in a client perceived, the Web TV server 6 memorizes the size information about an image into the cache 8. When the client 2 requires a web page including an image, the Web TV server 6 collects size information from that cache, it rewrites HTML of a web page so that this size information may be included, and delivers this HTML to the client 2. Therefore, the browser in the client 2 can begin to make a web page using the size information over any image in a web page, if HTML to a background page is received. A browser publishes the demand to the image data which decodes HTML of a background page, identifies the tag of an image, and is identified with this image tag, and it does not need to wait for it until it receives actual image data with size information. This size information is received with the original HTML. Therefore, the result of rewriting of HTML results in bringing about shortening of "the waiting time perceived" in the client 2.
[0012]
[Problem to be solved by the invention]The code of the Web TV server 6 used commercially now is a monolithic code which supports typically the client (namely, Web TV Internet terminal which runs specific software) of one type. This code does not have the flexibility of adaptation and change, and is difficult again. For example, in order to require a second type of client, it is difficult [it / reformatting contents by one method, in order to require a first type of client,] to adapt this code so that it may reformat by a second method. It is necessary for there to be many codes of the Web TV server, or for such change to recompile all generally. It needs to get to

know the internal structure of the code of the Web TV server in detail for it. Therefore, the Web TV server 6 is not considered to be sufficiently suitable for operation by an independent operator (operators other than Web TV which does not become skilled in the internal structure of a monolithic code), maintenance, and customization. It is not necessary to have the detailed knowledge of the internal structure of plat-form software, without changing other portions of plat-form software. A Web TV server plat form which can be applied with such an independent operator is desired so that an operator can change, delete and (or) add each part of plat-form software comparatively easily.

[0013]

[Means for solving problem]Proxy server - "plat form" in which change, customization, and maintenance are possible is easily provided by the interactive television service operator ("operator") which is not skilled in the interior action of a proxy server enough. This plat form has the "modular" architecture to which reformatting of contents is performed with one or more "modules." A module can be dynamically linked to the proxy server plat-form software under execution at the time of operation. in order that an operator may customize operation of a proxy server -- addition of a module -- or it can delete. In one embodiment, without changing or recompiling other modules, a module is written according to COM modular programming standards so that removal of each module, exchange, and (or) addition may be possible. Each module may differ in the author (auther). A module may be written by an operator, Web TV, or other entities. Regardless of a modular author, if a COM standard is followed when realizing each module, two or more modules can be made so that it may work together on a proxy server plat form.

[0014]In one mode, a proxy server determines which module processes contents, before contents are relayed to the client of a requestor side using the information showing the "client capability" of the client of a requestor side. A first client emits the first demand to the web contents memorized by the remote server to a proxy server. This first demand includes the information (for example, the hardware capability, software version number, and software preparation number of a first client) showing the "client capability" of a first client. A proxy server determines a first format suitable for a first client using the information showing client capability. If the demanded web contents are cached by the proxy server in this first format, a proxy server will send these web contents to a first client. If the demanded contents are not cached in a first format, a proxy server reformats web contents into a first format using a suitable module. Reformatting will send web contents to the first client of a requestor side. When web contents are not cached in a proxy server, Or when the cached web contents are not used for other Reasons (it being too old for example) of a certain, a proxy server emits the demand to web contents to a remote server, and searches these web contents. If these web contents are not first formats, a proxy server will reformat web contents into a first format using a suitable module. If reformatted, a proxy server will return these web contents to the first client of a requestor side.

[0015]Next, a second client with the client capability to differ from a first client emits the second demand to web contents to a proxy server. This second demand includes the information showing the client capability of a second client. A proxy server receives this second demand and determines a second format suitable for a second client using the information showing the client capability of a second client.

[0016]If the demanded web contents are cached in a second format in a proxy server, a proxy server will send web contents to a second client. If the demanded contents are not cached in a second format, a proxy server reformats web contents into a second format using a suitable module. Reformatting will send web contents to the second client of a requestor side. If the cached web contents are not used (for example, since it is too old), a proxy server emits the demand of web contents to a remote server, and searches web contents. If the web contents searched from the remote server are not second formats, a proxy server will reformat web contents into a second format using a suitable module. If reformatted, a proxy server will return web contents to the second client of a requestor side. Therefore, it turns out that web contents determine the format returned to the client of a requestor side based on the information for which a proxy server expresses the client capability of the client of a requestor side at least partially.

[0017]According to another mode, a proxy server contains a first module and second module. A first module reformats contents by a first method, and a second module reformats contents by a second method. Second not a module but first module reformat the web contents supplied to a first client. First not a module but second module reformat the web contents supplied to a second client. A first module and second module are a part of executable code which can be linked dynamically independently to a proxy server respectively at the time of operation.
[0018]According to another mode, determination of the type of the reformatted contents which are supplied to the client of a given requestor side is performed using the group of the rule which can be changed with an operator. A proxy server receives the information showing client capability in a HTTP header or the form data of a demand first. A proxy server investigates the group of client capability from a look up table or a database using this information. The client capability determined in this way is used as an input for evaluation after the rule which can be changed with an operator. Evaluation of a rule is determined to the requestor-side client which has specific client capability for whether the web contents as which which module was required are processed, and (or) how these modules process the demanded web contents. A rule is written by the text format which is comparatively easy to understand. The rule of this text format is read into proxy server software so that it may be changed without operation of various modules changing the code of the module itself. The operator does not need to have the detailed knowledge of a modular interior action, in order to change a rule and (or) to add or delete a module.
[0019]Modular reformatting software is used by applications other than proxy server application. In one mode, email server application, The Attached paper of email is reformatted into a second format suitable for the client which receives email from an unsuitable first format to the client which receives email using this reformatting software. By reformatting, the email client can read the email Attached paper which was not able to be read if Attached paper was not reformatted. Using the information showing the client capability of the email client sent to a server by the client, a reformatting server determines the method of reformatting Attached paper so that it may become the suitable format for a client.
[0020]About other mode and other embodiments of the present invention, it describes in subsequent detailed description. The outline of invention described here does not limit the present invention. The present invention is prescribed by above-mentioned Claims.
[0021]
[Mode for carrying out the invention]Fig.2 is a figure of the system 100 by one mode of the present invention. The system 100 contains the first interactive television network 101 containing two or more clients 102-104. The client 102-104 is combined with the Internet 109 via the client/server path cord 105-107 and the first modular proxy server 108. Any suitable type including dialup connection, ISDN connection, T1 connection, DSL connection, or cable modem connection of thing may be sufficient as the client/server path cord 105-107. The first proxy server 108 operates with a first operator. The user of the client 102-104 is a customer who contains typically the capability to access the Internet 109 via the first modular proxy server 108 and who pays a first operator about service of the versatility provided. In the example of Fig.2, the first interactive television network 101 is a web network, The client 102-104 is the available Web TV set top Internet terminal from Web TV Networks of the U.S. California state Mountain View. Therefore, the operator of the first proxy server 108 is Web TV Networks of the U.S. California state Mountain View. Web TV The 09/[U.S. patent application 09th / No. 295,746, and] 238, and No. 133 should be referred to for the further information about a set top box Internet terminal (the theme of these U.S. patent applications is used for the text for reference). US,5,918,013,B and 5,935,207 should be referred to for the structure of a client/server interactive television network, and the further general information about a proxy server of operation (the theme of these United States patents is used for the text for reference).
[0022]According to one mode of the present invention, the second interactive television network 110 is provided. Although the software in the proxy server 111 of the second network 110 shares the software in the proxy server 108 of a first network, and advanced similarity, the second network 110 is operated by a second operator. The software of the proxy server 108 of the first network 101, and the software of the proxy server 111 of the second network 110, Are an adaptable and customizable modular software platform, and this software platform, To the

operation as the first proxy server 108 in the first network 101, by a first method, it is adapted and is customized, To the operation as the second proxy server 111 in the second network 110, by a second method, this software platform is adapted and is customized.
[0023]Even if the same plat-form software is performed by the proxy server of the two networks 101 and 110, these two networks are separate different networks from the viewpoint of the user of two networks. The similarity of the internal structure of the proxy server of two networks does not become clear from any user of two networks easily. The user of the second network 110 is a customer of the second operator instead of a first operator. In the example of Fig.2, the client 112-114 is a different interactive television Internet terminal of manufacture and structure in the client 102-104. The client 112-114 is combined with the Internet 109 via the client/server path cord 115-117 and the second modular proxy server 111.
[0024]Fig.3 is a flow chart of the method of following operation of the system 100 of Fig.2.The client 102-104 of the first network 101 is a client which can use the web contents in the remote server 118 best, when web contents are provided in a first format. On the other hand, the client 112-114 of the second network 110 is a client which can use the web contents in the remote server 118 best, when web contents are provided in a second format.
[0025]In an example, the display of the client 102-104 is a thing of a low resolution from the display of the client 112-114. The web contents in the remote server 118 are the image data for an image, and this image data is a thing of high resolution rather than being able to display on the display of the client 102-104 or the client 112-114. Therefore, in order to reduce the amount of information of the image which needs to transmit image data to the client of a requestor side, many amounts of image data are reduced for the direction in the case of being sent to the client 102-104 rather than the case where image data is sent to the client 112-114. The first image reformatting module (MODULE 1) that was provided first with the modular proxy server software platform and that can be linked dynamically reduces a suitable quantity to the client 102-104. Therefore, the first operator of the first network 101 reformats image data using this MODULE 1. However, especially this image data is reformatted to the client 112-114 of the second network 110 using the image reformatting module (MODULE 4) which is written by a second operator for the purpose concerned and which can be linked dynamically. MODULE4 which the image reformatting module (MODULE 1) of the origin provided by this plat form was removed from the second proxy server 111, instead was written specially is used. These two modules (MODULE 1 and MODULE4) are modules which were written according to COM programming standards and which can be linked dynamically.
[0026]In the first step 200 (refer to Fig.3), the first modular proxy server 108 receives the demand from the first client 102 to the web contents in the 1 remote server 118, and the information showing the client capability of the 2 1st client. The information showing client capability is included in the header or form data of an HTTP request, for example. The information showing client capability is client capability sent to the proxy server 108 by the client, or the information showing client capability may be other usable information, in order to determine client capability. In this example, the information concerned is information (the type of a browser, the version number of software, and the creation number of software) showing the specific resolution of the display of the first client 102. Although this information is not the resolution of a display, depending on an embodiment, it may be resolution.
[0027]In the second step 201, the first modular proxy server 108, In order to determine reformatting the demanded web contents using an image reformatting module (MODULE 1), the aforementioned information showing the capability of the client 102 is used. From the information showing client capability, the first proxy server 108 in this example determines as what is best provided with the image data which the first client had a display of specific resolution, therefore was reformatted by MODULE 1. If the demanded web contents do not exist in the first proxy server 108, the first proxy server 108 emits the demand to these web contents to the remote server 118. The remote server 118 responds by returning the demanded web contents (in this case, image data) to the first proxy server 108.
[0028]Next, (Step 202) and the first proxy server 108 reformat web contents into the reformatted first contents, without using a second module (MODULE 4), using a first module (MODULE 1). In this example, the reformatted first contents have suitable resolution to the display of the client 102. Subsequently, (Step 203) and the first proxy server 108 are returned to

the first client 102 that requires the reformatted first contents.
[0029]Next, (Step 204) and the second modular proxy server 111 of the second network 110, 1) receiving the demand to the web contents in the remote server 118 from the second client 112 -- 2 -- receive the information showing the client capability of the second client 112. This information is included in the header of a demand and expresses the resolution of the display of the second client 112 with this example.
[0030]Next, (Step 205) and the second modular proxy server 111 determine reformatting the demanded web contents using a second module (MODULE 4) using the information showing the client capability of the second client 112. In this example, the demanded image data is reformatted so that a second module may have the suitable resolution to the resolution of the display of the second client 112. If the demanded web contents do not exist in the second proxy server 111, the second proxy server 111 emits the demand to web contents to the remote server 118. A remote server responds by returning the demanded web contents to the second proxy server 111. Subsequently, (Step 206) and the second modular proxy server 111 reformat web contents into the reformatted second contents, without using a first module (MODULE 1), using a second module (MODULE 4). Subsequently, (Step 207) and the second modular proxy server 111 give the reformatted second contents to the second client 112. Therefore, the first example of the proxy server plat form in the first network 101, The demanded web contents are reformatted using a specific module (MODULE 1), It turns out that the second example of the proxy server plat form in the second network 110 just reformats the demanded same web contents using a different module (MODULE 4).
[0031]Fig.4 is a flow chart of the option according to operation of the system 100 of Fig.2.In the method concerned, web contents are formatted in the method of being different within the same interactive television network depending on the client capability for the clients of a requestor side to differ.
[0032]In a first step (Step 300), the modular proxy server 108 receives the demand to the web contents in the remote server 118 from the first client 102. This modular proxy server 108 also receives the information showing the client capability of the first client 102 from the first client 102. In this example, this information showing client capability exists in the header of a demand, and shows that operation is made possible so that the image into which the first client 102 was compressed by the first compression format may be dealt with.
[0033]Next, the information showing client capability is used for (Step 302) and the modular proxy server 108 in order to determine reformatting the demanded web contents using a first module (MODULE 1). This first module reformats image data into the image data compressed by the first compression format, for example.
[0034]If the demanded web contents do not exist in the proxy server 108, the proxy server 108 emits the demand to web contents to the remote server 118. The remote server 118 responds by returning the demanded web contents to the proxy server 108. Subsequently, (Step 303) and the modular proxy server 108 reformat web contents into the reformatted first contents, without using a second module (MODULE3), using a first module (MODULE 1). In this example, the reformatted first contents are the image data in a first compression format. Once it is generated, these reformatted first contents will be returned to the first client 102 to demand. Therefore, image data is carrying out the first compression format liked by the first client 102.
[0035]Next, the modular proxy server 108 receives the demand to the same web contents in the remote server 118 from the second client 103 of the network 101. This modular proxy server 108 also receives the information showing the client capability of the second client 103. This information may exist in the header of a demand again.
[0036]Subsequently, the information showing the client capability of the second client 103 is used for the modular proxy server 108 in order to determine reformatting web contents using a second module (MODULE 3). The web contents which were already collected by the proxy server 108 and which are demanded may be cached in the form of the origin of it (**** memorized by the remote server 118) in the cache 119 of the server 108. If the web contents cached in this way are not too old, the proxy server 108 does not need to collect web contents from the remote server 118 using these contents. Otherwise, the proxy server 108 emits the demand to web contents to the remote server 118. The remote server 118 responds by returning the demanded web contents to the proxy server 108.

[0037]Next, (Step 308) and the modular proxy server 108 reformat web contents into the reformatted second contents, without using a first module (MODULE 1), using a second module (MODULE 3). The second module in this example reformats image data into the compressed-images data of the second compression format liked by the second client 103. Once the reformatted second contents are generated, the modular proxy server 108 will give the reformatted second contents to the second client 103 (Step 309).
[0038]Therefore, in the method concerned, if web contents are required by a first client with first client capability, will reformat web contents by one method using a first module, but a modular proxy server. When web contents are required by a second client with second client capability, it turns out that the same web contents are reformatted by a second method using a second module. The easy equipment (for example, PalmPilot, a personal organizer, or a cellular phone) which does not have the capability to decode a second type of compression format, for example may be sufficient as a first client. The Web TV Internet terminal which has the capability to decode a second type of compression format, for example may be sufficient as a second client.
[0039]Fig.5 shows the example of the modular proxy server 108 of operation, and the client 102 requires a HTML web page including an image. The image data to an image has high resolution rather than being able to display on the screen of the first client 102. Since the HTML image tag to an image does not include the size information over an image, If HTML is sent without lack size information to the client 102, the problem of "the waiting time perceived" relevant to creation of a background page may arise in the client 102.
[0040]The modular proxy server 108, The proxy server application 400, The contents reformatting (CRF) object 401, two or more contents reformatting module (CRM) objects 402-405, and the CRF management configuration interface system (CACIS) 406 are included. CRF401 controls a contents reformatting process. CRF401 has the related configuration object 407 which memorizes the information about how reformatting of contents should be performed in the server concerned. This information includes 1 set of rules 408, and the list 409 of existing CRM (and any sub CRM).
[0041]The rule 408 is the text form as the text file 410 which human being can read, or is put in by an operator via the graphical user interface (GUI) 411 CACIS406. CACIS406 loads this rule to the regulation part 408 of the configuration object 407 further. Each rule has conditions (group of Boolean algebra expression), and expression obtained as a result. Expression obtained as a result is a CRM list (although it is usually only one, it may exist partly) with the input parameter which he proceeds to each CRM. All the rules estimated as "truth" are performed, and the execution sequence of these rules follows an order that these appear in the text file 410.
[0042]Fig.6 is an example of the text file 410. If the proxy server 108 is initialized, CACIS406 reads the text file 410 and then loads a rule to the regulation part 408 of the configuration object 407. CACIS406 loads the list of existing CRM402-405 to the list 409 again.
[0043]The regulation part 408 uses a demand variable and (or) client capability for operating time as an input, and is evaluated. A demand variable contains contents length, a contents type, and user agents (though it does not produce directly from the demand itself but produces from the response to a demand, it is considered that contents length and a contents type are "demand variables".). It is because these are connected with a demand for the purpose of describing the information demanded by demand. Client capability has an extensible operator. About each variable, the range of an acceptable value or a value exists.
[0044]Although client capability can be sent to a demand from a client by a certain embodiment to a proxy server, According to the embodiment described here, client capability is determined by the proxy server application 400 using a client capability database (CCD). The information showing the client capability received from the client of a requestor side. for example, the browser identifier to the browser performed in the client of a requestor side -- The software version number of browser software and the software preparation number of browser software are used for investigating the correspondence client capability of the client of a requestor side. In this example, a browser identifier, a software amendment number, and a software preparation number exist in the header of the **** demand received from the client 102. This information is a form of Web TV-1.2-XXXX. The "Web TV" portion is a browser identifier. Other possibilities contain "Netscape" and "Mozilla (Mozilla)." "1.2" portions are the amendment numbers of software. The "XXXX" portion is a four-digit software preparation number. In this example, the

proxy server application 400 from the information showing client capability. Display resolution [in / in the client 102 / "client capability (level dimension), i.e. x dimension,"], The display resolution in y dimension (vertical dimension), a color system, a bit depth, Connecting speed, a connection type, memory quantity, cache memory quantity, the amount of disk space, It determines processor speed, the audio format which is supported and which are imagined, formatted and supported, and a client supporting stereo sound, or having monophonic sound and a specific value over **********.

[0045]Once client capability and a demand variable (contents length, a contents type, and user agents) are known to a specific demand, In order that the proxy server application 400 may generate the context object (CTX) 413 for new conversion, the aforementioned information is used as an input, and the method "CreateNewContext" 415 is called. (The term "conversion" is used in order to show reformatting operation.) CRF401 refers for new CTX413, acquires an interface pointer (handle to CTX413), and gives this to the proxy server application 400. When generated, CTX413 is an object with which the proxy server application 400 communicates.

[0046]In this example, the demanded HTML document is not cached in the cache 414. Therefore, the proxy server 108 emits the demand to a HTML document to the remote server 118. The remote server 118 responds by returning HTML to the proxy server 108. If HTML (data) begins to return to the proxy server 108, the proxy server application 400 will call the "PushData" function 416 in CTX413 with a sign. This sign shows that further many data showed the subsequent thing (like [data streaming / of a case]) later, or all the data was pushed to the context. CTX413 produces evaluation of the rule 408 using the client capability and the demand variable which were determined using the reference to the configuration object 407. The results of this rule evaluation are an ordered list (an order shows an order that CRM is used) of CRM used for processing 1HTML, and an input control parameter for every CRM which controls the action of 2CRM. Operation of each CRM is controlled by the input control parameter sent to this.

[0047]CRM used in this example for processing of HTML is page PATCHACRM402 and tokenizer (tokenizer)CRM403. One of the input control parameters to page PATCHA CRM402 is a list of the structure of specifying the specific page patch with which each structure should be performed. Tokenizer CRM does not receive an input control parameter.

[0048]It proceeds to first CRM in an ordered list, and CTX413 generates one state (not shown) by calling CreateNewState in CRM. (A new state exists for each [are carried out by CRM] the operation of every.) Ranking second, CTX413 sends a suitable input control parameter to the CRM concerned, and calls the function "process data" 417 about the state. In this example, first CRM in an ordered list is page PATCHACRM402. If it turns out that the client 102 has a problem in a specific HTML sequence, page PATCHA CRM402 will look for the sequence which poses a specific problem in HTML, and will replace it by the sequence which can permit this. Next, data returns to CTX413 (418). It proceeds to the following CRM (in this case, tokenizer CRM403) in an ordered list, and CTX413 generates the state (not shown) of tokenizer CRM403, and calls the function "process data" of the state of a tokenizer (419).

[0049]In this example, the image tag in the **** HTML web page received from the remote server 118 does not have image size information. Therefore, when HTML is received in the client 102 and the client 102 tries to make a background page, it will experience "the waiting time perceived." The client 102 is because it does not have the size information over an image then. On the other hand, if HTML includes size information, the client 102 can begin to make a background page using the size information in an image tag, before actually receiving the image data itself. In order to remove such "waiting time perceived" at the time of formation of a background page, before HTML is returned to the client 102, tokenizer CRM403 inserts size information in HTML.

[0050]Therefore, the state of a tokenizer looks for a HTML tag about an image tag, Acquire an image name from an image tag and the size information over the specific image before memorized using this image name is looked for in the cache 414, Next, character H= W= is written in addition to the stream of HTML in a suitable place, and an image tag shows the size of an image.

[0051]Fig.7 is a figure of this operation of the state 500 of a tokenizer. The state 500 of a tokenizer converts the stream of HTML text 502 to the stream 503 of a notional token using the tokenizer 501 rather than performs the conversion itself. These tokens 503 are sent to a series of tokenizer submodules 504 and 505, and correction of a token, insertion, removal, and (or)

creation are performed there. The group of a tokenizer submodule is a operator which can be corrected by the same method as the group of CRM. In this example, the tokenizer submodule 504 sends the image name 506 to the cache 414 from an image tag. This image name identifies the memorized size information (height and width) over the image returned to the submodule 504 (507). This size information is inserted so that the token stream 508 corrected appropriately may be produced. This corrected token stream 508 is converted to the corrected HTML text stream 509 by DETOKUNAIZA (detokenizer)510 of the state 500 of a tokenizer next. This corrected HTML is returned next CTX413 (509, 420).

[0052]CTX413 makes the rule 408 reappraise, when regaining HTML data. This CTX returns from the call of a function "PushData", and returns again corrected HTML (at this time, the size information of the image is included, it was formed accidentally or HTML produced in KUAKU is removed) to the proxy server application 400 (421). Next, demanded HTML is returned to the client 102 of a requestor side. The client 102 receives this HTML and begins to make a background page using the size information in an image tag. Before the client 102 receives the actual image data itself or requires it, it begins to make a background page. Therefore, the problem of the above-mentioned "waiting time perceived" is solved.

[0053]Subsequently, the client 102 emits the demand to image data to the proxy server 108. The proxy server 108 inspects the cache 414 and judges whether this image data was cached there. If image data is cached, the proxy server 108 will return the image data reformatted as a suitable thing based on the judged client capability. Many versions of an image may be cached and one of the suitable versions of these is determined by client capability to the client of a requestor side.

[0054]Or only one version of image data is cached and this version is reformatted again if needed. Client capability is used in order to determine how reformatting should be performed to the client of a requestor side.

[0055]In this example, the proxy server 108 did not cache the demanded image data. Therefore, the proxy server 108 emits the demand about the image data from the remote server 118. If the remote server 118 responds to image data, the proxy server 108 will generate another context by letting the contents length, the contents type, user agents, and client capability to an image data demand pass. Subsequently, the proxy server application 400 calls the "PushData" function in this context, and generates the list of CRM which evaluates and uses that result, and 1 set of listed input control parameters for every CRM. Reformatting of all the images is performed by one CRM, i.e., image CRM, 404 in this example. CRM405 performs audio reformating.

[0056]In this example, the **** image data received from the remote server 118 is a thing of high resolution rather than being able to display on the display of the client of a requestor side. The new state of image CRM404 is generated using the input parameter which makes the image data of suitable resolution output to image CRM404 to the display of the client 102 of a requestor side. A context sends image data to an image CRM state, and receives the processed image data again. A context by sending the processed image data (it is the suitable resolution for the display of the client 102 of a requestor side) to the proxy server application 400, Returning from the call of the "PushData" function, the application 400 returns image data to the client 102 of a requestor side. The client 102 fills the free space left behind to the background page to the image using this image data, and makes the web page completed by this. Image data can be processed as a series of padding. Each padding is processed using proxy server application, a context, and suitable CRM, and as stated previously, it is again returned to proxy server application. Thereby, streaming becomes easy.

[0057]Completion of reformating will call the method DeleteContext with the proxy server application 400. Since a context follows reformatting operation from the start to the end, it can memorize conversion statistics (the total computation time, a mean square error, and attention conditions) in the context to the proxy server application 400 to be used. From this Reason, the proxy server application 400 controls the life time of a context completely.

CRMCRM does the work related to conversion of contents in which it specialized. Although one CRM is illustrated for every machine, by two or more lines, it is on two or more conversion, and the same example can be used simultaneously. Four CRM is provided by the standard proxy server plat form. First CRM is page PATCHA. Second CRM is a tokenizer. The 3rd CRM deals with image conversion and supports data streaming. The 4th CRM deals with audio conversion and supports data streaming. The action of these CRM is correctable via 1 set of input control

parameters peculiar to each CRM. Selection of these input control parameter for every demand is performed by evaluating the rule 408. The designer of each CRM has to exhibit the list of input control parameters supported with the default value and tolerance level of them, if CRM should be contained in the rule 408 (by for example, XML file). These input control parameter in the case of many does not need to write in CRM of itself, and gives all the required flexibility to an operator. However, when the necessity for the processing in which it specialized dramatically arises (for example, in order to tackle the bug found out by the specific client), an operator has a choice which writes in custom-made CRM (custom-made CRM and custom-made sub CRM). These custom-made CRM is whether it places before CRM with which a plat form is provided, it places after that, or to replace this. Existing CRM is shown in the list 409. The operator can add CRM to the list 409. The operator can also delete CRM from the list 409.

[0058]Therefore streaming CRM like an audio module is called before the completion of conversion many times, temporary memory of state information is indispensable. Such state information is memorized by the module-states object, and is held at the context itself. Streaming conversion also produces a possibility that two or more CRM will work simultaneously again in the portion from which a data stream differs. Therefore, a context actually holds the list of the module states accessed by a CRM identifier (assigned ID or the CRM pointer). Similarly, buffering is performed for every CRM and these buffers are memorized by module states.

[0059]A CRM interface contains four functions, i.e., DigestParams, CreateNewState, DeleteState, and Initialize.

[0060]HRESULT DigestParams ([in] RawParamType rawParams, [out] IWtvCRMParamType**digParams). As for this function "DigestParams", a rule is called when the time of initial setting of the proxy server 108 and the rule 408 are changed with the CACIS interface 406. The input control parameter of a raw text is, the strings, i.e., other composition, which were divided by a pair of easy semicolon of tag values, or these input control parameter is separately investigated by CRM by other methods. The syntax of a raw input control parameter is analyzed, and, as for CRM, a form converts these raw input control parameters to a compact and optimized structure known only to itself and its module states. Such an optimized format is known as a summarized parameter, and is returned via a general COM interface pointer to a CRM configuration object. Thus, the framework can require the function (contents are dumped to a log) of a certain baselevel from the aforementioned parameter, without specifying the internal structure of the summarized parameter correctly, or getting to know. The these-summarized parameter is memorized by the internal representation (rule tree) of the rule in the regulation part 408 of the configuration object 407 with a CRM pointer. Whenever conversion of contents can begin, raw not a parameter but summarized parameter are used. Therefore, the work of syntax analysis of an input parameter, compression, optimization, and a bound inspection is done only once for every rule at the time of start up of a system.

[0061]HRESULT CreateNewStates ([in] IWtvCRMParamType*params, [in] IWtvCRMContext*context, [out] IWtvCRMStates**moduleState). This function is called by the 1-time context for each [are called to conversion] CRM of every. Next, this context interacts with module states and processes data. CRM memorizes a parameter to module states in order to refer to two or more calls about the same conversion.

[0062]HRESULT DeleteState ([in] IWtvCRMState*moduleState). Conversion completes this function, and more, the state information of CRM is called, when not required.

Since the reaching data is often processed by padding, a CRM state CRM state is a required object. This context needs the method of memorizing the working state (for example, a parameter and temporary data) of CRM for arrival of new data with waiting. The CRMState itself performs converting operation (it can be regarded as the internal element of CRM so that this work may be done in Fig.5). A CRMState interface has four functions, i.e., ProcessData, IsStreaming, MinimumInputData, GetSpool, and GetState. Data is sent by the context through CRMState and returned with ProcessData to a context. A context determines what a buffer is improved arrival data most using two functions "IsStreaming" and "MinimumInputData." The data which comes partially is passed to CRMState, only when streaming is possible, and when available data volume exceeds the minimum input data for streaming. Otherwise, a context carries out the buffer of the data until more data comes. GetSpool is one method of avoiding the unnecessary data copy between a context and module states. In short, these data shares the same data area between

an effective method. Though GetStates does not know what kind of conversion with a specific context is performed by module states, it is one method of extracting general statistical information from a modular state. These statistics are returned to a context via the general COM interface pointer which instructs a certain minimum requirements (for example, output those contents to a log file) over statistics structure. Therefore, calculation of measuring and (or) storage of contents conversion statistics are possible for plat-form software even to the conversion written by the software vender of the plat-form operator or the third party.
A context context records the information for the specific conversion containing origin, and the demand variable at that time, module states and the input data by which the buffer was carried out. Since data is often received by the server by padding, conversion is reserved until further many data is obtained. A context records which CRM is working about the data stream. If these CRM is carrying out streaming, a context will send data to CRM immediately for processing. In non-streaming conversion, a context carries out the buffer of the data to CRM until a STREAM END sign is received. At this time, a context calls CRM for processing.
[0063]A context pursues CRM concerned with conversion by maintaining the CRM list generated by evaluation of the rule 408, when conversion starts. This list is provided with the following. Pointer.
A flag for every pointer which conversion must follow on going on and a context must update. Value WTV CRMACTIVE which means halting a flag although 1CRM is acting on a data stream,2) It has a value of ValueWTV CRM PENDING which means that CRM is planned for Value WTV CRM FINISHED which means that CRM completed the work about a stream or the whole data set, and the call of 3 futures.
[0064]The lists produced by evaluation of the rule 408 are a demand variable and (or) a function of client capability. This client capability is determined by proxy server application (from the information showing client capability, the proxy server can determine client capability and). Or the client capability itself is sent to a proxy server from a client, and although it is still fixed during ** and conversion, a part of demand variable (namely, a contents type and contents length) may change between reformatting. When a demand variable changes, a rule is reevaluated and, thereby, probably, generates a ******** CRM list. In order to prevent looping, a context only calls CRM with a flag equal to WTV CRM PENDING from the list newly generated.
[0065]A context interface PushData, Initialize, GetOrigContentLength, GetOrigContentType, The function of ten of GetCurContentLength, GetCurContentType, GetUserAgent, GetClientCapabilities, SetCurContentLength, and SetCurContentType is called.
[0066]HRESULT PushData ([in] StreamType*pInStream, [in] StreamType*pOutStream, StreamStatusType*streamStatus). This function is called by proxy server application, sends data to a context, and collects data from a context. If conversion is performed by CRM of non-streaming, proxy server application may expect pushing data several times (to streamStatus=STREAM END), before returning data. The whole file must be returned when the last PushData call returns. In streaming conversion, data is returned to PushData for every call. Value STREAM CONT as which streamStatus means that the data of 1 and also many is expected, 2) It can have one of the values of Value STREAM ERROR which shows the obstacle of Value STREAM END which shows the conformity or finally it is expected of data, finally it is not expected whether three data is too early, and (or) a network.
[0067]HRESULT Initialize ([in]) [unsigned intcontentLength and] [in] BSTR contentType, [in] BSTR userAgent, [in] ClientCapType*clientCaps, [in] ConfigType*curConfig. This function is called by a CreateNewContext function. A context memorizes four arguments of the head used by proxy server application and CRM later. Each context holds the pointer to the configuration by which this was generated. Thus, even if a new configuration is generated in the process of conversion, conversion will continue using the configuration of the older one.
[0068]the following six functions -- that is, HRESULT. GetOrigContentLength ([out]) unsigned int*origContentLength;HRESULT GetOrigContentType([out] BSTR*origContentType);HRESULT GetCurContentLength ([out]) unsigned. int*curContentLength;HRESULT GetCurContentType ([out] BSTR*curContentType);HRESULT GetUserAgent ([out] BSTR*userAgent). and HRESULT GetClientCapabiliti es ([out] ClientCapType**clientCaps) -- origin -- and in order to acquire the updated demand variable, it is used by proxy server application. The two following functions are used by CRM in order to update a demand variable during conversion. Reappraisal of a rule will be

produced if these functions are called with a different value from the original value. userAgent and clientCaps do not change to a given demand, therefore these do not have a similar "set" function. These two functions, They are HRESULT SetCurContentLength ([in] unsigned int newContentLength) and HRESULT SetCurContentType ([in] BSTR newContentType). If it is changed while one of the demand variables converts, this variable will result in the possible change in the module list under reappraisal of a rule, and suspension.
The web contents in the declaration remote server 118 of conformity are also cached by the cache 414. When a client requires web contents, the proxy server application 400, The cached web contents judge whether it is suitable for returning to the client of a requestor side instead of collecting web contents from the remote server 118, and returning these newly collected web contents to the client of a requestor side. For example, the first client 102 requires web contents. The proxy server 108 collects web contents and the collected web contents are reformatted, The reformatted web contents are stored in the cache 414, and the reformatted web contents are again sent to the client 102 of a first requestor side. The second client 103 requires the same web contents from a proxy server. If these cached web contents are suitable formats, to the client capability of the second client 103 a proxy server, These cached web contents are again returned to the second client 103, and access of the second client to web contents is made quick. If the cached web contents are unsuitable formats to the second client 103 on the other hand (for example, the second client 103) If the decipherment and (or) use of web contents which were cached by the cache 414 shall be tried, The proxy server which will function by the method which is not desirable should send these web contents in the suitable format to the client 103 of a second requestor side rather than should send the web contents cached at the time of a cache. After a proxy server deforms the cached web format, Send the reformatted web contents to the client of a requestor side, or or a proxy server, The web contents which collected web contents from the remote server and were newly collected are reformatted into a suitable format, and, subsequently these reformatted contents are returned to the client of a requestor side.
[0069]The proxy server application 400 determines whether the cached specific web contents are suitable by memorizing the specific information about the cached web contents in one embodiment. A first client requires web contents and a rule is estimated to have said previously that a proxy server reformats these web contents. According to the client capability determined to the specific demand variable of a demand, and (or) this demand, it is evaluated whether each rule is truth or it is an imitation. To each rule estimated to be truth, the ordered list of CRM used in reformatting and the input control parameter which controls operation of CRM are generated, as Fig.5 was described previously. It is cached [pointer / to the specific rule estimated as such information] with the web contents reformatted in the cache 414.
[0070]If the second client 103 requires web contents from proxy server application, the demand variable and (or) client capability to a second demand will be used for evaluation of a rule. The input control parameter with which CRM was listed and related is determined like the case of a first demand. In order to judge whether the cached web contents are suitable for the second client 103, the proxy server application 400, The rule estimated as truth, the list of CRM, and the cached related input control parameter are compared with the rule judged to the second demand. If the same rule is used and the same rule is estimated as truth, it will be judged with it being suitable for the cached web page sending to a second client. In such a case, the processing performed to a second demand is the same as the thing to a first demand.
[0071]If the rule estimated as the used rule or truth on the other hand differs from the rule over a first demand, it will be judged with web contents not being suitable for sending to a second client. Therefore, web contents are reformatted according to the input control parameter with which CRM determined to the second demand is listed and related.
[0072]Other techniques are possible although such a technique for conformity interposes the reappraisal of a rule to a second demand. In one suitable technique, it is judged using the client capability of the client of a requestor side whether the cached information is suitable. In one embodiment, for example, the resolution of the x axis of the second client 103, The resolution of the y-axis and the client capability of a bit depth are used, and it is determined whether the cached image with specific resolution is suitable for a second client or it should be reformatted before this image is given to a second client.

Although email server application modular CRF and CRM reformatting software are described about the proxy server application 400 in Fig.5, Applications other than proxy server application can also use this modular CRF and CRM reformatting software. Email server application reformats the Attached paper in an email message into the format which a client can decode in one embodiment using this modular CRF and CRM reformatting software.

[0073]In a first step, an email message is received by the e-mail application which runs by the proxy server 108. This email message is stored in a mail storing part. Next, a client secures connection between the server 108 and an email server. If such connection is secured, a client will send the information showing client capability to an email server. Since the information which actual client capability is sent to a server, or expresses client capability is sent to a server, a server determines the client capability to be related, using a client capability database (CCD). An email server collects the email messages to a client from a mail storing part, evaluates a rule, using client capability as an input, and processes an email message by the method by which HTML was processed in the example previously described about Fig.5, and a similar method. In this case, it is accepted and processing does not need to be performed by the email message itself. Therefore, CRM is not called. An email message is not promptly returned to a ** client, but processing is performed about Attached paper. An email server separates Attached paper from an email message, and reformats Attached paper after that. An image like the method reformatted in the example previously described about Fig.5, It judges which input control parameter a new context is generated and the client capability of a client is used, and is used in order to control which CRM processes Attached paper and operation of these CRM. The data of Attached paper is put in to suitable CRM for processing next, and the processed data is returned to a context. Once reformatting of Attached paper is completed, Attached paper will be again inserted in an email message, and an email message will be sent to a client. For example, although a client cannot decode Attached paper of a first image format, if the image of a second image format is decipherable, If the email to a client shall be received by the email server containing the Attached paper in a first image format, an email server, Using client capability, Attached paper is reformatted into a second image format, before returning email to a client. Therefore, even if the Attached paper in which origin is not reformatted as for a client is undecipherable, it can decode the Attached paper of email. When it is stored in the form which email was reformatted and was reformatted into the email storage part in some embodiments, a client establishes connection as a result and email messages are collected, A client receives the reformatted email message. In other embodiments, by the reformatted format, email is not stored but is stored in an email storage part in the original format. A client's demand of email will collect and reformat an email message, just before a client is returned.

[0074]Although the present invention was described about the specific embodiment for the purpose of instruction, the present invention is not limited to this. Although the information showing client capability is actual client capability sent to a server from the client of a requestor side in some embodiments, In other embodiments, the information showing client capability is information used by the server in order to determine the client capability of the client of a requestor side. According to some embodiments, although a proxy server receives a demand variable (for example, user agents) from a client, other demand variables (for example, contents length and a contents type) are received from a remote server. The conventional programming techniques other than COM programming standards can be used in order to embody the modular special feature of the modular server plat form by the special feature of the present invention. The software which carries out the steps of the method by the present invention is storable in the medium which can be computer read. The example of a computer readable medium contains a magnetic storage medium, an optical storage medium, and semiconductor memory.

[0075]Therefore, various corrections of the characteristics of the embodiment stated to the text, application, and combination are feasible, without deviating from the scope of **** invention described in above-mentioned Claims.

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公表特許公報（Ａ）

JP 2004-530176 A 2004.9.30
(11)特許出願公表番号
特表2004-530176
(Ｐ２００４－５３０１７６Ａ)
(43)公表日　平成16年9月30日(2004.9.30)

(51)Int.Cl.[7]	FI		テーマコード(参考)
Ｇ０６Ｆ　13/00	Ｇ０６Ｆ　13/00	５４０Ｃ	５Ｂ０７５
Ｇ０６Ｆ　12/00	Ｇ０６Ｆ　12/00	５４６Ｋ	５Ｂ０８２
Ｇ０６Ｆ　17/30	Ｇ０６Ｆ　17/30	１１０Ｅ	
	Ｇ０６Ｆ　17/30	１１０Ｆ	
	Ｇ０６Ｆ　17/30	２４０Ａ	

審査請求　未請求　　予備審査請求　有　（全27頁）

(21)出願番号　特願2002-529426(P2002-529426)
(86)(22)出願日　平成13年8月30日(2001.8.30)
(85)翻訳文提出日　平成15年3月20日(2003.3.20)
(86)国際出願番号　PCT/US2001/027018
(87)国際公開番号　WO2002/025496
(87)国際公開日　平成14年3月28日(2002.3.28)
(31)優先権主張番号　09/668,110
(32)優先日　平成12年9月22日(2000.9.22)
(33)優先権主張国　米国(US)

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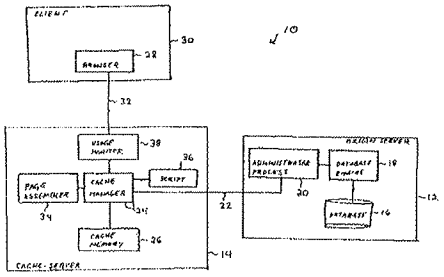
最終頁に続く

(54)【発明の名称】動的ウェブページの提供

(57)【要約】
ウェブページの構成オブジェクトを内部に格納したキャッシュメモリを管理するためのウェブ提供システムは、キャッシュメモリの内容を制御するために、キャッシュメモリと通信するキャッシュマネージャを含む。キャッシュマネージャと通信するプログラム可能スクリプトが、トリガイベントの生起を検出する。トリガイベントに応答して、プログラム可能スクリプトは、キャッシュマネージャにキャッシュメモリの内容を変更するよう命令する。



【特許請求の範囲】
【請求項１】
更新済みウェブページをキャッシュ内に生成可能とする方法であって、
トリガイベントを定義するプログラム可能規則を定める段階であって、前記トリガイベントの生起が、前記ウェブページの古くなった部分が存在することを示す、定める段階と、
前記トリガイベントの生起を検出する段階と、
前記トリガイベントの生起に応答して、前記古くなった部分の更新を要求する段階と、
前記ウェブページの更新済み部分を、前記キャッシュ内に格納するため受信する段階とを包含した、方法。
【請求項２】
前記更新済み部分を組み込んだウェブページを生成する段階と、
前記ウェブページをユーザに提供する段階とを更に包含した、請求項１に記載の方法。
【請求項３】
前記プログラム可能規則を定める前記段階が、前記規則を定義するための命令を含んだスクリプトを解釈する段階を包含した、請求項１に記載の方法。
【請求項４】
前記トリガイベントを検出する前記段階が、前記プログラム可能規則により定義された経過時間を検出する段階を包含した、請求項１に記載の方法。
【請求項５】
前記トリガイベントを検出する前記段階が、前記ウェブページの更新済み部分の受信を検出する段階を包含した、請求項１に記載の方法。
【請求項６】
前記ウェブページの更新済み部分を要求する前記段階が、データベースエンジンにより実行されるデータベース質問を作成する段階を包含した、請求項１に記載の方法。
【請求項７】
前記ウェブページが、前記更新済み部分に加えて、複数の構成部分を包含し、且つ、前記方法が、前記構成部分と前記更新済み部分とを前記ウェブページへと組み立てるための命令を包含したアセンブリスクリプトを提供する段階を更に包含した、請求項１に記載の方法。
【請求項８】
更新を要求する前記段階が、起点サーバと通信を確立し且つ、そのサーバから前記更新を要求する段階を包含し、
更新済み部分を受信する前記段階が、前記更新済み部分を前記起点サーバから受信する段階を包含した、請求項１に記載の方法。
【請求項９】
前記起点サーバとは別個のキャッシュメモリ素子を更に包含した、請求項８に記載の方法。
【請求項１０】
前記起点サーバにキャッシュメモリ素子を更に包含した、請求項８に記載の方法。
【請求項１１】
前記ウェブページがどれだけの頻度で要求されるかを示すアクセスデータを収集する段階を更に包含した、請求項１に記載の方法。
【請求項１２】
前記アクセスデータに応答して、前記キャッシュの内容を管理する段階を更に包含した、請求項１１に記載の方法。
【請求項１３】
内容を内部に格納するキャッシュメモリと、
前記キャッシュメモリと通信して、前記キャッシュメモリの前記内容を制御するキャッシュマネージャと、
前記キャッシュマネージャと通信して、トリガイベントの生起を検出するプログラム可能

スクリプトであって、前記トリガイベントに応答して、前記キャッシュマネージャに、前記キャッシュメモリの前記内容を変更させる、プログラム可能スクリプトとを包含した、ウェブ提供システム。

【請求項１４】

選択したウェブページが要求される頻度を示すアクセスデータを収集する利用モニタを更に包含した、請求項１３に記載のウェブ提供システム。

【請求項１５】

前記利用モニタが、前記アクセスデータを前記プログラム可能スクリプトに提供し、更に、前記プログラム可能スクリプトが、前記アクセスデータに応答して、前記キャッシュメモリの前記内容を変更する、請求項１４に記載のウェブ提供システム。

【請求項１６】

前記プログラム可能スクリプトと管理プロセスとの間の通信路を更に包含し、この通信路により、前記プログラム可能スクリプトが、前記管理プロセスから命令を受信可能となる、請求項１３に記載のウェブ提供システム。

【請求項１７】

前記ウェブページの構成部分を前記ウェブページへと組み立てるための命令を含んだページアセンブラを更に包含した、請求項１３に記載のウェブ提供システム。

【請求項１８】

前記プログラム可能スクリプトが、ジャバスクリプトである、請求項１３に記載のウェブ提供システム。

【請求項１９】

キャッシュ内に更新済みウェブページを生成可能とするためのソフトウェアをその上に符号化したコンピュータ可読媒体であって、このソフトウェアが、

トリガイベントを定義するプログラム可能規則を定めるための命令であって、前記トリガイベントの生起が、前記ウェブページの古くなった部分が存在することを示す、定めるための命令と、

前記トリガイベントの生起を検出するための命令と、

前記トリガイベントの生起に応答して、前記古くなった部分の更新を要求するための命令と、

前記ウェブページの更新済み部分を、前記キャッシュ内に格納するために受信するための命令を包含した、コンピュータ可読媒体。

【請求項２０】

前記ソフトウェアが、前記更新済み部分を内部に組み込んだウェブページを生成するための命令と、

前記ウェブページをユーザに提供するための命令を更に包含した、請求項１９に記載のコンピュータ可読媒体。

【請求項２１】

前記プログラム可能規則を定めるための前記命令が、前記規則を定義するための命令を含んだスクリプトを解釈するための命令を更に包含した、請求項１９に記載のコンピュータ可読媒体。

【請求項２２】

前記トリガイベントを検出するための前記命令が、前記プログラム可能規則により定義された経過時間を検出するための命令を包含した、請求項１９に記載のコンピュータ可読媒体。

【請求項２３】

前記トリガイベントを検出するための前記命令が、前記ウェブページの更新済み部分の受信を検出するための命令を包含した、請求項１９に記載のコンピュータ可読媒体。

【請求項２４】

前記ウェブページの更新済み部分を要求するための前記命令が、データベースエンジンにより実行されるデータベース質問を作成するための命令を包含した、請求項１９に記載の

コンピュータ可読媒体。
【請求項２５】
前記ウェブページが、前記更新済み部分に加えて、複数の構成部分を包含し、且つ、前記コンピュータ可読媒体が、前記構成部分と前記更新済み部分とを前記ウェブページへと組み立てるための命令を更に包含した、請求項１９に記載のコンピュータ可読媒体。
【請求項２６】
更新を要求するための前記命令が、起点サーバと通信を確立し且つそのサーバから前記更新を要求するための命令とを包含し、更に、
更新済み部分を受信するための前記命令が、前記更新済み部分を前記起点サーバから受信するための命令を包含した、請求項１９に記載のコンピュータ可読媒体。
【請求項２７】
前記ソフトウェアが、前記ウェブページがどれだけの頻度で要求されるかを示すアクセスデータを収集するための命令を更に包含した、請求項１９に記載のコンピュータ可読媒体。
【請求項２８】
前記ソフトウェアが、前記アクセスデータに応答して、前記キャッシュの内容を管理するための命令を更に包含した、請求項２７に記載のコンピュータ可読媒体。
【発明の詳細な説明】
【０００１】
本発明は、動的ウェブページの提供に関し、特に、動的ウェブページの古くなった部分の更新に関する。
【０００２】
発明の背景
動的ウェブページは、典型的には、１つ又は複数の静的オブジェクト及び１つ又は複数の動的オブジェクトを含む。従って、ウェブページ提供には、これらオブジェクトの組み立てと、ウェブページの統合が含まれる。
【０００３】静的オブジェクトとは、仮に変更されるとしても希にしか変更されないオブジェクトのことである。こうしたオブジェクトの例としては、会社のロゴ又は一般的な利用説明、及び商品注文用の様式、幹部の経歴、当該ウェブページを提供する会社に関する一般的な社歴説明などがある。
【０００４】
動的オブジェクトとは、頻繁に変更されるオブジェクトのことである。例えば、商品カタログには、定期的に更新しなければならない特別セールのお知らせが含まれることもあるだろう。株価又はニュースは日ごとに頻繁に更新される。別の例としては、ウェブページが、そのウェブページを要求するユーザに固有に関連付けられたオブジェクトを含むことも可能である。こうしたオブジェクトのよくある例としては、得意客に名前で呼びかけて挨拶するウェブページがある。こうした構成要素は、ユーザがウェブページを要求する度に更新しなければならない。
【０００５】
一般的に、最近のウェブページは、起点サーバが複数のキャッシュと通信する分散形システムである。ウェブページの静的構成要素は、典型的にはこれらキャッシュに格納されているが、ウェブページの動的オブジェクトは、起点サーバにより生成される。こうしたシステムでは、顧客に提供するためにウェブページを組み立てる過程には、様々な場所から様々な構成オブジェクトを取り出す処理が含まれる。この種の分散形ウェブ提供システムは、起点サーバが静的オブジェクトを提供する必要性がなくなるので有利である。
【０００６】
上述の分散形ウェブ提供システムの１つの欠点は、動的オブジェクトを定期的に更新する必要があるとはいえ、要求がある度にこうしたオブジェクトを常時更新する必要はないという点である。例えば、様々な商品の毎日の価格をリストアップしている動的オブジェクトは、一日に一度だけ更新すれば事足りる。購入可能な品目をリストアップしている動的

オブジェクトは、その商品の最後の１点が販売された時点で更新する必要がある。

【０００７】

動的オブジェクトの更新には、起点サーバが、データベース質問を実行する段階がしばしば含まれる。例えば、顧客が、どんな品目が特別割引の対象となっているかを見たい場合は、起点サーバは、特売品目のリストだけでなく、こうした品目の特売在庫数を特定するデータベース質問を作成しなければならないこともある。

【０００８】

起点サーバの負荷を軽減するためには、こうした動的オブジェクトをキャッシュに格納し、且つ、このキャッシュを定期的に更新して、古くなった動的構成要素が提供されるのを避けるのが好ましい。動的オブジェクト生成に、ウェブページを要求する多くの顧客に共通することが予想されるデータベース質問を実行する必要がある場合は、その質問の結果をキャッシュに格納して、起点サーバが同じ質問を無駄に再実行する必要性を回避すれば有効である。

【０００９】

既存のキャッシュ管理用ソフトウェアは、動的ウェブページを洗練された方法でキャッシュ格納する能力が欠けている。動的ウェブページのキャッシュを管理する従来の方法は、各動的ウェブページに、そのオブジェクトが古くなって更新を必要とする日付を指定するというものである。この方法の欠点は、特別な理由もなく随意に指定したこの更新日が、動的オブジェクトを更新する必要性があるかどうかを判断するための決定的な標識だということである。実のところ、動的オブジェクトが、その更新必要日の遙か以前に古くなることがあり得るのである。逆に、動的オブジェクトが、その更新必要日を過ぎても長期間最新状態のままである場合もある。

【００１０】

発明の概要

本発明によるウェブ提供システムは、キャッシュマネージャと通信するプログラム可能スクリプトを提供することで、キャッシュメモリの内容をより柔軟に制御することを可能とする。このスクリプトはプログラム可能なので、プログラマーがカストマイズできる。具体的には、プログラム可能スクリプトが、トリガイベントを検出し且つそれに応答させうるようにし、更に、このスクリプトが、キャッシュマネージャに、トリガイベントに応答してキャッシュメモリの内容を変更させるようにもできる。

【００１１】

本発明の一態様においては、このウェブ提供システムは、選択したウェブページが要求される頻度を示すアクセスデータを収集する利用モニタも含む。この利用モニタは、アクセスデータをプログラム可能スクリプトに任意選択で提供する。プログラム可能スクリプトは、アクセスデータを用いて、このデータに応答してキャッシュメモリの内容を変更できる。

【００１２】

本発明の別の態様では、このウェブ提供システムは、プログラム可能スクリプトと管理プロセスとの間に通信路を含む。この通信路は、プログラム可能スクリプトが管理プロセスから命令を受け取ることを可能とする。

【００１３】

本発明のその他の特徴及び利点は、次の詳細な説明、請求の範囲、及び添付の図面から明らかになるはずである。

【００１４】

詳細な説明

本発明の実施形態であるシステム１０は、図１に示すように、キャッシュサーバ１４及びデータベース１６に通信する起点サーバ１２を含む。起点サーバ１２は、管理プロセス２０が発行した命令に応答してデータベース質問を作成且つ実行するデータベースエンジン１８をサポートする。管理プロセス２０も起点サーバ１２にサポートされている。データベース１６は、動的ウェブページを作成するのに使用するデータを格納する。例えば、起

点サーバ１２が小売業者に関連付けられている場合は、データベースは、最新の在庫表及び価格情報、又は、今週の特売品情報を含むことができる。典型的には、起点サーバ１２は、第１インターネットリンク２２を介してキャッシュサーバ１４と通信状態にある。図１には１つのキャッシュサーバ１４しか示していないが、システム１０は、地理的に分散した多数のキャッシュサーバ１４を含むことができることが理解されている。

【００１５】

ウェブサーバ１４は、ウェブページの構成オブジェクトを取り込んで、キャッシュメモリ２６内にそれらを格納するキャッシュマネージャ２４をサポートする。これらオブジェクトは、起点サーバ１２上で実行する管理プロセス２０により、キャッシュマネージャ２４に供給される。必要なときは、管理プロセス２０が、入替ウェブページオブジェクトをキャッシュマネージャ２４に提供し、それを受けて、キャッシュマネージャ２４が、キャッシュメモリ２６に常駐する対応した古くなったオブジェクトと入れ替える。

【００１６】

典型的には、クライアントマシーン３０上で実行しているブラウザ３０は、起点サーバ１２が提供するウェブサイトからウェブページを要求する。分散形ウェブ提供システム１０では、これらブラウザの要求は、図１に示したような利用可能なキャッシュサーバ１４に自動的に転送される。従って、ブラウザは、図１に示したように、第２インターネットリンク３２を介してキャッシュマネージャ２４と通信を確立する。

【００１７】

ウェブページへの要求に応答して、キャッシュマネージャ２４は、そのウェブページの構成オブジェクト及びそれらが格納されている場所を識別する。これらオブジェクトには、キャッシュメモリ２６内で既に利用可能なものもある。この場合は、キャッシュマネージャ２４は、これらのオブジェクトをキャッシュメモリ２６から取り込んで、それらをウェブページに含めるためにページアセンブラ３４に与える。

【００１８】

ウェブページのそれ以外の構成オブジェクトは、キャッシュメモリ２６からは入手できない。これらの欠けているオブジェクトについては、キャッシュマネージャ２４が、起点サーバ１２上の管理プロセス２０に要求を発行する。それに応答して、管理プロセス２０は、必要なら欠けているオブジェクトを入手して、それらをキャッシュマネージャ２４に提供する。キャッシュマネージャ２４が、欠けているオブジェクトをページアセンブラ３４に提供すると、ページアセンブラ３４は、このウェブページを完成して、組み立てたウェブページをキャッシュマネージャ２４に提供し、このページはクライアントマシーンに送信される。

【００１９】

ウェブページの欠けているオブジェクトを要求するこの段階が、クライアントへのサービス提供が遅延する原因となる。従って、ウェブページのできるだけ多くの部分をキャッシュメモリ２６に保持しておくのが望ましい。キャッシュメモリ２６内への格納を制限する２つの制約条件がある。それらは、キャッシュメモリ２６の容量に限りがあることと、キャッシュメモリ２６内に格納されるオブジェクトが古くなる傾向があることである。

【００２０】

キャッシュメモリ２６の容量は限られているので、特に頻繁に要求されるオブジェクトのみをそれに格納しておくのが好ましい。これには、特定のオブジェクトに対してどれだけの頻度で要求があると期待されるかを、適当な時点で予測する必要がある。

【００２１】

場合によっては、この予測は単純である。仮に全てのウェブページが、会社ロゴが入ったグラフィック画像を含んでいれば、その構成要素は、キャッシュメモリ２６に格納すべきなのは明らかである。

【００２２】

しかし、その他の場合は、ウェブページの人気が、予測不能な外部イベントにより変動することがある。例えば、流行の移り変わりによって、特定品目の販売を提供するウェブペ

ージの人気が上昇することもある。報道価値のある事件が偶然起こることによって、それまでは目立たなかった話題に関する特集記事の人気が、限られた予測不能な期間に急に上がることもあろう。

【００２３】

キャッシュメモリ２６の容量に限りがあることに加え、このメモリの通用性にも限界がある。定期的にキャッシュメモリ２６を更新しない限り、そこに格納されたオブジェクトが古くなった後も、長期間にわたりクライアントに提供されてしまうことになる。場合によっては、オブジェクトの性質によっては古くなる時期が予測できるため、それらを適切な時期に取り替えることが可能である。例えば、毎日の株価の終値を列挙するオブジェクトは、当然、毎日入れ替える必要がある。

【００２４】

しかし他の場合には、オブジェクトの陳腐化は、殆ど何の前触れもなく或いは全く前触れもなくいつでも起こりうる。一例としては、仮にあるオブジェクトがある店の特売品を列挙していれば、その売れ行きが非常に好調なため、特定人気商品の在庫が早々と底をつくことも十分あり得る。こうした場合は、このオブジェクトは、予定していた更新時期より遙か前に古くなることがあり得る。

【００２５】

キャッシュメモリ２６内の構成オブジェクトは、典型的には、それらを入れ替えるべき日付及び時間を特定する情報を含んでいる。こうした場合は、キャッシュメモリ２６は時間を監視して、適切な時間に更新済みウェブページに対する要求を送信するだけでよい。これが好ましくないのは、上述の通り、予測不能なイベントが発生したり、予測しないときにイベントが発生したために、オブジェクトを予定より早く入れ替える必要が起こることがあるからである。従来のキャッシュマネージャ２４は、指定日時にウェブページを入れ替えるだけなので、ウェブページを予定より早く入れ替えるのは困難である。

【００２６】

上述のこうした不都合に対処するため、本発明によるシステム１０は、キャッシュマネージャ２４とプログラム可能スクリプト３６との間の通信を行う。プログラム可能スクリプト３６は、プログラマーが準備する一組のジャバスクリプト命令でよい。従って、プログラマーが定義したトリガイベントが発生すると、このスクリプト３６は、キャッシュマネージャ２４に、ウェブページの選択した構成オブジェクトを更新させる。こうしたトリガイベントの１つとしては、言うまでもなく、選択した時間の経過がある。しかし、スクリプト３６は自由にプログラム可能なので、トリガイベントは、スクリプト３６が定義可能なものならどんなイベントでもよい。例えば、６人以上の顧客が同一品目を注文した場合は、特定オブジェクトの指定した取り替え時期以前でも、スクリプト３６は、起点サーバ１２からの更新を求める要求を発行できる。こうして、プログラム可能スクリプト３６により、キャッシュマネージャ２４が、ウェブページの構成オブジェクトを取り替えるためのトリガイベントとして時間の経過のみに依存する必要がなくなる。

【００２７】

ウェブページの人気が上昇したり、その人気が閾値を超過すれば、そのウェブページの構成オブジェクトがキャッシュメモリ２６にまだ格納されていない場合は、それらオブジェクトをキャッシュメモリ２６に格納するのが好ましいこともあろう。反対に、特定ウェブページの人気が下降したり、その人気が閾値を下回れば、キャッシュメモリ２６からそのウェブページの構成オブジェクトを削除して、より人気のあるウェブページに関連付けられたオブジェクト格納のためにスペースを空けるのが好ましいかもしれない。

【００２８】

このウェブ提供システムのこうした適応性のある動作を可能とするため、このシステムに、任意選択の利用モニタ３８を更に組み込んで、クライアントマシーンが要求しているウェブページの種類を示すアクセスデータを収集できる。利用モニタ３８を組み込めば、キャッシュマネージャ２４は、特定ウェブページの人気傾向を特定できる。スクリプト３６が、利用モニタ３８が提供するアクセスデータに基づいて、特定のウェブページの人気が

増したこと、或いはその人気が正に上昇するところであると判断すれば、スクリプトは、キャッシュマネージャ２４に命令して、キャッシュメモリ２６に格納するためにそのウェブページの構成オブジェクトのコピーを要求させることができる。逆に、利用モニタ３８が提供するアクセスデータに基づいて、スクリプト３６が、特定のウェブページの人気が以前ほど高くないと判断すれば、スクリプトは、キャッシュマネージャ２４に命令して、キャッシュメモリ２６からそのウェブページの構成オブジェクトを除去させることができる。

【００２９】

利用モニタ３８とスクリプト３６とをこうして組み合わせることで、測定変量が特定のウェブページの人気であり、制御変量が様々なウェブページの構成オブジェクトの記憶位置であるフィードバック制御システムが提供される。利用モニタ３８は、測定変量に関するアクセスデータを入手し、制御装置として作用するスクリプト３６にそれらを提供する。このアクセスデータに基づいて、スクリプト３６は、キャッシュマネージャ２４に、キャッシュメモリ２６の内容を適応管理させる。

【００３０】

更に、スクリプト３６は、利用モニタ３８からアクセスデータを入手して、上述のようにそのアクセスデータに基づいて動作するのでなく、そのデータを管理プロセス２０に報告できる。このアクセスデータは、その後、人間のアナリストが利用可能となり、次に、アナリストは、スクリプトとして定める新たな規則を提案できる。

【００３１】

又、図１に示したような分散形システムではないウェブ提供システムも存在する。こうしたウェブ提供システムも、ウェブページの頻繁に要求される構成オブジェクトが高速取り出し用に格納される高速キャッシュメモリを設けると有利となる。この種の代表的なウェブ提供システムを図２に示す。

【００３２】

図２のウェブ提供システム４０では、キャッシュメモリ２６、キャッシュマネージャ２４、利用モニタ３８、ページアセンブラ３４、及びスクリプト３６は、全て起点サーバ１２上に存在する。従って、図２の実施形態では、ウェブページへの要求を転送するキャッシュサーバは存在しないので、こうした要求をキャッシュサーバに転送する必要はない。その代わり、ウェブページへの要求は、利用モニタ３８が直接受信する。

【００３３】

本発明は、ハードウェア又はソフトウェア、或いはその両方の組合せによっても実現可能である。本発明は、本明細書に記載された方法段階及び図面に従い標準的なプログラミング技法を用いて、コンピュータプログラムにより実現可能である。こうしたプログラムは、プロセッサ、データ格納システム（メモリ及び／又は記憶素子を含む）、少なくとも１つの入力装置、及びＣＲＴ又はプリンタなどの少なくとも１つの出力装置をそれぞれ含んだ、プログラム可能コンピュータ上で実行できるように設計すべきである。プログラムコードは、入力データに適用されて、ここに説明した諸機能を実行し且つ出力情報を生成する。この出力情報は、上述のように、ＣＲＴのような１つ又は複数の出力装置に適用される。

【００３４】

各プログラムは、コンピュータシステムと通信する高レベル手続き言語又はオブジェクト指向プログラミング言語で実現するのが好ましい。しかし、これらのプログラムは、所望ならアセンブリ言語又は機械言語で実現可能である。いずれの場合も、この言語は、コンパイル済み言語でも翻訳言語でもよい。

【００３５】

こうしたコンピュータプログラムはそれぞれ、汎用又は専用プログラム可能コンピュータが読み出し可能な記憶媒体又は装置（例えば、ＲＯＭ又は磁気ディスク）上に格納されており、この記憶媒体又は装置がこのコンピュータに読み出されて、記述されている手順を実行する際に、このコンピュータを構成し且つ作動するのが好ましい。又、本システムは

、コンピュータプログラムを用いて構成されたコンピュータ可読記憶媒体として実現されていると考えることもでき、こうして構成された記憶媒体は、コンピュータを、上述の機能を実行させるため特定の予め定義した態様で動作させる。

【００３６】

本発明及びその好適な実施形態を説明してきたが、新規であると主張し且つ特許証により確保するものは以下の通りである。

【図面の簡単な説明】

【図１】

本発明を組み込んだ分散形ウェブ提供システムである。

【図２】

本発明を同様に組み込んだ集中ウェブ提供システムである。

【図１】

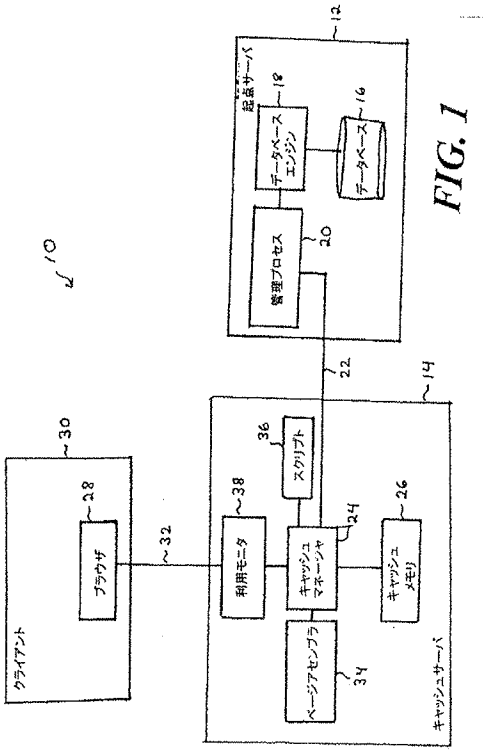


FIG. 1

【図２】

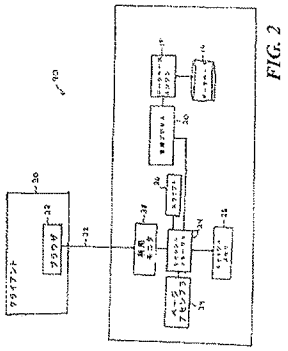


FIG. 2

【国際公開パンフレット】

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 March 2002 (28.03.2002)

PCT

(10) International Publication Number
WO 02/25496 A2

(51) International Patent Classification⁷: G06F 17/30

(21) International Application Number: PCT/US01/27018

(22) International Filing Date: 30 August 2001 (30.08.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/668,110 22 September 2000 (22.09.2000) US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:
US 09/668,110 (CON)
Filed on 22 September 2000 (22.09.2000)

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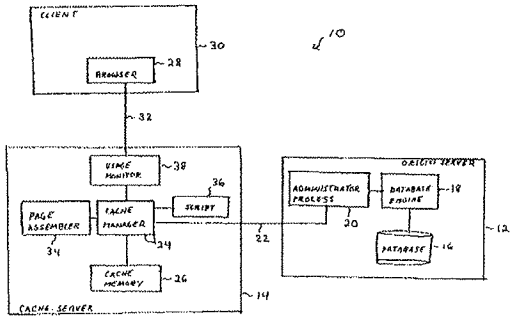
(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, 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, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

[Continued on next page]

(54) Title: SERVING DYNAMIC WEB-PAGES



(57) Abstract: A web-serving system for managing a cache memory having constituent objects of a web-page stored therein includes a cache manager in communication with the cache memory for controlling the content of the cache memory. A programmable script in communication with the cache manager detects the occurrence of a triggering event. In response to the triggering event, the programmable script instructs the cache manager to alter the content of the cache memory.

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SERVING DYNAMIC WEB-PAGES

The invention relates to serving dynamic web-pages, and in particular, to the updating of obsolete portions of a dynamic web-page.

BACKGROUND

A dynamic web-page typically includes one or more static objects and one or more dynamic objects. Serving a web-page thus includes assembling these objects and integrating them to form a web-page.

The static objects are those objects that change rarely, if at all. Examples of such objects include company logos or general instructions and forms for ordering merchandise, biographies of key personnel, and general background about the company serving the web-page.

Dynamic objects are those objects that change frequently. For example, a catalog of merchandise may include notice of special sales that must be updated at regular intervals. Stock prices or news items are often updated on a daily basis. In another example, a web-page can include objects that are uniquely associated with a user requesting the web-page. One common example of such an object can be found in web-pages that greet a repeat customer by name. These components must be updated every time a user requests the web-page.

A modern web-serving system is typically a distributed system in which an origin server is in communication with a plurality of caches. Static components of a web-page are typically stored in the caches, whereas dynamic components of the web-page are generated by the origin server. In such a system, the process of assembling a web-page for serving to a customer involves retrieval of a variety of constituent objects from various locations. A distributed web-serving system of this type is advantageous because it frees the origin server from having to provide static objects.

A disadvantage of the foregoing distributed web-serving system is that although dynamic objects need to be periodically updated, they do not always need to be updated each time a request is made. For example, a dynamic object that lists the daily price of

various commodities needs to be updated only once a day. A dynamic object that lists available items needs to be updated when the last unit of a particular item has been sold.

The updating of dynamic objects often involves execution of a database query by the origin server. For example, when a customer wishes to view what items are being offered for a special discount, the origin server may need to formulate a database query that not only asks for a list of what items are on sale but also determines the number of such items available for sale.

To further reduce the load on the origin server, it is preferable that these dynamic objects also be cached and that the cache be updated periodically to avoid the serving of obsolete dynamic components. Where the generation of a dynamic object requires execution of a database query that is expected to be common to many requesting users, it is useful to cache the results of that query to avoid having the origin server needlessly re-execute the same query.

Existing cache management software is not capable of gracefully accommodating the caching of dynamic web-pages. The conventional method of managing a cache of dynamic web-pages is to assign to each dynamic object a date on which that object becomes stale and must be updated. A disadvantage of this method is that it assumes that a stale date, which is to some extent arbitrarily assigned, is a definitive indicator of whether a dynamic object needs to updated. In fact, there may be occasions when a dynamic object becomes obsolete long before its stale date. Conversely, there may occasions when a dynamic object remains current long after the stale date.

SUMMARY OF THE INVENTION

A web-serving system according to the invention enables the contents of cache memory to be controlled with greater flexibility by providing a programmable script in communication with a cache manager. Because the script is programmable, it can be customized by a programmer. In particular, the programmable script can be made to detect and respond to a triggering event and to instruct the cache manager to alter the content of cache memory in response to that triggering event.

In one aspect of the invention, the web-serving system also includes a usage-monitor for collecting access-data indicative of the frequency with which a selected web-page is requested. The usage-monitor optionally provides the access-data to the programmable script. The programmable script can use this data to alter the content of cache memory in response to the access-data.

In another aspect of the invention, the web-serving system includes a communication path between the programmable script and an administrator process. This communication path enables the programmable script to receive instructions from the administrator process.

Other features and advantages of the invention will be apparent from the following detailed description, the claims, and the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a distributed web-serving system incorporating the invention; and

FIG. 2 is a centralized web-serving system also incorporating the invention.

DETAILED DESCRIPTION

A system 10 embodying the invention, as shown in FIG. 1, includes an origin server 12 in communication with a cache server 14 and a database 16. The origin server 12 supports a database engine 18 for formulating and executing database queries in response to instructions issued by an administrator process 20, also supported by the origin server 12. The database 16 stores data that is used to create dynamic web-pages. For example, if the origin server 12 is associated with a retailer, the database may include current inventory and pricing information, or information regarding weekly specials. The origin server 12 is typically in communication with the cache server 14 over a first internet link 22. Although only a single cache server 14 is shown in FIG. 1, it is understood that the system 10 can include many geographically dispersed cache servers 14.

The cache server 14 supports a cache manager 24 that fetches and stores constituent objects of web-pages in a cache memory 26. These objects are provided to the

cache manager 24 by the administrator process 20 running on the origin server 12. When necessary, the administrator process 20 provides replacement web-page objects to the cache manager 24, which then replaces corresponding obsolete objects that are resident in the cache memory 26.

A browser 28 executing on a client machine 30 typically requests web-pages from a web site served by the origin server 12. In a distributed web-serving system 10, the browser's requests are automatically redirected to an available cache server 14 such as that shown in FIG. 1. The browser thus establishes communication with the cache manager 24 over a second internet link 32, as shown in FIG. 1.

In response to the request for a web-page, the cache manager 24 identifies the constituent objects of the web-page and where they are stored. Some of those objects are already available in the cache memory 26. Under these circumstances, the cache manager 24 fetches these objects from the cache memory 26 and provides them to a page assembler 34 for inclusion in the web-page.

Other constituent objects of the web-page are not available from the cache memory 26. For these missing objects, the cache manager 24 issues a request to the administrator process 20 on the origin server 12. In response, the administrator process 20 prepares the missing objects, if necessary, and provides them to the cache manager 24. The cache manager 24 provides the missing objects to the page assembler, which then completes the web-page and provides the assembled web-page to the cache manager 24 for delivery to the client machine.

The step of requesting missing objects of a web-page is a source of delay in serving clients. It is thus desirable to maintain as much of the web-page in the cache memory 26 as possible. There are two constraints that impose limits on what can be stored in the cache memory 26: the finite capacity of the cache memory 26 and the tendency of objects stored in the cache memory 26 to become obsolete.

Because the cache memory 26 has a limited capacity, it is preferable that only the most frequently requested objects be stored in it. This requires that, at some point, a

prediction be made concerning how frequently requested a particular object is expected to be.

In some cases, this prediction is simple. If every web-page contains a graphic image with the company logo, then clearly that component should be stored in cache memory 26.

In other cases, however, the popularity of a web-page may vary depending on unpredictable external events. For example, changes in fashion may gradually make web-pages offering the sale of certain items more popular. The random occurrence of newsworthy events may cause feature articles on previously obscure topics to surge in popularity for a limited, and unpredictable, time.

In addition to its limited capacity, cache memory 26 has limited currency. Unless steps are taken to periodically update cache memory 26, objects stored therein will be served to clients long after they have become obsolete. In some cases, it is possible to replace objects at appropriate times because the nature of those objects renders their obsolescence predictable. For example, an object listing the daily closing price of a stock, by definition, requires daily replacement.

In other cases, however, obsolescence can strike an object at any time, with little or no warning. For example, if an object lists special sale items available at a store, it is entirely possible that the sale will be so successful that inventory of certain popular items will be prematurely depleted. Under these circumstances, the object may become obsolete long before it is scheduled to be updated.

Constituent objects in the cache memory 26 typically carry information specifying a date and time on which they should be replaced. In such cases, the cache manager 24 need only monitor the time and transmit a request for an updated web-page at the appropriate time. This is a disadvantage because, as noted above, an object may need to be replaced prematurely, either because an unpredictable event occurred or because an event occurred at an unpredictable time. Since the conventional cache manager 24 will

only replace a web-page on its designated date, the premature replacement of a web-page is difficult.

To address the foregoing disadvantages, a system 10 according to the invention provides communication between the cache manager 24 and a programmable script 36. The programmable script 36 can be a set of JavaScript instructions provided by a programmer. The script 36 can thus cause the cache manager 24 to update selected constituent objects of a web page upon the occurrence of a programmer-defined triggering event. One such triggering event can, of course, be the passage of a selected amount of time. However, because the script 36 is freely programmable, the triggering event can be any event that can be defined by the script 36. For example, if more than five clients order the same item, the script 36 can issue a request for an update from the origin server 12 even though the designated replacement time for a particular object may not have arrived. The programmable script 36 thus liberates the cache manager 24 from relying solely on the passage of time as a triggering event for replacing constituent objects of web-pages.

If a web-page increases in popularity, or if its popularity exceeds a threshold, it may be preferable to store the constituent objects of that web-page in the cache memory 26 if they are not already there. Conversely, if a particular web-page is decreasing in popularity, or if the popularity of a web-page falls below a threshold, it may be preferable to remove the constituent objects of that web-page from the cache memory 26 to free space for objects associated with more popular web-pages.

To enable it to engage in such adaptive behavior, the web-serving system can further include an optional usage monitor 38 to collect access-data that illuminates the types of web-pages being requested by client machines. With the usage-monitor 38 in place, the cache manager 24 is able to identify trends in the popularity of particular web-pages. If, on the basis of access-data provided by the usage-monitor 38, a script 36 determines that a particular web-page has become, or is about to become more popular, it can instruct the cache manager 24 to request copies of the constituent objects of that web page for storage in the cache memory 26. Conversely, if on the basis of access-data

provided by the usage-monitor 38, the script 36 determines that a web-page is no longer as popular as it once was, it can instruct the cache manager 24 to remove the constituent components of that web page from the cache memory 26.

The usage-monitor 38 and the script 36 thus combine to create a feedback control system in which the measured variables are the popularities of particular web-pages and the controlled variables are the locations of constituent objects of various web-pages. The usage-monitor 38 obtains access-data concerning the measured variables and provides them to the script 36, which functions as a controller. On the basis of that access-data, the script 36 causes the cache manager 24 to adaptively manage the contents of the cache memory 26.

The script 36 can also take access-data from the usage-monitor 38 and, instead of acting upon it as described above, it can report that access-data to the administrator process 20. This access-data can then be made available to human analysts who can then propose new rules to be implemented as scripts.

There also exist web-serving systems that are not distributed systems such as that shown in FIG. 1. Such web-serving systems also benefit from having a high-speed cache memory in which frequently requested constituent objects of web-pages are stored for rapid retrieval. A representative web-serving system of this type is shown in FIG. 2.

In the web-serving system 40 of FIG. 2, the cache memory 26, the cache manager 24, the usage monitor 38, the page assembler 34, and the script 36, all reside on the origin server 12. In the embodiment of FIG. 2, there is thus no need to redirect requests for web-pages to a cache server because there is no cache server to redirect to. Instead, requests for web-pages are directly intercepted by the usage monitor 38.

The invention can be implemented in hardware or software, or a combination of both. The invention can be implemented in computer programs using standard programming techniques following the method steps and figures described herein. The programs should be designed to execute on programmable computers each comprising a processor, a data storage system (including memory and/or storage elements), at least one

input device, and at least one output device, such as a CRT or printer. Program code is applied to input data to perform the functions described herein and generate output information. The output information is applied to one or more output devices such as a CRT, as described herein.

Each program is preferably implemented in a high level procedural or object oriented programming language to communicate with a computer system. However, the programs can be implemented in assembly or machine language, if desired. In any case, the language can be a compiled or interpreted language.

Each such computer program is preferably stored on a storage medium or device (e.g., ROM or magnetic diskette) readable by a general or special purpose programmable computer, for configuring and operating the computer when the storage media or device is read by the computer to perform the procedures described herein. The system can also be considered to be implemented as a computer-readable storage medium, configured with a computer program, where the storage medium so configured causes a computer to operate in a specific and predefined manner to perform the functions described herein.

Having described the invention, and a preferred embodiment thereof, what we claim as new and secured by letters patent is:

CLAIMS

1. A method for enabling the generation of an updated web-page in a cache, said method comprising:

implementing a programmable rule defining a triggering event, the occurrence of which is indicative of the existence of an obsolete portion of said web-page;

detecting the occurrence of said triggering event;

in response to the occurrence of said triggering event, requesting an update of said obsolete portion; and

receiving an updated portion of said web-page for storage in said cache.

2. The method of claim 1, further comprising

generating a web-page incorporating said updated portion therein; and

serving said web-page to a user.

3. The method of claim 1, wherein implementing said programmable rule comprises interpreting a script containing instructions for defining said rule.

4. The method of claim 1, wherein detecting said triggering event comprises detecting an elapsed time defined by said programmable rule.

5. The method of claim 1, wherein detecting said triggering event comprises detecting the receipt of an updated portion of said web-page.

6. The method of claim 1, wherein requesting an updated portion of said web-page comprises formulating a database query to be carried out by a database engine.

7. The method of claim 1, wherein said web-page comprises, in addition to said updated portion, a plurality of constituent portions and said method further comprises providing an assembly script containing instructions for assembling said constituent portions and said updated portion into said web-page.

8. The method of claim 1, wherein

requesting an update comprises establishing communication with an origin server and requesting said update therefrom, and

receiving an updated portion comprises receiving said updated portion from said origin server.

9. The method of claim 8, further comprising a cache memory element separate from said origin server.

10. The method of claim 8, further comprising a cache memory element at said origin server.

11. The method of claim 1, further comprising collecting access-data indicative of how frequently said web-page is requested.

12. The method of claim 11, further comprising managing the content of said cache in response to said access-data.

13. A web-serving system comprising:

a cache memory having content stored therein;

a cache manager in communication with said cache memory for controlling said content of said cache memory; and

a programmable script in communication with said cache manager for detecting the occurrence of a triggering event, and in response to said triggering event, instructing said cache manager to alter said content of said cache memory.

14. The web-serving system of claim 13, further comprising a usage-monitor for collecting access-data indicative of the frequency with which a selected web-page is requested.

15. The web-serving system of claim 14, wherein said usage-monitor provides said access data to said programmable script, and said programmable script alters said content of said cache memory in response to said access-data.

16. The web-serving system of claim 13, further comprising a communication path between said programmable script and an administrator process, said communication path enabling said programmable script to receive instructions from said administrator process.

17. The web-serving system of claim 13 further comprising a page assembler containing instructions for assembling constituent portions of said web-page into said web-page.

18. The web-serving system of claim 13 wherein said programmable script is a Java script.

19. A computer-readable medium having encoded thereon software for enabling the generation of an updated web-page in a cache, said software comprising instructions for:

implementing a programmable rule defining a triggering event, the occurrence of which is indicative of the existence of an obsolete portion of said web-page;

detecting the occurrence of said triggering event;

in response to the occurrence of said triggering event, requesting an update of said obsolete portion; and

receiving an updated portion of said web-page for storage in said cache.

20. The computer-readable medium of claim 19, wherein said software further comprises instructions for:

generating a web-page incorporating said updated portion therein; and

serving said web-page to a user.

21. The computer-readable medium of claim 19, said instructions for implementing said programmable rule further comprise instructions for interpreting a script containing instructions for defining said rule.

22. The computer-readable medium of claim 19, wherein said instructions for detecting said triggering event comprise instructions for detecting an elapsed time defined by said programmable rule.

23. The computer-readable medium of claim 19, wherein said instructions for detecting said triggering event comprise instructions detecting the receipt of an updated portion of said web-page.

24. The computer-readable medium of claim 19, wherein said instructions for requesting an updated portion of said web-page comprise instructions for formulating a database query to be carried out by a database engine.

25. The computer-readable medium of claim 19, wherein said web-page comprises, in addition to said updated portion, a plurality of constituent portions and said computer-readable medium further comprises instructions for assembling said constituent portions and said updated portion into said web-page.

26. The computer-readable medium of claim 19, wherein

said instructions for requesting an update comprise instructions for establishing communication with an origin server and requesting said update therefrom, and

said instructions for receiving an updated portion comprise instructions for receiving said updated portion from said origin server.

27. The computer-readable medium of claim 19, wherein said software further comprises instructions for collecting access-data indicative of how frequently said web-page is requested.

28. The computer-readable medium of claim 27, wherein said software further comprises instructions for managing the content of said cache in response to said access-data.

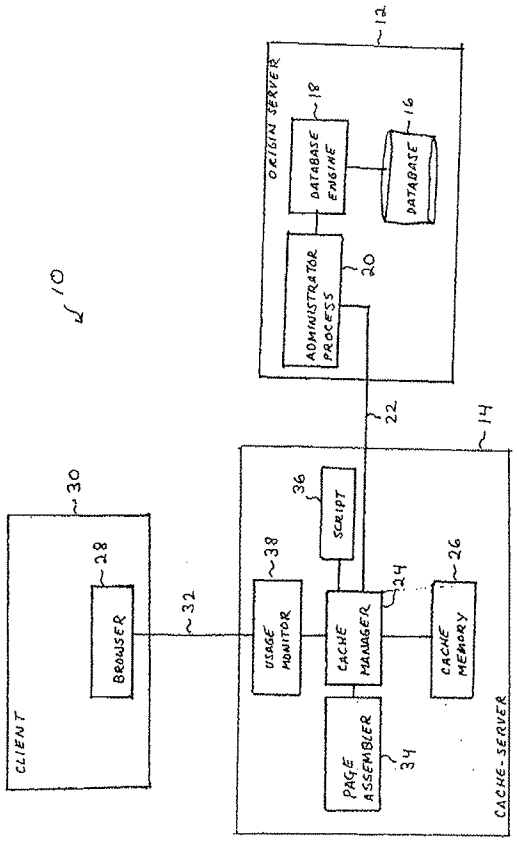
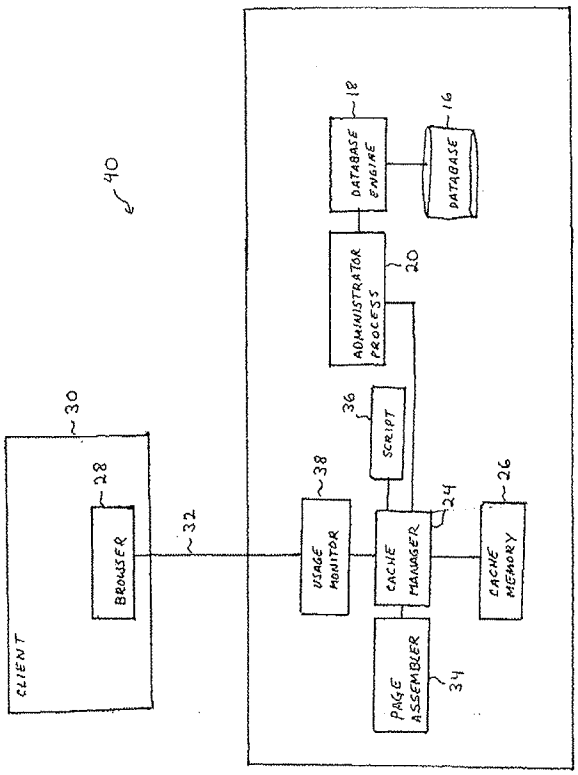

10
12
ORIGIN SERVER
18
DATABASE ENGINE
16
DATABASE
20
ADMINISTRATOR PROCESS
22
14
30
36
SCRIPT
28
38
26
24
32
BROWSER
USAGE MONITOR
CACHE MANAGER
CACHE MEMORY
CLIENT
PAGE ASSEMBLER
34
CACHE-SERVER

FIG. 1


40
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BROWSER
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CLIENT
38
USAGE MONITOR
36
SCRIPT
24
CACHE MANAGER
26
CACHE MEMORY
34
PAGE ASSEMBLER
20
ADMINISTRATOR PROCESS
18
DATABASE ENGINE
16
DATABASE

FIG. 2

フロントページの続き

(81)指定国 AP(GH,GM,KE,LS,MW,MZ,SD,SL,SZ,TZ,UG,ZW),EA(AM,AZ,BY,KG,KZ,MD,RU,TJ,TM),EP(AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE,TR),OA(BF,BJ,CF,CG,CI,CM,GA,GN,GQ,GW,ML,MR,NE,SN,TD,TG),AE,AG,AL,AM,AT,AU,AZ,BA,BB,BG,BR,BY,BZ,CA,CH,CN,CR,CU,CZ,DE,DK,DM,DZ,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,MA,MD,MG,MK,MN,MW,MX,MZ,NO,NZ,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,US,UZ,VN,YU,ZA,ZW

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Ｆターム(参考) 5B075 NR02
5B082 HA02 HA05 HA08

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
The present invention relates to updating of the portion which became old [a dynamic web page] especially about offer of a dynamic web page.
[0002]
The background of invention
Typically, a dynamic web page contains one or more static object and one or more dynamic objects. Therefore, integration of an assembly of these objects and a web page is included in web page offer.
[0003]Even if a static object is changed, it will be an object which is not changed rarely. As an example of such an object, there are a general history-of-company description about the company which provides the logo of a company or a general use description and the style for a goods order, management's career, and the web page concerned, etc.
[0004]
A dynamic object is an object changed frequently. For example, information of the special sale which must be updated periodically may be included in a commodity catalog. A stock price or news is updated frequently day by day. A web page is able to contain the object associated peculiar to the user who demands the web page as another example. There is a web page which calls out and greets a good customer by a name as an example which often has such an object. Such a component must be updated whenever a user demands a web page.
[0005]
Generally, the latest web page is a distributed system with which a starting point server communicates with two or more caches. Although the static component of the web page is typically stored in these caches, the dynamic object of a web page is generated by the starting point server. In such a system, the processing which takes out various composition objects from various places is included in the process which is assembling the web page in order to provide for a customer. Since the necessity that a starting point server provides a static object is lost, this kind of distributed web provision system is advantageous.
[0006]
Although one fault of an above-mentioned distributed web provision system needs to update a dynamic object periodically, it is a point that it is not necessary to always update such an object whenever there is a demand. For example, once it updates to a day the dynamic object which has listed the price of every day of various goods, it ******s. When one point of the last of the product is sold, it is necessary to update the dynamic object which has listed the items which can be purchased.
[0007]
The stage where a starting point server performs a database question is often included in updating of a dynamic object. For example, when a customer wants to see what kind of item whether have been the target of the extra discount, the starting point server may have to create not only the list of bargain eyes but the database question which specifies the bargain sale inventory figures of such an item.
[0008]
In order to reduce the load of a starting point server, it is preferable to avoid that store such a

dynamic object in a cache, and update this cache periodically, and the dynamic component which became old is provided. When it needs to perform the database question expected that it is common to many customers who demand a web page of dynamic object generation, it is effective, if the result of the question is stored in a cache and a starting point server avoids the necessity of rerunning the same question vainly.

[0009]

The capability to carry out cache storing by the method which had the dynamic web page refined lacks the existing cache administrative software. The conventional method of managing a cache of a dynamic web page specifies the date which the object becomes old and needs updating for each dynamic web page. I hear that the fault of this method is a decisive sign for judging whether there is any necessity that this updated date that a special Reason does not have, either and was specified optionally updates a dynamic object, and there is. As a matter of fact, a dynamic object can become old Haruka of the updating required day, or before. On the contrary, even if a dynamic object passes over the updating required day, it may still be the newest state for a long period of time.

[0010]

The outline of invention

The web provision system by the present invention is providing the programmable script which communicates with a cache manager, and makes it possible to control the contents of cache memory more flexibly. Since it is programmable, a programmer can customize this script. A programmable script detects a trigger event, and makes it respond to it specifically, and it is made to get, and this script responds to a trigger event and can make a cache manager change the contents of cache memory further.

[0011]

In one mode of the present invention, this web provision system also includes the use monitor which collects the access information which shows the frequency where the selected web page is required. This use monitor provides a programmable script with access information by option. Using access information, a programmable script responds to this data and can change the contents of cache memory.

[0012]

In another mode of the present invention, this web provision system contains a channel between a programmable script and a managing process. This channel enables a programmable script to receive a command from a managing process.

[0013]

The other characteristics and advantages of the present invention should become clear from the following detailed description, Claim, and attached Drawings.

[0014]

DETAILED DESCRIPTION

The system 10 which is an embodiment of the present invention contains the starting point server 12 which communicates in the cache server 14 and the database 16, as shown in Fig. 1. The starting point server 12 supports the database engine 18 which responds to the command which the managing process 20 published, and creates and performs a database question. The managing process 20 is also supported by the starting point server 12. The data used for the database 16 creating a dynamic web page is stored. For example, when the starting point server 12 is related with the retailer, the database can include the newest stock list and price information, or the bargain information on this week. Typically, the starting point server 12 is in the cache server 14 and a communicating state via the 1st Internet link 22. Although only the one cache server 14 is shown in Fig. 1, it is understood that the system 10 can contain the many, geographically dispersed cache server 14.

[0015]

The web server 14 incorporates the composition object of a web page, and supports the cache manager 24 who stores them in the cache memory 26. These objects are supplied to the cache manager 24 by the managing process 20 performed on the starting point server 12. When required, the managing process 20 provides the cache manager 24 with an exchange web page object, and the cache manager 24 changes for the corresponding object which resides in the cache memory 26 permanently and which became old in response to it.

[0016]
Typically, the browser 30 currently performed on the client machine 30 requires a web page from the website which the starting point server 12 provides. In the distributed web provision system 10, the demand of these browsers is automatically transmitted to the available cache server 14 as shown in Fig.1. Therefore, a browser establishes communication with the cache manager 24 via the 2nd Internet link 32, as shown in Fig.1.
[0017]
Responding to the demand to a web page, the cache manager 24 identifies the place where the composition object of the web page and they are stored. Some these objects are already available within the cache memory 26. In this case, the cache manager 24 incorporates these objects from the cache memory 26, and in order to include them in a web page, he gives the page assembler 34.
[0018]
The other composition object of a web page cannot be obtained from the cache memory 26. About these missing objects, the cache manager 24 publishes a demand to the managing process 20 on the starting point server 12. Responding to it, the managing process 20 obtains the object which is missing if required, and provides the cache manager 24 with them. If the cache manager 24 provides the page assembler 34 with a missing object, the page assembler 34 will provide the cache manager 24 with the web page which was completing and assembling this web page, and this page will be transmitted to a client machine.
[0019]
This stage of requiring the object which the web page lacks becomes a cause by which the service provision to a client is delayed. Therefore, it is desirable to hold as many portions of a web page as possible to the cache memory 26. There are two constraints which restrict storing into the cache memory 26. They are that the capacity of the cache memory 26 has a limitation, and that there is a tendency for the object stored in the cache memory 26 to become old.
[0020]
Since the capacity of the cache memory 26 is restricted, it is preferable to store in it only the object demanded especially frequently. It is necessary to predict at the suitable time whether it is expected that this has a demand by the frequency of which to a specific object.
[0021]
Depending on the case, this prediction is simple. If all the web pages contain the graphic images containing a company logo, it is clear that the component's it should store in the cache memory 26.
[0022]
However, in the case of others, the popularity of a web page may be changed by the external event which cannot be predicted. For example, the popularity of the web page which provides sale of a promotional item may go up by change of fashion. When an incident with report value arises by chance, the popularity of the special feature article about the subject which was not conspicuous till then may go up suddenly in the limited period which cannot be predicted.
[0023]
In addition to the capacity of the cache memory 26 having a limitation, there is a limit also in the popular use nature of this memory. Unless the cache memory 26 is updated periodically, even after the object stored there becomes old, it will be provided for a client over a long period of time. Since the time to become old depending on the property of an object depending on the case can be predicted, it is possible to exchange them at a suitable time. For example, naturally it is necessary to replace every day the object which enumerates the closing prices of a daily stock price.
[0024]
However, in other cases, obsoleting of an object does not almost have any previous announcement, or there is also no previous announcement in them, and it may take place to them always. If the bargains of the store which has a certain object temporarily are enumerated as an example, since the sale is very healthy, stock of a specific hot product may sometimes hit [enough] the beginning and the bottom. In such a case, this object can become older to Haruka or a front than the updating period which was being planned.
[0025]

Typically, the composition object in the cache memory 26 includes the information which specifies the date and time which should replace them. In such a case, the cache memory 26 supervises time and should just transmit the demand to an updated web page to suitable time. It is because the event occurred when the event which cannot be predicted did not occur or it did not predict as above-mentioned, so it may be necessary to replace an object earlier than a schedule that this [whose] is not preferable. Since the conventional cache manager 24 only replaces a web page at the time of a designated date, it is difficult to replace a web page earlier than a schedule.

[0026]

In order to cope with such above-mentioned inconvenience, the system 10 by the present invention performs communication between the cache manager 24 and the programmable script 36. The Java scree PUKUTO command of a lot which a programmer prepares may be sufficient as the programmable script 36. Therefore, when the trigger event which the programmer defined occurs, this script 36 makes the composition object which the web page chose as the cache manager 24 update. As one of such the trigger events, it is needless to say and there is a selected lapse of time. However, since it is freely programmable in the script 36, if the script 36 can be defined, what kind of event may be sufficient as a trigger event. For example, when six or more customers place an order for the same items, the demand which, as for the script 36, the replacement time or before which the specific object specified asks for the updating from the starting point server 12 can be published. It becomes unnecessary in this way, for the cache manager 24 to be dependent only on a lapse of time as a trigger event for exchanging the composition object of a web page in the programmable script 36.

[0027]

If the popularity of a web page goes up or the popularity exceeds a threshold value, when the composition object of the web page has not been stored in the cache memory 26 yet, it will sometimes be preferable to store these objects in the cache memory 26. If the popularity of a specific web page descends or the popularity is less than a threshold value on the contrary, it may be preferable to delete the composition object of the web page from the cache memory 26, and to leave space for object storing related with the more popular web page.

[0028]

Since operation with such adaptability of this web provision system is enabled, the use monitor 38 of option is further built into this system, and the access information which shows the kind of web page which the client machine is demanding can be collected. If the use monitor 38 is incorporated, the cache manager 24 can specify the popular tendency of a specific web page. If the popularity of the specific web page having increased or its popularity judges [being just going to go up and] based on the access information which the use monitor 38 provides in the script 36, It orders the cache manager 24, and since it stores in the cache memory 26, the script can make the copy of the composition object of the web page require. On the contrary, if the script 36 judges that the popularity of a specific web page is not so high as before based on the access information which the use monitor 38 provides, a script, It can order the cache manager 24 and the composition object of the web page can be made to remove from the cache memory 26.

[0029]

By combining the use monitor 38 and the script 36 in this way, variables to be measured are the popularity of a specific web page, and the feedback control system which is a memory site of the composition object of a web page with various control variates is provided. The use monitor 38 obtains the access information about variables to be measured, and provides with them the script 36 which acts as a control device. The script 36 makes the cache manager 24 do adaptation management of the contents of the cache memory 26 based on this access information.

[0030]

The script 36 obtains access information from the use monitor 38, and does not operate based on the access information as mentioned above, but can report the data to the managing process 20. This access information becomes available [human being's analyst] after that, next the analyst can propose the new rule defined as a script.

[0031]

The web provision system which is not a distributed system as shown in Fig. 1 also exists. Such a web provision system will also become advantageous if the composition object as which a web

page is required frequently provides the high-speed cache memory stored in high-speed extraction. This kind of typical web provision system is shown in Fig.2.

[0032]

In the web provision system 40 of Fig.2, the cache memory 26, the cache manager 24, the use monitor 38, the page assembler 34, and the script 36 exist on the starting point server 12 altogether. Therefore, in the embodiment of Fig.2, since the cache server which transmits the demand to a web page does not exist, it is not necessary to transmit such a demand to a cache server. Instead, the use monitor 38 carries out direct reception of the demand to a web page.

[0033]

The present invention is realizable also with the combination of hardware, software, or its both. The present invention is realizable by a computer program using standard programming technique according to the method stage and Drawings which were described in this Description. Such a program should be designed to perform at least one output units, such as a processor, a data storage system (a memory and/or a storage cell are included), at least one input device and CRT, or a printer, on the programmable computer included, respectively. A program code is applied to input data, and performs the functions described here, and generates a print-out. This print-out is applied to one or more output units like CRT as mentioned above.

[0034]

As for each program, it is preferable to realize in the high-level procedure language or object oriented programming language which communicates with a computer system. However, if these programs are requests, they are realizable by the assembly language or a machine language. In any case, a compiled language or an interpretive language may be used for this language.

[0035]

Such a computer program A storage medium in which the reading of a wide use or exclusive use programmable computer is possible respectively, or equipment. (For example, ROM or a magnetic disk) When it is stored upwards, this storage medium or equipment is read to this computer and the procedure described is performed, it is preferable to constitute this computer and to operate. Since the storage medium which could also think that this system was realized as a computer readable storage medium constituted using the computer program, and was constituted in this way performs an above-mentioned function, it operates a computer in the specific, previously defined mode.

[0036]

Although the present invention and its preferable embodiment have been described, what it claims that is new and is secured by a letters patent is as follows.

[Brief Description of the Drawings]

[Drawing 1]

It is a distributed web provision system incorporating the present invention.

[Drawing 2]

It is the concentration web provision system which incorporated the present invention similarly.

[Translation done.]

Electronic Acknowledgement Receipt

EFS ID:	20019164
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	02-SEP-2014
Filing Date:	14-JUL-2010
Time Stamp:	14:10:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370USU1_IDS.pdf	36153 0f1eee799e3625c4ff59931c16eaa22f77755c9f	no	5

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Form (SB08)	370USU1_SB08.pdf	28282 ff463c73b987edee2cc5893db724eb113aa32c4c	no	1
Warnings:					
Information:					
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3	Foreign Reference	JP_11_345164.pdf	2059902 67d9f8dbea9f8673662cb20c99fedda2bdb37b7f	no	41
Warnings:					
Information:					
4	Foreign Reference	JP_200518773.pdf	1415744 3a0f5f7437a33bd2b9013d076c68695be33ff1cd	no	33
Warnings:					
Information:					
5	Foreign Reference	JP_2001265645.pdf	2065952 6b1b8d46e62fdc89402af661d37bff6ef0cd9223	no	34
Warnings:					
Information:					
6	Foreign Reference	JP_2004530176.pdf	1032948 afc78b97e1015f138ddadccbcbcc74c62e0d54c4	no	32
Warnings:					
Information:					
7	Other Reference-Patent/App/Search documents	JP_2012528936_ExRpt_29Jul14_370JP.pdf	123766 8dd8d1db90e73031cf4dd37e186b22a39ed8084f	no	4
Warnings:					
Information:					
			Total Files Size (in bytes):	6762747	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	MIDDLETON, Ted	Art Unit	:	2447
Filed	:	July 14, 2010	Examiner	:	Karen C. Tang
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			

Submitted Via EFS-Web

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

Sir:

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

Copies of all of the cited documents:

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant on _____.

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

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

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

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

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

III

CERTIFICATION

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

☒ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

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

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

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

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

V
REMARKS

It is respectfully requested that:

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

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted,

Date: September 2, 2014

/JCS/

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/836,418	Filing Date 07/14/2010	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

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

APPLICATION AS AMENDED – PART II

AMENDMENT **06/23/2014**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 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

AMENDMENT

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

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

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

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

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

LIE
/YOLANDA A. MIDDLETON/

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.

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

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

Complete if Known

Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or RelevantFigures Appear	T[2]
		CN-101023627A	Aug 22, 2007	Stirbu et al.		
		CN-101374158A	Feb 25, 2009	Burckhart et al.		
		CN-101421719A	Apr 29, 2009	Volodarsky et al.		

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Chinese Examination Report, dated May 12, 2014, Application No. 20108004026.7, filed September 10, 2010; Dkt. No. 0370-CN-01, 10 pgs.	

EXAMINER **DATE CONSIDERED**

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

[19] 中华人民共和国国家知识产权局

[51] Int. Cl.
H04L 12/28 (2006.01)
G06F 17/30 (2006.01)

[12] 发明专利申请公布说明书

[21] 申请号 200580031512.3

[43] 公开日 2007 年 8 月 22 日

[11] 公开号 CN 101023627A

[22] 申请日 2005.8.11
[21] 申请号 200580031512.3
[30] 优先权
[32] 2004.8.19 [33] US [31] 60/603,021
[32] 2005.1.3 [33] US [31] 11/029,027
[86] 国际申请 PCT/IB2005/002572 2005.8.11
[87] 国际公布 WO2006/018717 英 2006.2.23
[85] 进入国家阶段日期 2007.3.19
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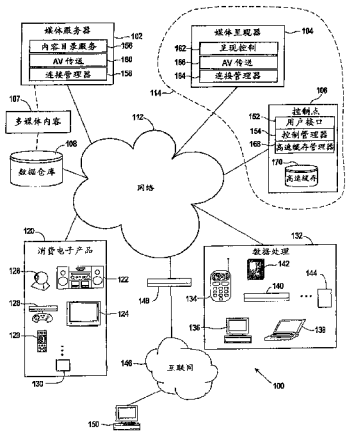
权利要求书 8 页 说明书 22 页 附图 5 页

[54] 发明名称

为控制网络上多媒体数据的部署而对目录服务器数据进行高速缓存

[57] 摘要

将 ad hoc 对等网络上的设备之间的内容描述数据进行同步，包括将多个数据条目存储在目录服务器上。每个数据条目描述可经由网络访问的一个或多个多媒体数据对象。目录服务器的同步对象与数据条目关联。同步对象能够描述对数据条目的改变。数据条目从目录服务器经由网络下载到控制点设备的高速缓存。目录服务器的同步对象响应于目录服务器的数据条目的至少一个中的改变而改变。基于目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新控制点设备的高速缓存。



1.一种将 ad hoc 对等网络上的设备之间的内容描述数据进行同步的方法，包括:

将多个数据条目存储在目录服务器上，每个数据条目描述可经由网络访问的一个或多个多媒体数据对象;

将所述目录服务器的同步对象与数据条目进行关联，所述同步对象能够描述对所述数据条目的改变;

将所述数据条目从所述目录服务器经由网络下载到控制点设备的高速缓存;

响应于所述目录服务器的至少一个数据条目中的改变，改变所述目录服务器的同步对象；以及

基于所述目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新控制点设备的高速缓存。

2.根据权利要求 1 所述的方法，进一步包括修改所述同步对象，以反映所述控制点设备的高速缓存的更新。

3.根据权利要求 1 所述的方法，其中所述同步对象包括数据条目的散列。

4.根据权利要求 1 所述的方法，其中所述同步对象能够描述在与所述多媒体数据对象关联的时间戳和签名的至少一个中的改变。

5.根据权利要求 1 所述的方法，其中所述同步对象能够描述对多个数据条目的一个条目的增加和删除。

6.根据权利要求 1 所述的方法，其中响应于所述目录服务器的数据条目的至少一个中的改变，而改变所述目录服务器的同步对象，包括：将数据添加到所述同步对象，其中所述数据描述至少一个数据条目中的改变。

7.根据权利要求 1 所述的方法，其中响应于所述目录服务器的数据条目的至少一个中的改变，而改变所述目录服务器的同步对象，

包括:

创建描述所述改变的新的同步对象;以及

将所述新的同步对象与所述条目进行关联。

8.根据权利要求7所述的方法,其中对所述控制点设备的高速缓存的更新包括:检查在所述高速缓存的先前更新之后和在所述高速缓存的当前更新之前所添加的多个新的同步对象。

9.一种设备,包括:

网络接口,能够经由ad hoc对等网络与目录服务器进行通信;

处理器,耦接到所述网络接口;以及

存储器,耦接到所述处理器,所述存储器包括,

高速缓存,其能够存储数据;

控制点模块,其具有使得所述处理器进行以下步骤的指令,

将多个数据条目从所述目录服务器经由网络下载到所述高速缓存,每个数据条目描述可经由网络访问的一个或多个多媒体数据对象;

经由网络访问与所述目录服务器的数据条目关联的所述目录服务器的同步对象,所述同步对象能够描述对所述数据条目的改变;

检测所述目录服务器的同步对象中的改变,所述改变响应于所述目录服务器的数据条目的至少一个中的改变而出现;以及

基于所述目录服务器的所述同步对象的改变,利用至少一个数据条目中的改变,更新所述高速缓存。

10.根据权利要求9所述的设备,其中所述控制点模块进一步使得所述处理器修改所述目录服务器的同步对象,以反映所述高速缓存的更新。

11.根据权利要求9所述的设备,其中所述同步对象包括与所述同步对象关联的数据条目的散列。

12.根据权利要求9所述的设备,其中所述同步对象能够描述在

与所述多媒体对象关联的元数据中的改变。

13.根据权利要求 9 所述的设备，其中所述同步对象能够描述对多个数据条目的一个条目的增加和删除。

14.根据权利要求 9 所述的设备，其中对同步对象中的改变的检测包括检测被添加到所述同步对象中的数据，其中所述数据描述至少一个数据条目中的改变。

15.根据权利要求 9 所述的设备，其中对同步对象中的改变的检测包括检测对描述所述改变的所述目录服务器的新的同步对象的创建。

16.根据权利要求 15 所述的设备，其中对所述高速缓存的更新包括检查在所述高速缓存的先前更新之后和在所述高速缓存的当前更新之前所添加的目录服务器的多个新的同步对象。

17.一种计算机可读介质，具有在其上存储的指令，所述指令可由能够耦接到 ad hoc 对等网络的数据处理设备执行，用于执行包括以下的步骤：

将多个数据条目从所述目录服务器经由网络下载到所述数据处理设备的高速缓存，每个数据条目描述可经由网络访问的一个或多个多媒体数据对象；

经由网络访问与所述目录服务器的数据条目的至少一个关联的所述目录服务器的同步对象；

检测所述目录服务器的同步对象中的改变，所述改变响应于与所述同步对象关联的目录服务器的数据条目的至少一个中的改变而出现；以及

基于所述目录服务器的所述同步对象的改变，利用至少一个数据条目中的改变，更新所述高速缓存。

18.根据权利要求 17 所述的计算机可读介质，其中所述步骤进一步包括修改所述目录服务器的同步对象，以反映所述高速缓存的更新。

19.根据权利要求 17 所述的计算机可读介质，其中所述同步对象

包括与所述同步对象关联的数据条目的散列。

20.根据权利要求 17 所述的计算机可读介质，其中所述同步对象能够描述在与所述多媒体对象关联的元数据中的改变。

21.根据权利要求 17 所述的计算机可读介质，其中所述同步对象能够描述对多个数据条目的一个条目的增加和删除。

22.根据权利要求 17 所述的计算机可读介质，其中检测同步对象中的改变包括检测被添加到所述同步对象中的数据，其中所述数据描述至少一个数据条目中的改变。

23.根据权利要求 17 所述的计算机可读介质，其中对同步对象中的改变的检测包括检测对描述所述改变的所述目录服务器的新的同步对象的创建。

24.根据权利要求 23 所述的计算机可读介质，其中对所述高速缓存的更新包括检查在所述高速缓存的先前更新之后和在所述高速缓存的当前更新之前所添加的目录服务器的多个新的同步对象。

25.一种设备，包括：

网络接口，能够经由 ad hoc 对等网络进行通信；

处理器，耦接到所述网络接口；以及

存储器，耦接到所述处理器，所述存储器包括目录服务模块，其具有引起所述处理器进行以下步骤的指令，

存储多个数据条目，每个数据条目描述一个或多个多媒体数据对象，所述多媒体对象是网络实体可经由网络访问的；

将数据条目向网络实体传递；

将同步对象与所述数据实体关联，所述同步对象能够描述对所述数据实体的改变；

响应于与所述同步对象关联的数据条目的至少一个中的改变，而改变所述同步对象；以及

将所述同步对象中的改变传递到网络实体，从而所述网络实体能够基于所述同步对象中的改变而更新所述数据条目的高速缓存。

26.根据权利要求25所述的设备，其中所述目录服务模块进一步使得处理器允许网络实体修改所述同步对象，以反映对所述网络实体的高速缓存进行的更新。

27.根据权利要求25所述的设备，其中所述同步对象包括与所述同步对象关联的数据条目的散列。

28.根据权利要求25所述的设备，其中所述同步对象能够描述在与所述多媒体对象关联的元数据中的改变。

29.根据权利要求25所述的设备，其中所述同步对象能够描述对多个数据条目的一个条目的增加和删除。

30.根据权利要求25所述的设备，其中对所述同步对象的改变包括将数据添加到所述同步对象中，其中所述数据描述至少一个数据条目中的改变。

31.根据权利要求25所述的设备，其中对所述同步对象的改变包括：

创建描述所述改变的新的同步对象；以及

将所述新的同步对象与所述数据条目进行关联。

32.一种计算机可读介质，具有在其上存储的指令，所述指令可由能够耦接到ad hoc对等网络的数据处理设备执行，用于执行包括以下的步骤：

存储多个数据条目，每个数据条目描述一个或多个多媒体数据对象，所述多媒体对象是网络实体可经由网络访问的；

将数据条目向网络实体传递；

存储能够描述对所述数据条目的改变的同步对象；

响应于所述数据条目的至少一个中的改变，而改变所述同步对象；以及

将所述同步对象中的改变传递到网络实体，从而所述网络实体能够基于所述同步对象中的改变而更新所述数据条目的高速缓存。

33.根据权利要求32所述的计算机可读介质，其中所述步骤进一步包括修改所述同步对象，以反映对所述网络实体的高速缓存进行

的更新。

34.根据权利要求 32 所述的计算机可读介质，其中所述同步对象包括与所述同步对象关联的数据条目的散列。

35.根据权利要求 32 所述的计算机可读介质，其中所述同步对象能够描述在与所述多媒体对象关联的元数据中的改变。

36.根据权利要求 32 所述的计算机可读介质，其中所述同步对象能够描述对多个数据条目的一个条目的增加和删除。

37.根据权利要求 32 所述的计算机可读介质，其中改变所述同步对象包括将数据添加到所述同步对象，其中所述数据描述至少一个数据条目中的改变。

38.根据权利要求 32 所述的计算机可读介质，其中对所述同步对象的改变包括：

创建描述所述改变的新的同步对象；以及

将所述新的同步对象与所述数据条目进行关联。

39.一种系统，包括：

ad hoc 对等网络；

目录服务器，耦接到网络并被配置为，

在数据仓库上存储多个数据条目，每个数据条目描述一个或多个多媒体数据对象，所述多媒体数据对象是可经由网络访问的；

将所述目录服务器的同步对象与所述数据实体关联；

响应于改变所述数据条目，而改变所述目录服务器的同步对象；以及

控制点，耦接到所述网络并被配置为，

将多个数据条目从所述目录服务器下载到所述控制点的高速缓存；

检测所述目录服务器的同步对象中的改变；以及

基于所述目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新所述高速缓存。

40.根据权利要求39所述的系统，其中所述控制点进一步被配置为修改所述同步对象，以反映所述高速缓存的更新。

41.根据权利要求39所述的系统，其中所述同步对象包括所述数据条目的散列。

42.一种设备，包括：

装置，其用于存储从目录服务器下载的多个数据条目，每个数据条目描述可经由网络访问的一个或多个多媒体数据对象；

装置，其用于访问与所述目录服务器的数据条目关联的所述目录服务器的同步对象，所述同步对象能够描述对所述目录服务器的数据条目的改变；

装置，其用于检测所述目录服务器的同步对象中的改变，所述改变响应于所述目录服务器的数据条目的至少一个中的改变而出现；以及

装置，其用于基于所述目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新所述设备上存储的数据条目。

43.一种设备，包括：

用于存储多个数据条目的装置，每个数据条目描述一个或多个多媒体数据对象，所述多媒体数据对象是可由网络实体访问的；

用于将数据条目向网络实体传递的装置；

用于存储能够描述对数据实体的改变的同步对象的装置；

用于响应于与所述同步对象关联的数据条目的至少一个中的改变，而改变所述同步对象的装置；以及

用于将所述同步对象中的改变传递到网络实体的装置，从而所述网络实体能够更新存储在所述网络实体上的数据实体的高速缓存。

44.一种控制在网络上的设备之间的多媒体数据的部署的方法，包括：

在目录服务器上存储多个数据条目，每个数据条目描述可经由网络访问的一个或多个多媒体数据对象；

将所述目录服务器的唯一ID与所述数据条目的至少一个进行关联;

将所述数据条目从所述目录服务器经由网络下载到移动终端的高速缓存;

响应于与所述唯一ID关联的数据条目的至少一个中的改变,而改变所述目录服务器的唯一ID;

从所述目录服务器提取描述至少一个数据条目中的改变的一个或多个数据对象;

基于所述一个或多个数据对象,利用至少一个数据条目中的改变,更新所述移动终端的高速缓存。

为控制网络上多媒体数据的部署而对目录服务器数据进行高速缓存

相关申请的交叉引用

本申请要求2004年8月19日提交的美国临时申请No.60/603,021的权益。

技术领域

本发明总体涉及通信，并且更具体地涉及控制消费电子产品网络环境中的多媒体数据。

背景技术

诸如蜂窝电话的移动通信设备正在得到更广泛的接受，这是因为多种能力被添加到这种设备中。在增长的个人数字通信领域中，现代移动技术已经变成一个重要的特殊领域。一些移动通信设备包括允许设备与计算机和其他消费电子产品设备通信的功能。例如，公知为通用即插即用™（UPnP）的标准提供了用于异类处理设备经由网络交换数据的方式。UPnP标准通过多个电子设备定义了针对端对端网络连通性的架构。UPnP标准包括用于服务发现的标准，并且UPnP标准主要目的是用于邻近或ad hoc网络。

各种设备公布UPnP设备和服务描述，因此创建易于连接设备的方式，并简化了网络的实现。UPnP被设计用于工作在多种环境下，包括家庭、商业、公共场所和附着于互联网的设备。UPnP标准是影响Web技术的开放架构，并且被设计用于提供ad-hoc组网和分布式计算。

UPnP模型被设计用于支持针对多种设备类别的零配置组网和自动发现。这允许设备动态地加入网络、获取网络地址、传达设备的

能力并知道其他设备的出现和能力。诸如动态主机配置协议(DHCP)和域名服务(DNS)的互联网协议可以可选地包括在 UPnP 网络中，尽管不需要这些协议。

DHCP 标准还包括音频-视频(AV)规范，具体面向消费电子产品(CE)设备，诸如 TV、VCR、DVD 播放器、立体声系统、MP3 播放器等。通常，CE 设备表示与多媒体内容(例如，电影、音频和静止图像)交互的任何设备，并且 CE 设备可以包括计算机和移动通信设备。

UPnP AV 框架定义三个主要逻辑实体：媒体服务器、媒体呈现器(Renderer)和 AV 控制点。媒体服务器可以使用多媒体内容，并可以经由 UPnP 网络将该内容发送到媒体呈现器设备。媒体呈现器能够将从 UPnP 网络接收的多媒体内容进行呈现。AV 控制点基于端用户需求来协调媒体服务器和媒体呈现器的操作。

AV 控制点包括在 UPnP AV 网络的命令和控制操作中。控制点访问内容目录服务器(CDS)，以发现和列举经由媒体服务器可访问的内容。经由 CDS 可发现的内容可以包括诸如歌曲和视频剪辑的多条内容。CDS 内容还可以包括容器，其代表诸如播放列表和相册的条目的集合。每个 CDS 内容对象，不论是条目或容器，都包括描述对象的各种属性(诸如标题、艺术家等)的元数据。

UPnP 媒体服务器的一个优点是，它能够在中心位置存储多媒体集合，而由于 UPnP 网络的分布式属性，所以内容可以由整个家庭中的不同位置的设备访问。因此，诸如移动通信设备的便携式单元制造理想的控制点以用于控制对这种数据的访问。为了移动通信设备从一个或多个媒体服务器访问数据，则移动通信设备必须与 CDS 进行通信。

将可以理解，CDS 可以包含对几千个内容对象的引用。如果移动设备必须列举出大量对象，则从移动设备访问 CDS 中消耗的带宽可能是非常大的。与有线设备相比，移动通信设备通常具有有限的带宽，因此如果要求移动设备重复地访问如此大的数据量，则移动

设备可能显示出较差的可用率和性能。为了移动设备经由 UPnP 或类似的网络来控制多媒体内容的部署，希望提供一种方式，用以在移动设备和提供目录服务器的那些网络实体之间有效地传送内容目录数据。

发明内容

本公开涉及用于控制网络上的设备之间的多媒体数据的部署的系统、设备和方法。根据本发明的一个实施方式，一种方法包括在目录服务器上存储多个数据条目。每个数据条目描述可经由网络访问的一个或多个多媒体数据对象。目录服务器的同步对象与数据条目关联。同步对象能够描述对数据条目的改变。数据条目从目录服务器经由网络下载到控制点设备的高速缓存。响应于目录服务器的数据条目的至少一个中的改变，而改变目录服务器的同步对象。基于目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新控制点设备的高速缓存。

在更具体的实施方式中，本方法进一步包括修改所述同步对象，以反映控制点设备的高速缓存的更新。在一种配置中，同步对象可以包括数据条目的散列。在其他配置中，同步对象能够描述在与所述多媒体数据对象关联的时间戳和签名的至少一个中的改变。在其他配置中，同步对象能够描述对多个数据条目的一个条目的增加和删除。

在更具体的实施方式中，响应于目录服务器的数据条目的至少一个中的改变，而对目录服务器的同步对象改变包括将数据添加到同步对象。所添加的数据描述至少一个数据条目中的改变。在其他更具体的实施方式中，对目录服务器的同步对象改变还可以包括创建描述改变的新的同步对象，并可以将新的同步对象与条目进行关联。在这些具体的实施方式中，更新控制点设备的高速缓存可以包括检查在高速缓存的先前更新之后和在高速缓存的当前更新之前所添加的多个新的同步对象。

根据本发明的另一实施方式，一种装置包括：网络接口，其能够经由 ad hoc 对等网络与目录服务器进行通信；处理器，其耦接到所述网络接口；以及存储器，其耦接到所述处理器。所述存储器包括能够存储数据的高速缓存并包括控制点模块。控制点模块具有使得处理器进行以下步骤的指令：将多个数据条目从目录服务器经由网络下载到高速缓存，每个数据条目描述可经由网络访问的一个或多个多媒体数据对象；经由网络访问与目录服务器的数据条目关联的目录服务器的同步对象，同步对象能够描述对数据条目的改变；检测目录服务器的同步对象中的改变，该改变响应于目录服务器的数据条目的至少一个中的改变而出现；以及基于目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新高速缓存。

根据本发明的另一实施方式，一种计算机可读介质存储了可由能够耦接到 ad hoc 对等网络的数据处理设备执行的指令。该指令可用于执行包括以下的步骤：存储多个数据条目，每个数据条目描述一个或多个多媒体数据对象，所述多媒体对象可由网络实体经由网络访问；将数据条目向网络实体进行传递；存储能够描述到数据条目的改变的同步对象；响应于至少一个数据条目中的改变，而改变同步对象；以及将同步对象中的改变传送到网络实体，从而网络实体能够基于同步对象中的改变而更新数据条目的高速缓存。

根据本发明的另一实施方式，一种设备包括能够经由 ad hoc 对等网络进行通信的网络接口。处理器耦接到网络接口，而存储器耦接到处理器。存储器包括目录服务模块，其具有引起所述处理器进行以下操作的指令：存储多个数据条目，每个数据条目描述一个或多个多媒体数据对象，所述多媒体对象是网络实体可经由网络访问的；将数据条目向网络实体传递；将同步对象与数据实体关联，同步对象能够描述对数据实体的改变；响应于与同步对象关联的至少一个数据条目中的改变，而改变所述同步对象；以及将同步对象中的改变传送到网络实体，从而网络实体能够基于同步对象中的改变而更新数据条目的高速缓存。

根据本发明的另一实施方式，计算机可读介质具有存储的指令，该指令可由能够耦接到 ad hoc 对等网络的数据处理设备执行。该指令可以用于执行包括以下的步骤：存储多个数据条目，每个数据条目描述一个或多个多媒体数据对象，所述多媒体对象是网络实体可经由网络访问；将数据条目向网络实体传递；存储能够描述对数据实体的改变的同步对象；响应于在至少一个数据实体中的改变，而改变所述同步对象；以及将所述同步对象中的改变传递到网络实体，从而所述网络实体能够基于所述同步对象中的改变而更新所述数据条目的高速缓存。

根据本发明的另一实施方式，一种系统包括 ad hoc 对等网络。目录服务器耦接到网络并被配置为在数据仓库（data store）上存储多个数据条目。每个数据条目描述可经由网络访问的一个或多个多媒体数据对象。将目录服务器的同步对象与所述数据实体关联。响应于改变所述数据条目，而改变目录服务器的同步对象。该系统还包括耦接到网络的控制点。该控制点被配置为将多个数据条目从目录服务器下载到控制点的高速缓存，并检测目录服务器的同步对象中的改变。控制点基于目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新高速缓存。

根据本发明的另一实施方式，一种设备包括：用于将从目录服务器下载的多个数据条目进行存储的装置，每个数据条目描述可经由网络访问的一个或多个多媒体数据对象；用于访问与目录服务器的数据条目关联的目录服务器的同步对象的装置，同步对象能够描述对目录服务器的数据条目的改变；用于检测目录服务器的同步对象中的改变的装置，所述改变响应于目录服务器的数据条目的至少一个中的改变而出现；以及用于基于所述目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新所述设备上存储的数据条目的装置。

根据本发明的另一实施方式，一种设备包括：用于将从目录服务器下载的多个数据条目进行存储的装置，每个数据条目描述可经

由网络访问的一个或多个多媒体数据对象；用于访问与目录服务器的数据条目关联的目录服务器的同步对象的装置，同步对象能够描述对目录服务器的数据条目的改变；用于检测目录服务器的同步对象中的改变的装置，所述改变响应于所述目录服务器的数据条目的至少一个中的改变而出现；以及用于基于所述目录服务器的同步对象的改变，利用至少一个数据条目中的改变，更新所述设备上存储的数据条目的装置。

根据本发明的另一实施方式，一种方法包括在目录服务器上存储多个数据条目。每个数据条目描述可经由网络访问的一个或多个多媒体数据对象。将目录服务器的唯一 ID 与至少一个数据条目进行关联。将数据条目从所述目录服务器经由网络下载到移动终端的高速缓存。响应于与所述唯一 ID 关联的数据条目的至少一个中的改变，改变所述目录服务器的唯一 ID。基于目录服务器的唯一 ID 的改变，利用至少一个数据条目中的改变，更新所述移动终端的高速缓存。

特别地，利用附在这里并形成这里一部分的权利要求书指出了表征本发明新颖性的这些和各种其他优势和特征。然而，为了更好地理解本发明，其优点以及通过其使用所达到的目的，应该对形成本发明另外部分的附图进行参考，并对伴随的描述性内容进行参考，其中存在根据本发明的系统、设备和方法而示出的和描述的特定例子。

附图说明

结合在以下附图中示出的实施方式描述本发明。

图 1 示出根据本发明的实施方式的通用即插即用多媒体系统；

图 2A 示出根据本发明的实施方式的用于初始填充目录服务器高速缓存的过程；

图 2B 示出根据本发明的实施方式的递归地读取目录服务器容器从而填充目录服务器高速缓存的过程。

图 3 示出根据本发明的实施方式的在可用于跟踪内容目录改变

的目录服务器上存储的对象和容器的设置；

图 4 示出根据本发明的实施方式的用于使用高速缓存同步来备份媒体服务器数据的交换序列；以及

图 5 示出根据本发明的实施方式的被配置为控制点和媒体呈现器的移动终端。

具体实施方式

在以下各种示例性实施方式的描述中，参考构成这里一部分的附图，其中通过图示可实现本发明的各种实施方式来进行表示。将理解到在不偏离本发明的范围的情况下，可以利用其他的实施方式，如可以做出结构上的和操作上的改变。

通常，本发明提供一种由控制设备控制多媒体数据的部署的方式。控制设备利用描述多媒体对象的目录数据以及多媒体对象之间的定义关系（例如分层结构）。元数据可以包括诸如多媒体数据文件的位置、多媒体对象的描述和分类、编解码器、传输协议、定制用户数据等的信息。关系数据可以包括对多媒体对象进行分组的集合定义或容器。

本发明可以利用一种机制，该机制使用现有的 UPnP AV 框架来提供用于触发 CDS 和 UPnP AV 控制点之间的元数据的同步的信息。另外，CDS 元数据可以由控制点或作为代表该控制点的设备来存储/高速缓存，从而可以根据用户的位置以良好的方式管理媒体文件（即，高级搜索、上下文感知搜索等）。这些同步机制还可以用于使得家庭网络中的媒体文件的备份过程自动化。

典型地，多媒体目录数据存储在网络的一个或多个服务器单元。控制设备经由网络访问来自服务器单元（例如，媒体服务器的 CDS）的多媒体目录数据。控制设备在数据存储装置中对目录数据进行本地高速缓存。用户设备和服务器单元可以通过系统和对象标识符的使用来对数据进行同步。标识符是使得控制设备确定服务器单元的数据是否已经整体出现改变的标记。标识符还可以用于提供更细粒

度的改变确定，诸如跟踪多媒体对象、容器或其他关系数据的状态。

标识符可以包括在 CDS 中具体格式化的条目，该 CDS 将存储媒体服务器的“签名”。每次在 CDS 中增加、删除或更新新的条目时，媒体服务器将更新该签名。该签名可以表示为每次有改变时进行增加的简单的计数器、元数据的散列或者可以具有也指示改变的属性的更高级的含义。可选地，CDS 可以定义新条目以用于同步，或者内容总结/备份数据，并且该条目可以包括：时间戳、签名等。在这种设置中的控制点还将存储与控制点连接的每个 CDS 的唯一 ID。

传统上，消费电子产品设备使用专用电缆和电接口交换数据。例如，音频/视频（AV）接收器可以具有用于接收模拟合成视频、模拟音频、数字音频、模拟分量视频、数字视频、远程控制信号等的任何组合的输入端。消费电子设备通常经由电缆连接到 AV 接收器，因此通常的娱乐中心在中央位置周围聚集。随着无线家庭组网的不断采用，要求所有设备连接到诸如 AV 接收器的控制位置和中央交换的概念正在变得过时。数字组网技术使得将被访问的多媒体和其他内容分布于家庭中。在一些设置中，还可以经由诸如互联网的长距离接入网而远程访问数据。

在家庭环境中提供数据分发能力的期望导致产生诸如 UPnP 标准的技术。UPnP 被开发用于允许在诸如家庭网络的本地网络中的电子设备之间的容易互操作性。UPnP AV 规范是 UPnP 的修改版，其允许消费电子产品设备在整个家庭网络中分发娱乐内容。尽管针对 UPnP 网络描述了本发明，可以理解，本发明还可以应用于允许在设备之间数字地分发娱乐内容的其他技术。例如，这里描述的概念可以等同地应用于家庭自动化技术中，诸如 X-10、xAP、Jini、HomeRF、蓝牙、IrDA 等。

现在参考图 1，根据本发明的实施方式示出了 UPnP AV 架构 100 的各种实体。具体地，示出了 UPnP 架构的三个逻辑实体：媒体服务器 102、媒体呈现器 104 和控制点 106。媒体服务器 102 可以对位于一个或多个数据仓库 108 中的娱乐内容 107 访问。媒体服务器 102

能够经由网络 112 向诸如媒体呈现器 104 的另一个 UPnP AV 设备发送内容 107。媒体呈现器 104 能够从网络 112 接收多媒体内容 107，并将内容 107 呈现在其硬件接口上。控制点 106 协调媒体服务器 102 和媒体呈现器 104 的操作，从而执行端用户所期望的动作。

媒体服务器 102 和媒体呈现器 104 实现一组 UPnP AV 服务。这些服务能够由控制点 106 使用，以将内容从服务器 102 传送到呈现器 104。在媒体服务器 102 与媒体呈现器 104 之间传输数据中，通常仅在命令和控制操作中涉及控制点 106。这些操作通常包括识别和选择将要用于数据传输的数据、数据传输协议和数据格式。媒体服务器 102 和媒体呈现器 104 将使用由网元 102、104 二者都支持的协议和格式来传输希望的内容。因此，可以独立于由服务器 102 和呈现器 104 所用的协议或数据格式而实现控制点 106。

媒体服务器 102、媒体呈现器 104 和控制点 106 是在 UPnP AV 架构 100 中定义的逻辑实体。在架构 100 中采用的设备可以包括这些实体 102、104、106 的任意组合的功能。例如，设备可以包括如虚线 114 所标识的媒体服务器 104 和嵌入的控制点 106。这样的设备 114 包括对来自呈现内容的相同位置的操作进行控制的能力。

UPnP 架构 100 适合于由广泛的电子设备使用。例如，消费电子产品设备 120 可以利用 UPnP 网络 112。消费电子设备 120 可以包括音频设备 122，电视 124、摄像机 126、视频游戏 128、红外（IR）远程控制 129 或传统上与消费娱乐相关的任何其他设备，如通用消费电子产品设备 130 所代表的。

还可以在 UPnP 架构 100 中利用数据处理设备 132。数据处理设备 132 通常提供计算或通信功能。数据处理设备 132 的例子包括蜂窝电话 134、台式计算机 136、便携式计算机 138、路由器 140、个人数字助理（PDA）142 或由通用设备 144 所代表的任何其他设备。将可以理解，消费电子产品设备 120 与数据处理设备 132 之间的区别是稍微任意的，因为大多数现代电子设备包括数据处理功能（例如，嵌入式微处理器）并且大多数有用的计算/通信设备具有家用应

用。

通常在例如家庭或办公室的本地环境中利用 UPnP 架构 100。架构 100 可以利用有线和无线网络媒体和协议的任何组合。还可以使得 UPnP 架构 100 的网络和设备 120、132 是经由诸如互联网 146 的公共数据传输媒体外部可访问的。例如，UPnP 网关/路由器 148 可以使得远程设备 150 经由互联网 146 或其他公共可访问媒体（例如，公共无线电波）来访问 UPnP 网络 112 的一些或所有单元。

利用 UPnP AV 网络的 AV 能力通常涉及设备之间的交互，所述设备扮演媒体服务器 102、媒体呈现器 104 和控制点 106 的一个或多个角色。这些实体 102、104、106 的逻辑功能可以包括在现有技术已知的消费电子产品和数据处理设备 120、132 中。例如，PDA 142 可以作为控制点 106，以便从用作媒体服务器 102 的计算机 136 选择可用的流传输视频。流传输视频可以被引导到用作媒体呈现器 104 的电视 124。假设架构 100 中的所有设备统一地包括 UPnP 标准，则在设备之间的这种类型的交互可以仅利用用户的最少设置和配置而发生。

UPnP AV 技术的特别有用的应用包括将无线设备（例如，蜂窝电话 134）用作控制点 106。通常，这些无线设备 134 可以被适用于通过多种无线网络和协议通信，包括 802.11 WLAN、蓝牙、CDMA、TDMA 等。无线设备 134 通常是便携式的和由电池供电的，并且理想地适于作为控制点 106，因为用户易于携带无线设备 134 用于例如接收电话呼叫的目的。因此，能够提供 UPnP 控制 106 的无线设备 134 使得用户不必搜索指定的远程控制 129 或其他设备。而且，现代蜂窝电话 134 和类似设备的高级显示能力对于传送控制点 106 所需的潜在的复杂用户接口而言是理想的。

使用无线设备 134 作为控制点 106 的缺点涉及这种设备使用的通常低的带宽连接。尽管一些无线协议（例如，802.11g）提供不断增加的带宽，但大多数便携式设备不能利用这种带宽，例如由于功率传输限制。因此，当执行网络通信时，用作 UPnP 控制点 106 的无

线设备 134 将需要仔细限制带宽的使用。为了更好地理解 UPnP 控制点 106 的带宽利用率的问题，提出了关于控制点 106 在 UPnP AV 规范中怎样操作的更详细的讨论。

UPnP 控制点 106 通常控制媒体服务器 102 和媒体呈现器 104 之间的数据传输。这可以包括：在网络上定位服务器 102 和呈现器 104；列举从服务器 102 可获得的内容；询问服务器 102 和呈现器 106，以确定公共传输协议和数据格式；利用期望的内容以及选择的协议和格式，配置服务器 102 和呈现器 104；启动内容的传输；规定对于诸如数据速率、数量等内容的调整。控制点 106 通常将包括用户接口 152，用于将目录信息传达给用户并从用户接收命令。控制管理器 154 可以用于用户接口 152 和服务器 102 以及呈现器 104 之间的通信，以便执行用户所期望的数据传输任务。

控制点 106 执行的一个任务包括询问媒体服务器 102，以确定服务器 102 上可用的内容。媒体服务器 102 可以访问娱乐内容 107，并能够将该内容 107 发送到另一设备用于呈现。媒体服务器 102 包括内容目录服务（CDS）156，其使得控制点 106 发现和列举服务器的所有内容。服务器 102 还包括连接管理器 158，其允许控制点 106 协商并选择当在媒体服务器 102 和呈现器 104 之间传输内容时所使用的协议和数据格式。服务器 102 可以可选择地包括 AV 传送服务 160，其用于在媒体呈现器 104 上回放期间控制内容流（例如暂停、快进）。

媒体呈现器 104 被配置为经由网络 112 或其他装置（例如直接的有线连接）接收内容 107，并呈现内容 107。内容 107 可以由任何形式的电子设备呈现，所述电子设备包括视频显示器、扬声器、发动机、加热/制冷单元、电化学设备、开关设备等。媒体呈现器 104 包括呈现控制 162，其可以被用于控制内容怎样被呈现。呈现控制 162 可以用于改变诸如视频亮度和音量的参数。媒体呈现器 104 包括连接管理器 164，其用于与媒体服务器 102 协商和选择协议和数据格式。类似于媒体服务器 102，媒体呈现器可以包括 AV 传送服务 166，

其被用于控制内容流。

关于由无线设备 134 所使用的带宽，特别关注的是 CDS 156 与控制点 106 之间的通信。CDS 156 使得控制点 106 发现和列举可由媒体服务器 102 访问的内容 107。以术语“对象”描述媒体服务器 102 上可用的内容 107。CDS 156 提供描述这些对象的各种属性的元数据。元数据包括诸如作为题目、持续时间、创建时间、修改时间等属性。

当控制点 106 加入网络 112 时，其使用简单服务发现协议（SSDP）来发现网络中的所有媒体服务器 102 和媒体呈现器 104。实现媒体服务器和媒体呈现器模板的所有设备将以设备的描述文档的 URL 来响应于该请求。一旦定位媒体服务器和呈现器，控制点 106 得到和解析描述文档，以确定每个设备的确切能力。

在初始化之后，控制点 106 可以使用每个媒体服务器的 CDS 156 来列举可从服务器 102 获得的内容。控制点 106 可以从多个服务器收集 CDS 156 信息，并且将该信息聚集到可从特定网络 112 获得的所有内容的单个视图中。CDS 156 利用可扩展标记语言（XML）描述对象和它们的相关性质。对象是能够由 CDS 从浏览或搜索动作返回的任何数据实体。一种性质代表 CDS 156 或对象的客户端定义特征。CDS 156 将 XML 中的性质表达为单元或属性。

CDS 156 利用对象分类的层次。具体地，对象的两个高层分类是“项目”和“容器”。项目通常表示 AV 数据的单元，诸如 CD 轨道或电影文件。容器代表对象的集合。容器可以包含项目和其他容器。CDS 156 形成提供这些对象的描述的 XML 文档。

CDS 156 主要是基于“动作”的，意指能够从控制点 106 调用某些预定的动作，并且 CDS 156 以数据做出响应。控制点 106 可以调用至少两个动作，以从 CDS 发现对象：“浏览”和“搜索”。CDS 156 至少支持“浏览”动作，并且可以选择地支持“搜索”动作。浏览包括在 CDS 目录结构的条目点（即，容器对象）处提取数据对象列表。浏览动作可以由功能原型“Browse（ObjectID、BrowseFlag、Filter、

StartingIndex、RequestedCount）”来表示。ObjectID 指当前被浏览的对象的 ID。CDS 156 中的根容器具有总是为“0”的 ObjectID。如果 BrowseFlag 被设置为“BrowseMetadata”，则 CDS 156 将返回与 ObjectID 相关的元数据。如果 BrowseFlag 被设置为“BrowseDirectChildren”，则 ObjectID 指容器，并且 CDS 156 将返回与在容器中包含的对象关联的元数据的列表。

控制点 106 可以使用在根容器处开始的浏览动作来发现 CDS 156 的整个内容。作为该动作和随后动作所找到的结果的任何容器被用作针对随后的浏览请求的条目点。以这种方式，控制点 106 可以遍历由 CDS 所展示的整个目录结构。

响应于“浏览”动作，CDS 156 将返回描述所请求的对象的 XML 段。CDS 156 还将返回指示结果中返回的对象数目、容器中对象的总数目（如果 BrowseFlag 被设置为 BrowseDirectChildren）以及 UpdateID 的值。UpdateID 是由 CDS 156 使用的标识符，以指示容器的当前状态。如果容器的性质或内容改变，则其 UpdateID 被增加。如果 ObjectID 是零（即，对象是根容器），则返回的 UpdateID 是称为 SystemUpdateID 的特定标识符。无论何时 CDS 156 目录中发生任何改变，SystemUpdateID 变量都改变。

CDS 156 可以可选择地相应于“搜索”动作。搜索用于找到匹配特定搜索准则的一组对象。CDS 156 能够提供性质列表，在其上能够通过响应于 GetSearchCapability 动作进行搜索。由于利用浏览动作，所以 CDS 156 将返回描述满足该搜索的对象的 XML 段（如果能够找到任何所述对象）。

在控制点 106 通过浏览或搜索动作得到对象的列表时，控制点 106 可以将结果显示在用户接口 152 中。用户可以从该接口 152 选择项目以用于进一步浏览，或选择项目以用于呈现。在用户选择将要被呈现的内容之后，控制点 106 从 CDS 156 提取元数据，用于所选择的项目。该元数据被用于确定所支持的传送协议和数据格式。接着控制点 106 将该元数据与来自呈现器的连接管理器 164 的数据进

行比较，以确定呈现器 104 是否能够呈现所期望的内容。

在识别公共协议/格式之后，控制点 106 在服务器 102 和呈现器 104 二者上调用连接管理器服务 158、164。向每个设备通知目标协议/格式，并且相应的连接管理器 158、164 基于所选择的公共协议和格式建立和配置多媒体回放会话。

CDS 156 主要设计用于使得控制点 106 发现可经由 CDS 156 访问的数据。控制点 106 可以完全依赖于 CDS 156 来确定媒体服务器 102 上的内容的当前状态。但是，存在当将 CDS 156 数据高速缓存在控制点设备 106 上是优选的情况。例如，控制点 106 可以提供经由 CDS 156 不可得到的高级搜索能力，诸如上下文感知搜索。另外，控制点 106 可以更快地搜索本地高速缓存而不是通过低带宽连接向 CDS 156 发送请求。当从网络 112 完全断开连接时，控制点 106 甚至可以访问本地高速缓存。在其他情况下，控制点 106 可以访问多个 CDS 156 服务器，所述多个 CDS 156 服务器不总是可由控制点 106 访问。通过将搜索限制到仅在当前网络连接上可用的那些 CDS，可以改善搜索。

根据本发明的一个实施方式，控制点 106 包含高速缓存管理器 168 和高速缓存 170，该高速缓存用于存储从 CDS 156 接收的对象元数据。高速缓存 170 可以在任何形式的易失性或非易失性存储器上实现，所述易失性或非易失性存储器包括硬驱动器、可移动介质、闪存、随机存取存储器（RAM）等。高速缓存 168 是软件组件，其能够自动启动动作（例如，浏览），以从 CDS 156 提取对象数据，并将该数据存储到高速缓存 170 中。高速缓存管理器 168 还可以监视由用户接口 152 执行的 CDS 动作，以及控制管理器 154 以创建部分 CDS 高速缓存和/或以更新现有的高速缓存条目。用户接口 152 可以显示数据和启动动作，例如，经由高速缓存管理器 168 进行搜索，代替经由控制管理器 154 和 CDS 156 进行搜索。

当在 UPnP 网络上第一次发现 CDS 156 时，控制点 106 设备可以被配置为读取和高速缓存整个 CDS 156 数据集合。用于根据本发

明的实施方式的将 CDS 数据读取到高速缓存 170 的一个示例过程在图 2A 和 2B 中示出。通过以根容器作为参量调用 202 图 2B 中所示的 Read_Container 例程 204，Build_Cache 例程 200 开始。通过取得 206 This_Container 中的所有对象，Read_Container 例程 204 开始，This_Container 是传递到例程 204 中的参量。例如，通过以 BrowseDirectChildren 的 BrowseFlag 调用浏览（Browse），可以执行该步骤 206。通过在 This_Container 中找到的容器（如果有的话）循环迭代 208，并且在每个找到的容器上重复地调用 210 Read_Container。在 Read_Container 210 返回之后，针对每个容器的元数据被添加 212 添加到高速缓存。接着，通过循环迭代 214，项目以及每个项目的元数据被添加 216 添加到高速缓存。在所有容器和项目的元数据被添加到高速缓存之后，例程退出 218。

作为图 2A 和图 2B 所示例程的可选方案，对于 CDS 接口的修改可以允许在单个动作中下载整个 CDS 目录结构。例如，浏览动作可以被扩展到允许在单个调用中下载整个 CDS 数据集合。这可以通过配置浏览动作以支持诸如“BrowseAll”的 BrowseFlag 而完成。使用 BrowseAll 标志的浏览动作将返回列出整个 CDS 元数据存放的文档。

再次参考图 1，当第一次连接到 UPnP 网络 112 上时，高速缓存 170 可以被填充一些或所有的 CDS 数据。一旦高速缓存 170 包含至少部分的 CDS 内容时，必须存在一种方式来确定 CDS 156 中的条目何时改变。重要的是，高速缓存 170 和 CDS 156 仍是同步的，以便控制点 106 正确地操作。目前，CDS 156 保持 SystemUpdateID，无论何时当由 CDS 156 跟踪的任何对象被添加或删除时，或当对象的元数据改变时，该 SystemUpdateID 将改变。CDS 156 提供异步事件，该异步事件将 SystemUpdateID 的值通知给系统实体。另外，在任何时间，客户端实体都能够通过在 CDS 156 处调用 GetSystemUpdateID 动作来请求 SystemUpdateID 的当前值。客户端可以使用后一种方法，以针对 SystemUpdateID 的当前值而轮询 CDS 156。

通常，控制点 106 将本地存储其遇到的每个 CDS 的内容。当控

制点 106 连接到已知的 CDS 156 时，控制点 106 将首先读取“签名”条目（例如，SystemUpdateID）。如果“签名”不同于在控制点 106 中高速缓存的“签名”，则 CDS 内容已经改变，并且同步过程被触发。

无论何时 CDS 对象改变，CDS 156 仅被要求修改 SystemUpdateID，但不规定 SystemUpdateID 被改变的方式。SystemUpdateID 可以是每次改变时增加的计数器，或可以是被特定编码以指示改变的属性和范围的值。最后一个选择的一个例子是设置 SystemUpdateID 的一个位元，以指示最后一次改变包含或不包含对元数据的改变。类似的位元可以用于指示对象的添加或删除，或其他改变类型。在另一实现中，SystemUpdateID 的一些位元可以用于指示其中发生改变的一部分 CDS 目录树，从而加速对所改变的数据的提取。

SystemUpdateID 的使用给出了 CDS 156 内的改变的粗粒度指示，因为其仅指示 CDS 156 已经改变，但不指示改变了什么或在哪里发生改变。CDS 156 还可以提供 ContainerUpdateID，当单个容器的内容改变时，该 ContainerUpdateID 改变。ContainerUpdateID 可以作为事件由 CDS 156 发送出去。ContainerUpdateID 事件包括一组定制（ordered）对。每个定制对包括“ContainerID、ContainerUpdateID”。控制点 106 可以监视 ContainerUpdateID 事件，通过浏览或搜索提取当前容器数据，并使用所提取的数据以更新高速缓存 170。

控制点 106 可以存储这些 ContainerUpdateID 和/或 SystemUpdateID 作为用于 CDS 156 的每个对应条目的唯一标识符。这使得控制点 106 智能地仅激活网络中实际可用的高速缓存 107 中的那些条目。例如，用户可以在家庭或工作处具有音乐收藏。用户可能想在这两个位置使用相同的应用和相同的设备来管理音乐。工作和家庭 CDS 将具有不同的唯一 ID（例如，SystemUpdateID），并且 CDS 内的各个条目还将具有唯一 ID（例如，ContainerUpdateID）。通过跟踪这些唯一 ID，控制点 106 能够为用户检测位置和激活可用

条目。

通常，控制点 106 能够针对更新 ID 中的改变而轮询 CDS 156 或监听常规出现的更新事件。尽管更新 ID 的这种跟踪对连续地连接的系统是有用的，但用作控制点 106 的移动设备 134 可以仅与 CDS 156 间断地连接。因此，如果控制点 106 在给定的时间量与网络 112 断开连接，则关于接收更新事件的信任（reliance）将不保证高速缓存 170 被同步。在这种情况下，控制点 106 可在重新连接时遍历 CDS 目录并且重新下载所有或一些改变的条目时。但是，如果仅存在对 CDS 156 的微小改变而控制点 106 被断开连接，则这可能消耗大量带宽，并且不是有效的。

一种用于对于间断连接的控制点 106 的高速缓存 170 进行同步的方案是，将 CDS 156 改变的记录作为 CDS 目录服务的一部分保存。根据本发明的一个实施方式的保存 CDS 改变的一种方式如图 3 所示。CDS 156 可以保存特定分类的容器，所述特定分类的容器存储在根容器 302 之下。在该例子中，容器是类 object.container.cache_delta 的。当将多媒体对象数据提供给用户时，控制点和其他客户端将被配置为忽略这种类型的容器。没有这种同步特性的控制点还将忽略该条目，因为其与常规的树相分离，并且该条目将不截断现有的条目。直接在根容器之下的 cache_delta 容器的位置是任意的；CDS 目录结构中的任何已知位置将是足够的。可以理解，利用最新的 CDS 树信息，媒体服务器将连续地保存这些条目。

在所示的例子中，两个 cache_delta 容器 302、304 位于根容器 300 之下。针对两个客户端 CLIENT_1 和 CLIENT_2 保存容器 302、304。通过 CDS 156 上调用的动作，控制点或其他客户端能够自动地创建这些目录结构。在每个容器之下是 object.ite.cache_delta 类型的对象列表，例如项目 306。在本例中，容器 302、304 包含多个 cache_delta 项目。每个 cache_delta 可以包含对 CDS 目录的单次改变的记录。控制点或其他客户端可以查看它们自身的 cache_delta 容器，读取该 cache_delta 项目，并将 cache_delta 项目中列出的改变应用到

客户端的本地高速缓存。接着客户端可以从容器删除 cache_delta 项目。其他设置可以包括针对当前或未来的删除而对已经检查的条目加标志或者标记。这样，CDS 156 可以将改变列表提供给客户端，而客户端不必遍历整个 CDS 目录结构。

在另一设置中，cache_delta 目录 302、304 可以仅包含与改变相连的单个文件。在这种设置中，可以针对根容器 300 或 CDS 156 中的其他已知位置的每个客户端保存单个文件，因此消除了对于特定 cache_delta 容器 302、304 的需要。在每个设置中，cache_delta 项目将包含这种数据，诸如时间戳、签名、objectID、改变的属性和更新本地高速缓存所需的其他数据。

图 3 中所示的设置上的其他变化包括在 CDS 156 中放置“同步元数据”条目。同步元数据可以包括类似于 SystemID 的唯一 ID，但还将包括签名或全部或部分 CDS 156 的散列。同步元数据还可以包括允许控制点确定改变的属性的其他元数据，类似于 cache_delta 项目 306。控制点可以包括“同步代理”，其被配置为读取该元数据并仅应用在该元数据中描述的那些改变。

根据 UPnP 执行同步所使用的同步协议，CDS 156 可以具有这种同步元数据条目的多个实例。例如，如果利用 SyncML 完成同步，则将存在包括 SyncML 需要的一些元数据的一个条目。在另一设置中，可以保存多个同步元数据条目，每个条目包括关联的 SystemID。如果 SystemID 是计数器，则控制点将比较 SystemID 的高速缓存值与 CDS 156 上最近的值。更新控制点将包含增加地读取和应用具有关联的 id 值的每个同步元数据条目，该关联的 id 值的范围在旧的 SystemID 和当前 SystemID 之间。将可以理解，多 CDS 系统中的每个 CDS 156 可以利用不同的同步协议，并且该条目将包括这种信息和那些协议所需的其他元数据。

如在以上各个例子中所描述的同步能够由用户当进行浏览或搜索动作时触发，或者可能由运行在设备上的同步代理自动触发。控制点 106 可以这种方式被配置，即当接近于媒体服务器 102 时，控

制点 106 将自动地下载所有相关数据，和/或在 object.container.cache_delta 或其他同步元数据中搜索。在控制点 106 已确定可下载的数据可从 CDS 156 获得之后，可以自动地触发同步，或者控制点 106 能够提示用户，指示在媒体服务器 102 中存在新的或修改的数据。接着用户可以浏览以观看新内容和启动同步。

通常，在搜索和系统浏览期间，对数据进行有规律地高速缓存的控制点将具有较快地响应。对于无线设备而言尤其如此，所述无线设备通常具有比有线连接更低的带宽和更高的延时。由于典型的系统仅不频繁地改变，所以本地高速缓存的下载和更新将对带宽利用具有最小的影响。

CDS 改变的跟踪可以用于除移动控制点之外的其他应用中。图 4 示出了根据本发明的实施方式的使用高速缓存更新概念的数据备份方案。在图 4 中，媒体服务器 102 包含如前所述的数据仓库 108 和 CDS 156。备份服务器 402 包括用于与 CDS 156 交互的控制点 106。备份服务器 402 发挥功能以将来自媒体数据仓库 108 的数据备份到备份数据仓库 404 上。

在第一次使用中，控制点 106 可能需要确定 CDS 156 的整个内容。在该说明中，控制点 106 使用具有先前描述的 BrowseAll 扩展的浏览命令 406。作为响应，CDS 156 以针对 CDS 数据存储装置 108 中的所有条目 408 的元数据进行回答。将理解到使用如图 2A 和 2B 中所示的目录遍历，可以得到相同的条目 408。

控制点 106 向备份数据存储装置 404 发出备份命令 410，该备份数据存储装置 404 包括需要被提取以供备份的所有条目。备份数据存储装置 404 启动条目的提取 412（例如，FTP GET），并且条目从媒体数据存储装置 108 下载 414 到备份数据存储装置 404。将可以理解，提取 414 的数据可以包括存储在媒体服务器 102 或任何其他地方的实际数据对象（例如，媒体文件）与 CDS 元数据的任何组合。此后，备份服务器 402 仅需要执行增加的备份。

图 4 示出了增加备份的两个方案。在第一方案中，控制点 106

针对改变主动地轮询 416 CDS 156。该轮询 156 可以包含检查 SystemUpdateID、ContainerUpdateID，或使用关于图 3 所述的规定的高速缓存的数据。如果已经发生了改变，响应 418 用于确定 delta。类似于完全备份，控制点 106 命令 420 备份数据仓库 404 对文件进行备份。然而，这次仅 delta 需要被备份。如以前那样，数据仓库 404、108 执行提取请求 422 并下载 424，以立即备份该数据。

图 4 中的下一个方案使用由 CDS 156 生成的异步更新事件。CDS 156 有规律地发送传递媒体数据存储装置 108 中任何改变的事件 426。控制点 106 仅将 delta 高速缓存 428 到内部高速缓存（例如，图 1 所示的高速缓存 170）。在这种方案下，备份服务器 402 被配置为在一定时间期间执行备份，诸如在深夜当网络可能不活跃时。因此，在预定时间，控制点 106 响应于内部产生的定时器事件 430 并启动备份请求 432，这将得到数据提取请求 434 和递增数据 436 的下载。将可以理解，如图 4 所示的完全的和增加的备份可以使用 CDS 轮询和 CDS 事件的任何组合以确定备份数据，以及立即备份和定时器时间备份的任何组合。

UPnP 标准是足够灵活的，以允许多种类型的设备执行作为媒体服务器、媒体呈现器和控制点的角色。移动设备作为控制点是特别有用的，并且还可以用作媒体呈现器。现在参考图 5，示出了代表性的移动计算设备 500 的例子，其能够根据本发明的实施方式执行操作。本领域的技术人员将可以理解，示例性移动计算设备 500 仅代表可以与这种移动设备关联的通用功能，而且地面计算系统类似地包括计算电路，以执行这种操作。

所示的移动计算设备 500 适于执行作为 UPnP AV 网络中的媒体呈现器和控制点二者的角色。移动计算设备 500 包括处理/控制单元 502，诸如微处理器、简化指令集计算机（RISC）或其他中央处理模块。处理单元 502 不需要是单个设备，并且可以包括一个或多个处理器。例如，处理器单元可以包括主处理器和关联的从处理器，所述从处理器被耦接用于与主处理器进行通信。

处理单元 502 控制设备 500 的基本功能。可以包括关联的那些功能作为存储在程序存贮器/存储器 504 中的指令。在本发明的一个实施方式中，与存贮器/存储器 504 关联的程序模块存储在非易失性电可擦可编程只读存储器（EEPROM）、闪存只读存储器（ROM）等中，从而当移动终端掉电时信息不会丢失。用于执行传统的移动终端操作和根据本发明的操作的相关软件还可以经由数据信号被发送到移动计算设备 500，例如经由诸如互联网和中间无线网络的一个或多个网络进行电下载。

程序存贮器/存储器 504 还可以包括操作系统，用于执行与移动计算设备 500 上的功能关联的应用和功能。程序存储器 504 可以包括一个或多个只读存储器（ROM）、闪存 ROM、可编程和/或可擦 ROM、随机存取存储器（RAM）、用户接口模块（SIM）、无线接口模块（WIM）、智能卡、硬盘驱动器或其他可移动存储设备。

为了执行控制点功能，程序存贮器/存储器 504 包括控制点管理器 154、高速缓存管理器 168 和高速缓存 170。控制点管理器 154 与用户接口应用程序接口（API）506 进行接口连接，用于显示媒体服务器元数据，并用于接收用户选择，从而控制 UPnP 多媒体服务。为了执行媒体呈现功能，程序存贮器/存储器 504 包含连接管理器 164、AV 传送模块 166 和呈现器控制 162。呈现器控制 162 还与 UP API 506 进行接口连接，以便将输出呈现给诸如显示器和扬声器的物理设备。

移动计算设备 500 包括耦合到处理/控制单元 502 的硬件和软件部件，用于执行网络数据交换。移动计算设备 500 可以包括多网络接口，用于维持有线或无线数据连接的任何组合。具体地，所示的移动计算设备 500 包括无线数据传输电路，用于执行网络数据交换。

该无线电路包括数字信号处理器（DSP）516，用于执行多种功能，包括模数（A/D）转换，数模（D/A）转换、语音编码/解码、加密/解密、检错和纠错、比特流变换、滤波等。通常耦接到天线 520 的收发器 518 发射输出的无线电信号 522 并接收与该无线设备关联的进入的无线电信号 524。

处理器 502 还耦合到与移动终端关联的用户接口 528 单元。移动终端的用户接口 528 可以包括，例如，诸如液晶显示器的显示器 526、键盘 510、扬声器 512 和麦克风 514。将这些和其他用户接口部件耦接到处理器 502 是现有技术所公知的。可以采用其他用户接口机制，诸如语音命令、开关、触摸板/屏、使用指向设备、跟踪球、操纵杆的图形用户接口、或任何其他用户接口机制。

提供图 5 的移动计算设备 500 作为计算环境的代表性例子，在该环境中可以应用本发明的原理。根据这里提供的描述，本领域的那些技术人员将可以理解，本发明可等同地应用于多种其他当前已知的和未来的移动和地面计算环境。例如，桌面计算设备类似地包括处理器、存储器、用户接口和数据通信电路。因此，本发明可应用于任何已知的计算结构，其中可以经由网络对数据进行传递。

硬件、固件、软件或其组合可以用于执行这里所描述的各种功能和操作。用以执行与本发明关联的功能的多项包含代码的加工产品旨在包含在任何计算机可用媒体上或在传输这种程序的任何传输媒体中永久存在或临时存在的计算机程序。传输媒体包括但不限于经由无线/无线电波通信网络、互联网、内联网、基于电话/调制解调器的网络通信、硬连线/电缆连接的通信网络、卫星通信和其他静止或移动网络系统/通信链接的传输。从这里提供的描述，本领域的技术人员很容易能够将如所述创建的软件与合适的通用或专用计算机硬件进行组合，以创建根据本发明的系统、设备和方法。

为了说明和描述的目的，给出了本发明的示例性实施方式的以上描述。其不旨在将本发明进行穷尽或限制到所公开的精确形式。根据以上教导，可以进行多种修改和变形。不旨在利用该详细描述对本发明的范围进行限制，而由这里所附的权利要求书来限定。

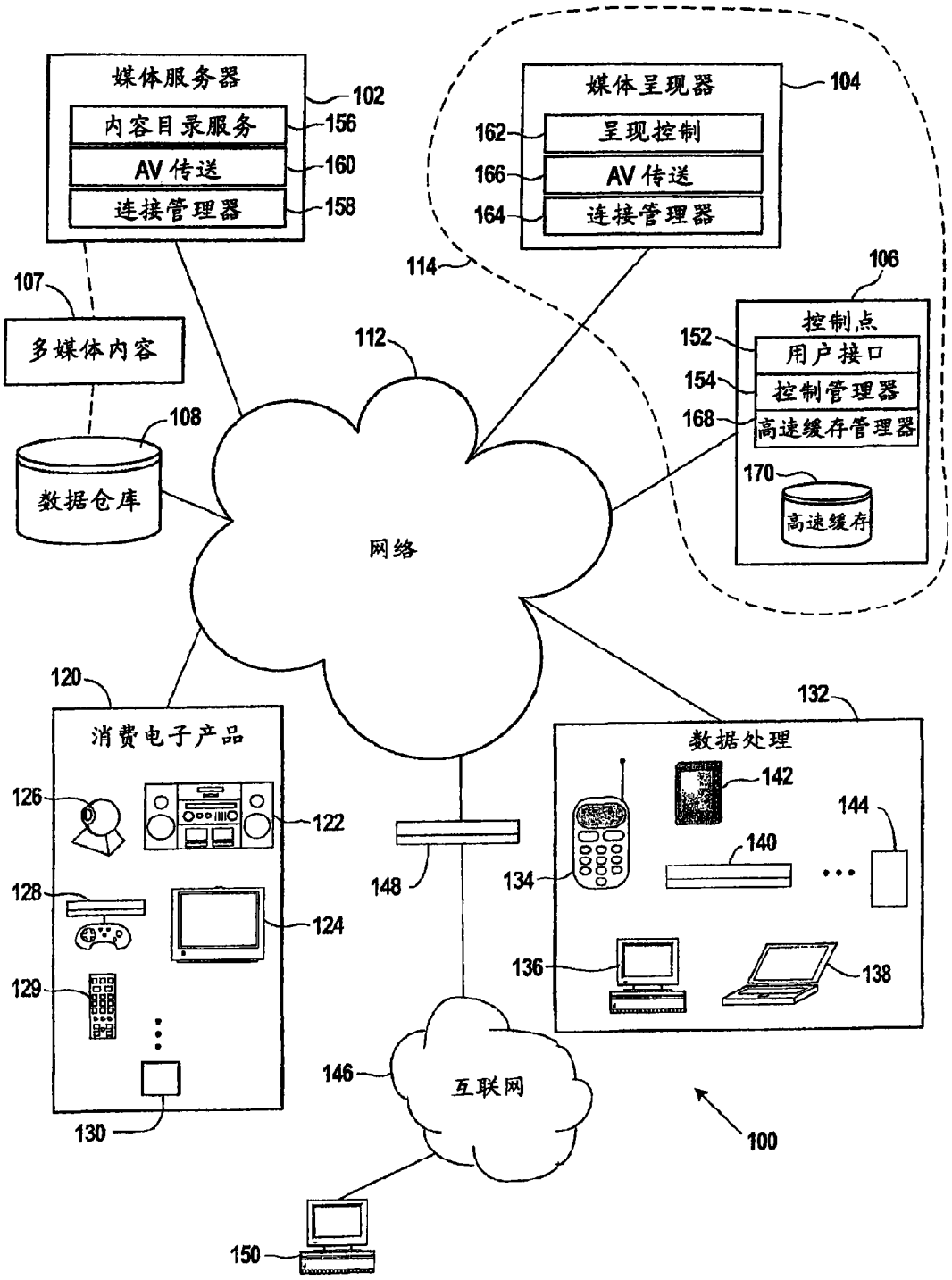

媒体服务器
102
内容目录服务
156
AV 传送
160
连接管理器
158
媒体呈现器
104
162
呈现控制
166
AV 传送
164
连接管理器
114
106
控制点
152
用户接口
154
控制管理器
168
高速缓存管理器
170
高速缓存
107
多媒体内容
108
数据仓库
112
网络
120
消费电子产品
126
122
128
124
129
130
132
数据处理
142
144
140
134
136
138
148
146
互联网
100
150

图 1

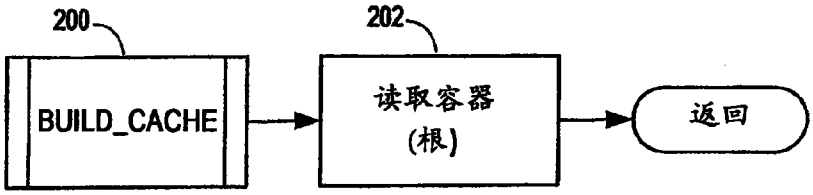

200
BUILD_CACHE
202
读取容器
(根)
返回

图 2A

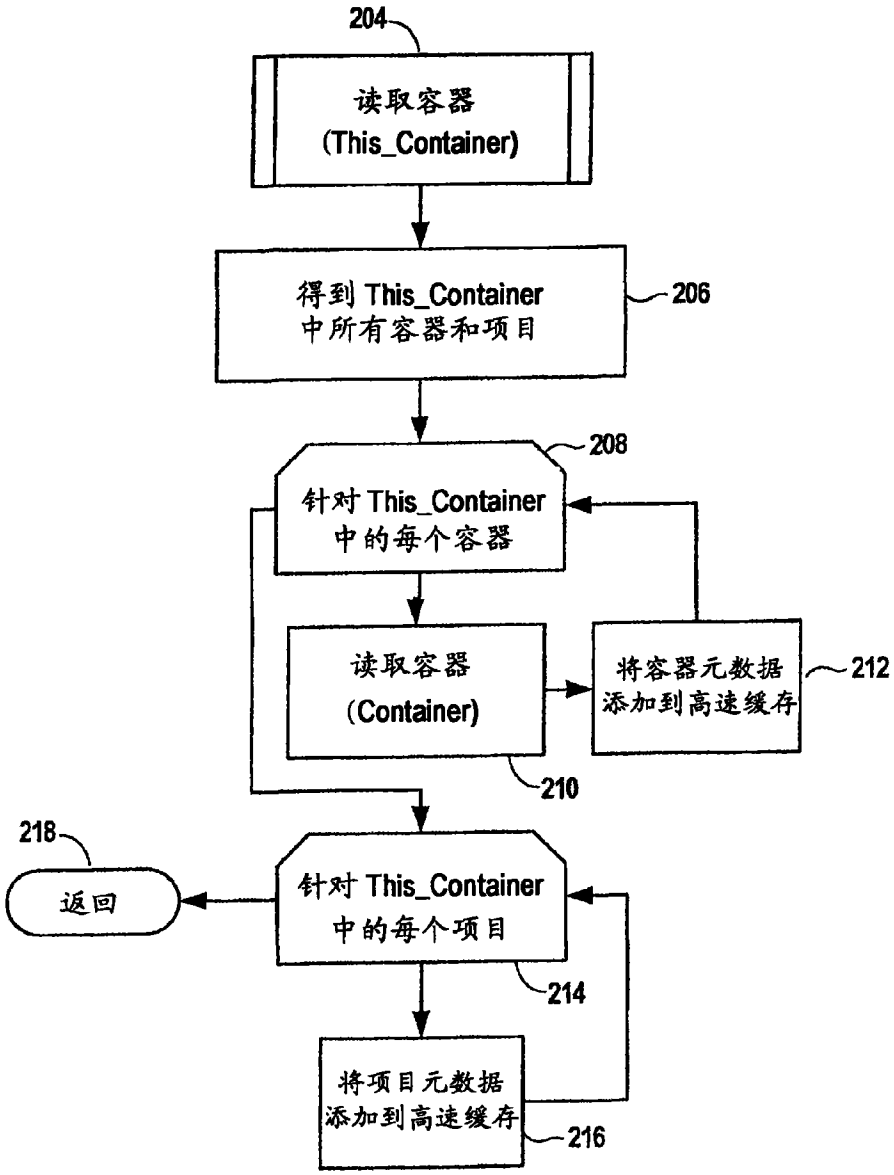

204
读取容器
(This_Container)
得到 This_Container
中所有容器和项目
206
208
针对 This_Container
中的每个容器
读取容器
(Container)
将容器元数据
添加到高速缓存
212
210
218
返回
针对 This_Container
中的每个项目
214
将项目元数据
添加到高速缓存
216

图 2B

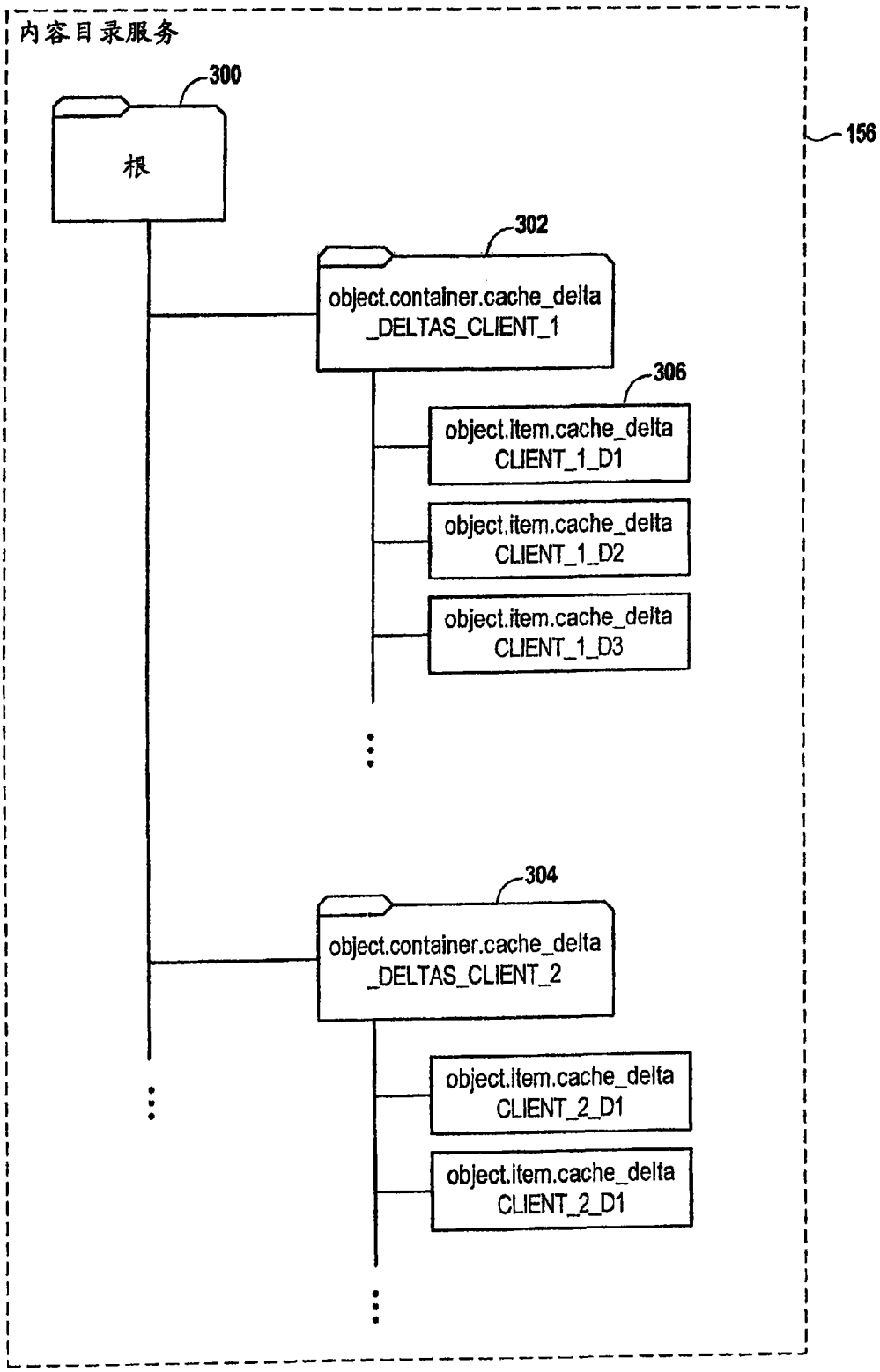

内容目录服务
300
根
156
302
object.container.cache_delta
_DELTAS_CLIENT_1
306
object.item.cache_delta
CLIENT_1_D1
object.item.cache_delta
CLIENT_1_D2
object.item.cache_delta
CLIENT_1_D3
304
object.container.cache_delta
_DELTAS_CLIENT_2
object.item.cache_delta
CLIENT_2_D1
object.item.cache_delta
CLIENT_2_D1

图 3

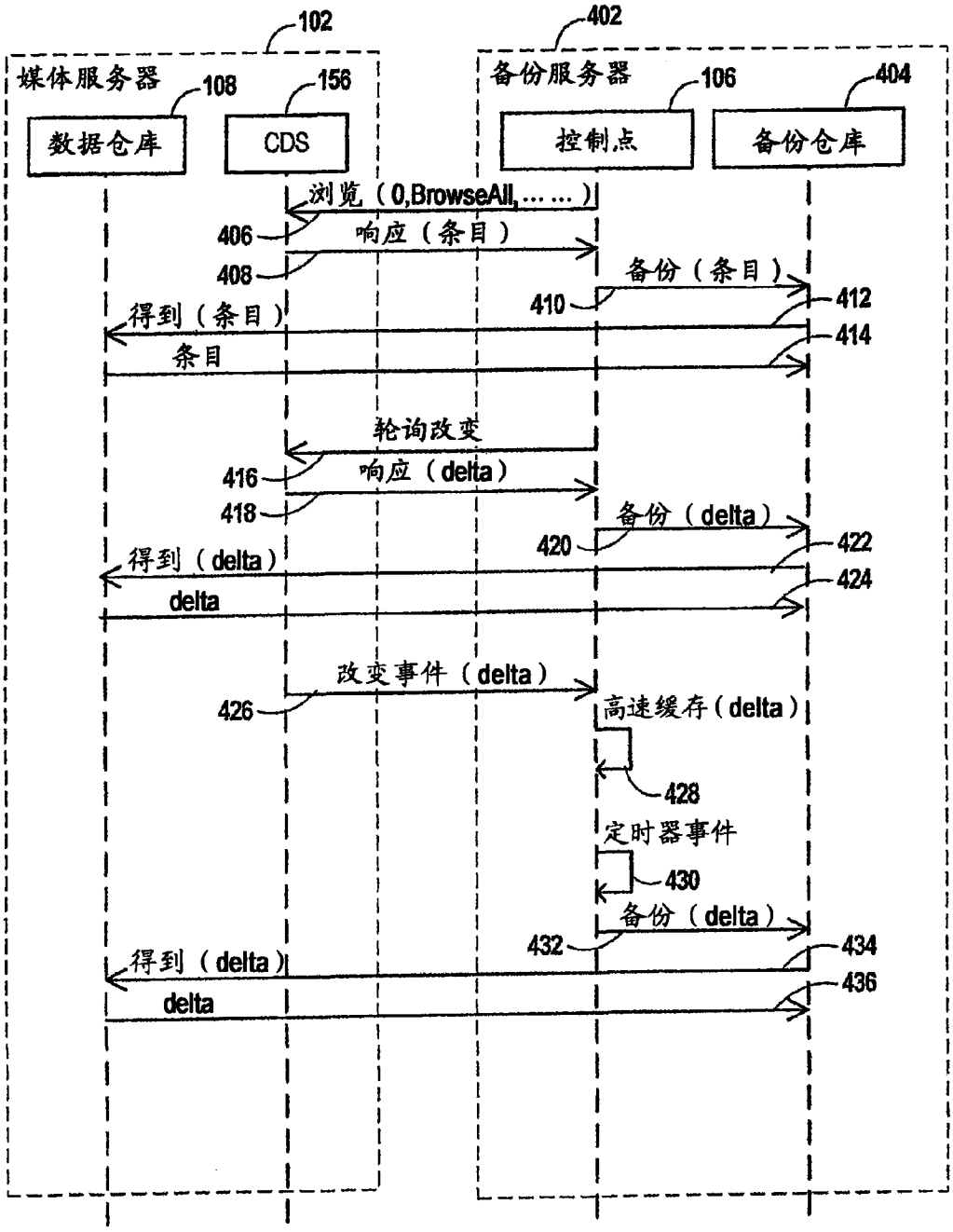

102
媒体服务器
108
数据仓库
156
CDS
402
备份服务器
106
控制点
404
备份仓库
浏览（0,BrowseAll,……）
406
响应（条目）
408
备份（条目）
410
412
得到（条目）
414
条目
轮询改变
416
响应（delta）
418
备份（delta）
420
422
得到（delta）
424
delta
改变事件（delta）
426
高速缓存（delta）
428
定时器事件
430
备份（delta）
432
434
得到（delta）
436
delta

图 4

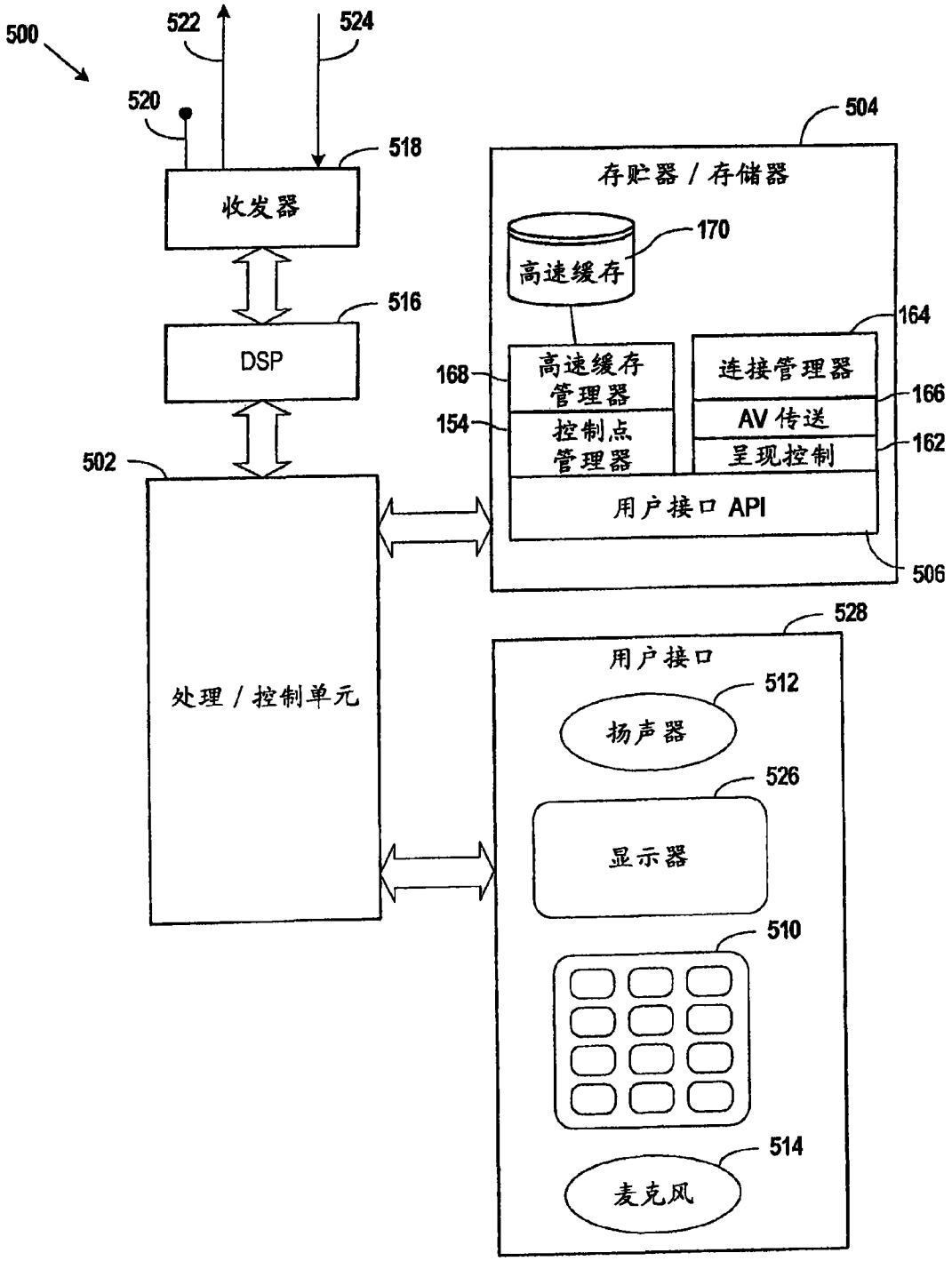

500
522
524
520
518
收发器
516
DSP
502
处理 / 控制单元
504
存贮器 / 存储器
170
高速缓存
164
168
高速缓存管理器
连接管理器
166
154
控制点管理器
AV 传送
162
呈现控制
用户接口 API
506
528
用户接口
512
扬声器
526
显示器
510
514
麦克风

图 5

[19] 中华人民共和国国家知识产权局

[51] Int. Cl.
H04L 29/08 (2006.01)
H04L 12/56 (2006.01)

[12] 发明专利申请公布说明书

[21] 申请号 200810213308.9

[43] 公开日 2009 年 2 月 25 日

[11] 公开号 CN 101374158A

[22] 申请日 2008.8.22
[21] 申请号 200810213308.9
[30] 优先权
[32] 2007. 8.24 [33] US [31] 11/844,894
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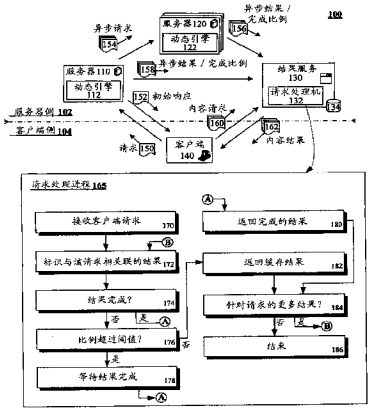
权利要求书 4 页 说明书 12 页 附图 2 页

[54] 发明名称

根据结果完成比例将缓存内容或处理内容递送给客户端

[57] 摘要

本发明公开了一种服务器侧的结果分发服务软件程序的解决方案。程序可以接收和存储与来自不同内容提供服务器的请求上下文相关的结果。可以从客户端接收异步请求，客户端发起定义该请求的上下文的内容请求。可以确定满足所接收的客户端请求的请求结果的完成程度。完成程度可以与与先前建立的阈值进行比较。根据比较步骤的产生结果，可以将动态处理的结果或者先前缓存的结果传送给客户端。产生动态处理的结果的服务器侧操作可以是在由客户端发送内容请求之后发起的操作。先前缓存的结果可以根据在由客户端发送内容请求之前发起的处理而生成。



1. 一种用于根据完成程度选择性地使用缓存结果以处理请求的方法，包括:

服务器侧的结果服务接收客户端侧针对内容的请求，所述内容包括由服务器侧的资源产生的结果，所述服务器侧的资源将所产生的结果递送至所述服务器侧的结果服务;

确定最终产生所述结果的处理操作的完成程度；以及

基于所确定的完成程度，选择性地提供对所述客户端侧请求的缓存响应或者对所述客户端侧请求的动态产生的响应。

2. 根据权利要求 1 所述的方法，进一步包括:

服务器接收针对内容的原始请求；以及

所述服务器发起多个异步操作来满足所述原始请求，其中，所述异步操作之一是所述处理操作，其中，在已经传送了所述原始请求之后并且在已经进行了所述发起步骤之后，所述服务器侧的服务接收所述客户端侧的请求。

3. 根据权利要求 2 所述的方法，进一步包括:

其中，当确定步骤指示所述处理操作完成时，提供包含来自所述处理操作的结果的动态产生的响应。

4. 根据权利要求 3 所述的方法，其中，在接收到所述客户端侧针对内容的请求时，所述处理操作正在执行，所述方法进一步包括:

将所述完成程度与先前建立的阈值进行比较;

当所述完成程度大于所述阈值时，等待所述处理操作完成，并且在完成时提供包含来自所述处理操作的结果的所述动态产生的响应;以及

当所述完成程度不大于所述阈值时，提供所述缓存响应。

5. 根据权利要求 4 所述的方法，其中，所述先前建立的阈值是可配置的值，其是由发出请求的客户端建立的。

6. 根据权利要求 1 所述的方法，其中，所述结果服务是被配置为

处理REST型请求的服务器侧程序，所述处理操作由Web服务器处理，所述客户端侧请求是从客户端浏览器发出的HTTP请求。

7. 根据权利要求1所述的方法，进一步包括：

客户端向请求接收服务器发出所述客户端侧请求，所述客户端侧请求定义了请求上下文；

请求接收服务器发出针对所述请求上下文的多个异步请求；

结果服务接收处理所述异步请求的结果，其中，所述结果服务是被配置为处理REST型请求的服务器侧程序；以及

所述结果服务将接收到的结果提供给所述客户端，其中，所述客户端聚合针对所述请求上下文的结果。

8. 根据权利要求1所述的方法，其中，所述结果服务初始地按照提供步骤向所述客户端提供至少一个缓存结果，并且其中，所述结果服务随即通过向所述客户端提供同等的接收到的结果来更新所述缓存结果。

9. 根据权利要求1所述的方法，其中，所述结果是针对所述客户端侧请求而由所述服务器侧的资源产生的同步处理结果。

10. 根据权利要求1所述的方法，其中，所述结果是针对单个请求上下文而产生的多个异步处理结果之一。

11. 根据权利要求10所述的方法，其中，所述多个异步处理结果是由不同的服务器产生的。

12. 根据权利要求11所述的方法，其中，由最初发出建立所述单个请求上下文的客户端请求的客户端来聚合所述异步处理结果。

13. 根据权利要求1所述的方法，其中，权利要求1所述的步骤是由至少一个机器按照具有多个代码段的至少一个计算机程序来自动执行的步骤，其中，所述代码段可由所述至少一个机器执行，所述至少一个计算机程序存储在机器可读介质中。

14. 一种用于根据结果完成程度选择性地将缓存内容或处理内容递送给客户端的方法，所述方法包括：

Web服务器从客户端接收针对内容的REST型请求；

发起多个异步操作，所述异步操作一起满足所述 REST 型请求；

将操作结果递送给结果服务；

所述结果服务从所述客户端接收针对所述操作结果的至少一个 REST 型请求；以及

基于产生所述操作结果的所述异步操作的结果完成程度，所述结果服务选择性地递送缓存内容或者处理的内容以响应于所述 REST 型请求。

15. 根据权利要求 14 所述的方法，进一步包括：

当所述完成程度指示操作结果完成时，将所述操作结果提供给所述客户端；

当所述完成程度大于先前建立的阈值时，等待将要处理的所述操作结果，并且将所述操作结果提供给所述客户端；以及

当所述完成程度不大于所述先前建立的阈值时，将所述缓存内容提供给所述客户端。

16. 根据权利要求 14 所述的方法，其中，所述结果完成程度是完成比例。

17. 一种结果分发服务，包括存储在机器可读介质上的机器可读指令的集合，其中，所述机器可读指令的集合可以由至少一个机器执行，使得所述至少一个机器执行以下步骤：

接收和存储与来自多个不同内容提供服务器相关的结果；

从客户端接收多个异步请求，所述客户端发起了定义请求上下文的内容请求；

响应于每个接收到的客户端请求，确定满足所接收到的客户端请求的请求结果的完成程度；

将所述完成程度与先前建立的阈值进行比较；以及

基于所述比较步骤的产出结果来传送动态处理结果或者先前缓存的结果，其中，在所述客户端发送所述内容请求之后，发起产生所述动态处理结果的服务器侧操作，并且其中，所述先前缓存的结果是从所述客户端发送所述内容请求之前发起的进程得到的。

18. 根据权利要求 17 所述的结果分发服务，所述步骤进一步包括:

当所述完成程度指示所述请求结果完成时，将所述完成结果提供给所述客户端;

当所述完成程度大于所述先前建立的阈值时，等待所述请求结果完成处理，并且将所述完成结果提供给所述客户端；以及

当所述完成程度指示所述请求结果不大于所述先前建立的阈值时，将所述先前缓存的结果提供给所述客户端。

19. 根据权利要求 17 所述的结果分发服务，其中，所述结果分发服务是被配置为响应 REST 型请求的软件程序，并且其中，所述完成程度是完成比例。

20. 根据权利要求 17 所述的结果分发服务，其中，在异步 HTTP 消息中将所述接收结果的每一个传送给所述结果分发服务，其中，在异步 HTTP 消息中指明来自所述客户端的每个所述异步请求，其中，在异步 HTTP 消息内将所述传送的结果提供给所述客户端。

根据结果完成比例将缓存内容或处理内容递送给客户端

技术领域

本发明涉及 HTTP 请求处理，并且更具体地，涉及根据结果完成比例将缓存内容或处理内容选择性地递送给客户端。

背景技术

对于服务器而言，发送缓存的响应来替代处理的响应是有益的。也即，服务器可以立即将缓存响应传送给客户端，使得客户端无需等待处理的响应，从而节省了服务器的处理资源。存在对内容缓存技术的扩展（例如，stale-while-revalidate HTTP 缓存控制扩展和 Coral 内容分发网络），其建立缓存内容的有效时间周期。在此时间周期之后，可以发送陈旧（stale）的响应，同时处理服务器进行查询以确定请求是否有效，并且根据需要来替换缓存的内容。该扩展具有明显的时间限制，并且不会更新最初触发重新生效的请求。此外，存在这样的系统：其建立处理超时周期，其中一旦超过了该超时周期，便提供缓存的内容来替代处理的内容。

正在出现这样的服务器侧系统，其针对单个请求上下文而异步地处理内容。这些系统可以使用多个服务器来处理异步请求，并且可以执行客户端侧的内容聚合。例如，_____提交的美国专利申请序号公开了一种在单应用服务器环境中用于异步上下文敏感请求操作的客户端侧聚合的方案。2007 年 8 月 22 日提交的美国专利申请号 11/843,038 扩展了客户端侧内容聚合的概念，其教导了上下文敏感请求结果的客户端侧聚合，其中，请求结果由多个服务器异步处理。此外，_____提交的美国专利申请序号_____教导了一种共享服务器生成的响应输出以满足由不同客户端发起的内容请求的方案，该方案可以与本发明的布置结合使用。

传统的内容缓存技术难以处理针对单个请求上下文而产生多个请求/结果这样的情况，其中，每个异步请求将具有不同的期望响应时间。由于这些不同的期望响应时间，使用单个超时规则以提供缓存结果来替代处理结果将是不适当的。对这些难题的预期解决方案是建立用于请求上下文的复杂的缓存配置，其中每个异步结果具有个性化的响应超时阈值。另一预期方案是将多个操作聚集在一起，并建立用于这些聚集操作的单个超时。这些方案的每一个都导致开销成本并具有固有的缺陷。需要一种用于处理缓存内容的新技术。

发明内容

本发明公开了一种根据结果的完成比例来选择性地使用缓存内容或者处理内容的方案。更具体地，请求接收服务器可以使用多个异步操作来处理客户端请求，其中，一旦操作完成便可以将操作的结果递送给结果服务。操作还可以将完成比例消息传送给结果服务。当实体向结果服务请求内容时，结果服务可以首先确定该内容是否已完成，如果已完成则在响应中返回结果。否则，结果服务可以确定完成比例。当该比例低于指定的完成阈值时，可以返回缓存结果。当完成比例超过阈值时，服务可以等待直到操作完成，继而返回处理结果。每次处理了结果时，可以更新缓存。在一个实施方式中，基于比例的缓存返回可以应用于共享进程（例如，美国专利申请号_____）。

应当意识到，将完成比例用于选择性缓存返回实质上补偿了具有不同期望响应时间的不同异步进程。比例的使用允许将相关进程分组或者单独的进程处理。总体上，所公开的方案优于基于一个或多个固定超时值的传统缓存管理技术。该方案可以处理针对单个请求上下文而产生的异步结果（以及同步结果），而不论是由单个服务器还是多个服务器进行处理的。而且，在客户端侧或者服务器侧对内容进行聚合时，可以使用基于比例的缓存方案。

可以使用各种编程技术来确定完成比例。例如，可以维护进程的平均完成时间的历史日志，并且可以使用该平均值来估计相对于已用

时间量而言完成当前进程尚需的时间量。可以根据这些时间计算来确定完成比例。在另一示例中，服务器侧进程可以包括多个嵌入的里程标，在处理发生时报告这些里程标，其可以用来确定完成比例。

可以根据与在此给出的素材相一致的多个方面来实现本发明。例如，本发明的一个方面可以包括服务器侧的结果分发服务软件程序。该程序可以接收和存储与来自不同的内容提供服务器的请求上下文相关的结果。可以从客户端接收异步请求，所述客户端发起了定义该请求上下文的内容请求。可以确定满足所接收的客户端请求的请求结果的完成程度。可以将完成程度与之前建立的阈值进行比较。根据比较步骤的结果，可以将动态处理的结果或者先前缓存的结果递送给客户端。产生动态处理结果的服务器侧操作可以是在客户端发送内容请求之后发起的操作。先前缓存的内容可以从客户端发送内容请求之前启动的进程中生成。

本发明的另一方面可以包括一种用于根据完成程度来选择性地使用缓存结果以处理请求的方法。在该方法中，服务器侧的结果服务可以接收客户端侧的内容请求。内容可以包括由服务器侧的资源产生的结果，该服务器侧的资源将产生的结果递送给服务器侧的结果服务。例如，服务器侧的资源可以是多个 Web 服务器之一，其处理针对单个请求上下文的异步请求。可以使用各种编程技术（例如，基于历史的处理平均值，软件嵌入的完成里程标，等等）来确定最终产生结果的处理操作的完成程度（例如，完成比例）。基于所确定的完成程度，可以将对客户端侧请求的缓存响应或者针对客户端侧请求而动态产生的响应提供给发起请求的客户端。

本发明的又一方面可以包括一种基于结果完成程度来选择性地向客户端递送缓存内容或处理内容的方法。该方法可以包括 Web 服务器从客户端接收针对内容的 REST 型请求的步骤。REST 型命令是一种遵循表象化状态转变（REST）架构的命令。可以发起一组异步操作，这些操作一起满足 REST 型请求。可以将操作结果递送给结果服务。结果服务可以从客户端接收针对操作结果的至少一个 REST 型

请求。基于产生操作结果的异步操作的完成比例程度，结果服务可以选择性地将缓存内容或者对REST型请求的处理内容响应递送给客户端。

例如，当完成程度指示操作结果完成时，可以将完成的操作结果传送至客户端。当完成程度大于先前建立的阈值时，该方法可以等待处理操作结果，并继而将完成的操作结果提供给客户端。当完成程度没有大于先前建立的阈值时，可以将缓存内容提供给客户端。

应当注意，可以将本发明的各方面实现为用于控制计算设备来实现在此描述的功能的程序，或者实现为使计算设备能够执行对应于在此公开的步骤的过程的程序。可以通过将该程序存储在磁盘、光盘、半导体存储器或者任何其他记录介质上来提供该程序。还可以将该程序作为通过载波传送的数字编码信号来提供。所描述的程序可以是单个程序，或者可以作为多个子程序实现，其中每个子程序在单个计算设备中交互或者按照跨越网络空间的分布式方式交互。

附图说明

在附图中示出了目前优选的实施方式，然而应当理解，本发明不限于所示的精确布置和手段。

图1示出了一个系统的框图，在该系统中，根据服务器已经完成的处理比例，客户端请求选择性地返回缓存内容或者动态处理的内容。

图2是示出了根据在此公开的创造性布置的实施方式的基于结果完成比例而将缓存内容或者动态处理的内容递送给客户端的交互流程图。

具体实施方式

图1示出了系统100的示意图，其中，根据服务器已经完成的处理比例，客户端请求选择性地返回缓存内容或者动态处理的内容。基于比例的请求处理可以应用于任意数目的请求-响应范式(paradigm)。

这些范式可以包括针对公共请求上下文（图中已示出）的一组异步处理的进程或者同步处理的请求。而且，内容在客户端侧的聚合（图中已示出）或者内容在服务器侧的聚合二者都可以通过基于比例的请求处理机 132 来处理。基本上，请求处理机 132 可以在任何环境中实现，其中，当一组系统 100 条件存在时，可以将缓存内容选择性地传送给请求客户端 140，而当一组不同的条件存在时，可以将动态内容传送给请求客户端 140。

更具体地，请求处理机 132 可以包括实现请求处理进程 165 的可编程指令集。进程 165 假设：客户端正在请求与先前发出的请求相关联的内容，其中，针对该先前发出的请求已经开始了处理。进程 165 可以开始于步骤 170，在此接收客户端请求。在步骤 172 中，可以标识与该请求相关联的结果。在步骤 174 中，进程可以确定是否存在针对该请求的完成结果。如果存在，则进程可以在步骤 180 中返回完成结果。

如果结果还没有完成处理，则进程可以从步骤 174 进行到步骤 176，在此，可以将结果的完成比例与先前建立的阈值进行比较。当比例没有超过该阈值时，方法可以从步骤 176 进行到步骤 182，在此，可以返回缓存的内容。当比例超过阈值时，进程可以在步骤 178 中等待结果完成。可以在步骤 180 中返回完成的结果。尽管没有在进程 165 中明确示出，但是可以将步骤 180 的完成结果写入缓存，以便在处理针对相同内容的后续请求时使用。

当在步骤 180 或者 182 中返回了结果集合之后，方法可以进行到步骤 184，在此，可以执行针对更多结果的检查。当更多的结果与请求相关联时（步骤 170），进程可以从步骤 184 进行到步骤 172，在此，可以标识和处理接下来的结果。

当在步骤 184 中不存在更多的结果时，进程可以在步骤 186 中结束。在一个可选实现中（未示出），可以建立自动的刷新循环，以便一旦生成了完成结果（步骤 180）便利用完成结果（180）来刷新返回的缓存内容（步骤 182）。刷新循环可以由客户端侧程序来处理，其

中，间歇性地将内容请求发往结果服务，直到返回非缓存的完成内容。可选的刷新循环可以由服务器侧的进程来处理，其将完成的内容推送给先前已经从缓存接收了结果的客户端。

可以实现请求处理机 132 的一个上下文执行对已经异步处理的服务器侧 102 内容的客户端侧聚合。在该示出的上下文中，客户端 140 可以从服务器 110 请求 150 内容。服务器 110 可以立即提供包括静态内容的初始响应 152，其中该静态内容包含一组在动态内容可用时将由动态内容填充的占位符。根据实现规范，客户端 140 可以立即显示初始内容 152，或者可以在接收到占位符内容之前延迟。

服务器 110 可以向一个或多个服务器 120 发出多个异步请求 154 以进行处理。这些服务器 120 的每一个可以包括动态引擎 122，其生成传送给结果服务 130 的结果 156。动态引擎 122 可以确定完成比例 156，该完成比例 156 在某些处理点处被自动地传送给结果服务 130，或者响应于服务 130 发出的查询而被传送给结果服务 130。在一个实施方式中，服务器 110 可以包括动态引擎 112，其生成传送给结果服务 130 的异步结果和完成比例 158。因此，服务 130 可以在包括一个（服务器 110）或多个（服务器 120）结果处理服务器的系统中使用。

动态引擎 112 和/或 122 可以使用多种不同的编程技术来确定完成程度或完成比例 156。例如，可以维护进程的平均完成时间的历史记录，并且可以使用该平均值来估计相对于已用时间量而言完成当前进程尚需的时间量。可以根据这些时间计算来确定完成比例。可以结合其他因素来改进完成比例计算的准确性，诸如服务器负载、可用的存储器/资源、所处理请求的复杂性、处理的时刻/日期，等等。当执行时间平均计算时，可以直接由结果服务 130 来执行历史数据和比例的确定，而无需由实际执行处理操作的服务器 110、120 来执行。

在另一示例中，处理请求 154 的服务器侧程序可以包括多个软件嵌入的完成里程标，这些里程标在处理发生时被报告，其可以用来确定完成比例。例如，服务器侧程序可以包括 10 个不同的“等间隔”里程标，每个代表处理操作的十分之一已经完成。在达到每个里程标

时，相关联的完成比例可以增加 10%。上述示例仅是可以用来计算完成比例的多种技术中的两个，不应将本发明理解为受限于此。

在传递了初始请求 150 之后的一些时间点，客户端 140 可以从结果服务 130 请求 160 内容。结果服务 130 可以选择性地返回内容结果 162 来响应请求 160。结果 162 可以异步地返回。结果 162 可以与从服务器 120 返回的结果 156 和/或从服务器 110 返回的结果 158 相关联。如进程 165 所示，当所请求结果的完成比例低于所建立的阈值时，结果 162 可以包括来自数据存储 134 的缓存结果。在各种实现中，客户端 140 可以接受缓存结果作为最终结果；客户端 140 可以持续地请求 160 内容，直到接收到处理结果 156、158（非缓存的）；和/或服务 130 可以在更新（处理结果）可用时，返回对缓存返回的更新（处理结果）。

在系统 100 中，服务器 110-120 可以是能够处理来自网络的超文本传输协议（HTTP）请求、并且能够提供对这些请求的 HTTP 响应的计算系统。服务器 110-120 的每一个可以与在传送 HTTP 请求时用于服务器 110-120 标识的统一资源标识符（URI）相关联。HTTP 响应可以包括静态内容和动态内容。通常，服务器 110 产生的初始响应 152 将包括静态内容以及一个或多个占位符。占位符内容（包括动态内容）可以由服务器 120 产生。服务器 110-120 的每一个可以包括多个可选特征，诸如认证支持、加密通道支持（例如，通过传输层安全性（TLS）技术、安全套接字层（SSL）技术等的 HTTPS 支持）、内容压缩和解压缩支持，等等。服务器 110-120 的每一个可以分配资源来处理接收到的请求 150、154，并且可以在服务器的处理任务完成时释放这些资源。也即，服务器 110-120 中的任意服务器用来处理请求上下文的时间周期小于处理请求上下文所需的总时间。服务器 110-120 可以在物理机器以及虚拟计算设备中实现，其中虚拟计算设备诸如通过虚拟化方案提供的那些设备（例如，VMWARE、MS VIRTUAL SERVER，等等）。

服务器 110-120 可以是公共服务器或专用服务器。在一个实现中，

服务器 110 可以是公共服务器 110，并且对请求 154 进行异步处理的一个或多个服务器 120 可以是不能直接通过公共网络访问的专用服务器。专用服务器可以受防火墙保护，可以是与服务器 110 链接的虚拟专用网络（VPN）的一部分，并且可以是允许服务器 110 访问的专用网络的一部分。而且，尽管系统 100 示出由单个服务器 120 来处理服务器 110 所发出的每个请求 154，并由服务器 120 将结果提供给服务 130，但是也可以使用其他布置。例如，服务器 120 最初可以处理请求 154，可以将结果传送给中间服务器（未示出）以用于进一步处理，并且中间服务器可以将结果发送给服务 130。

结果服务 130 可以是能够处理 HTTP 消息和其他 REST 型消息的服务器侧 102 软件程序。REST 型消息是遵循表象化状态转变（REST）软件架构的消息。REST 架构提供包括几个基本原语命令（例如，HTTP GET、HTTP PUT、HTTP POST、HTTP DELETE）的已存在的统一接口。基于 REST 的方案简化了组件实现，降低了连接器语法的复杂性，改进了性能调整的有效性，并增加了纯服务器组件的可伸缩性。

结果服务 130 可以实现为 servlet、JAVA 服务器页面（JSP）、活动服务器页面（ASP）、企业 Java Bean（EJB）、企业服务总线（ESB）服务等。服务 130 可以与 URI 相关联，服务器 110-120 可以将响应 156、158 传送给该 URI，并且客户端 140 可以将请求 160 传送给该 URI。结果分发服务 130 可以驻留在服务器 110、服务器 120 或者任何其他服务器之内。当服务 130 与不同于原始 HTTP 请求中寻址组件的组件相关联时，系统 100 必须实现度量，以确保服务 130 的 URL 对于服务器 110-120 和客户端 140 可用。

客户端 140 可以是能够发送 HTTP 请求 150 和能够呈现对这些请求的响应的任何计算设备。例如，客户端 140 可以包括个人计算机、笔记本计算机、移动计算设备、智能电话、个人数据助理（PDA）、嵌入式计算设备、电子游戏设备等等。客户端 140 可以包括浏览器，其处理 HTTP 通信。浏览器可以链接至用户与客户端 140 交互的界面。界面可以是图形用户界面（GUI）、多模态界面、语音用户界面（VUI）

等等。界面可以包括内容和占位符。

在一个实现中，内容在客户端侧 104 的聚合可以以用户透明的方式进行。例如，可以通过插件或扩展来增强客户端浏览器，该插件或扩展自动地提交请求 160，直到接收到了响应 162。在一个实施方式中，服务器 110 可以将服务 130 的地址传送给客户端 140 和服务器 120，使得每个计算设备能够确定请求的目标（例如，客户端 140）和/或递送的目标（例如，服务器 120）。在另一实施方式中，服务器 110 可以将用户标识的地址传送给服务器 120，服务器 120 继而将其传送给服务 130。服务 130 继而可以将结果 162 传送给由该地址标记的客户端 140，和/或服务 130 继而可以向客户端 140 传送消息，使得客户端 140 知道将请求 160 发送到哪里。

系统 100 的各个组件可以经由网络（未示出）可通信地链接。网络可以包括能够传送在载波中编码的数字内容的组件。内容可以包含在模拟或数字信号中，并且可以通过数据或语音信道来传送，并且可以通过个人区域网络（PAN）或广域网（WAN）来传送。网络可以包括本地组件和将在计算设备组件之间以及集成设备组件和外围设备之间交换的通信所需的数据通路。网络还可以包括网络设备（诸如路由器、数据线路、集线器）以及一同构成了基于分组的网络（诸如互联网和内联网）的中间服务器。网络还可以包括基于电路的通信组件和移动通信组件，诸如电话交换机、调制解调器、蜂窝通信塔，等等。网络可以包括基于线路和/或无线的通信路径。

链接至服务器 110-120 或者客户端 140 的数据存储 134 和其他数据存储（未示出）在物理上可以在任意类型的硬件中实现，包括但不限于：磁盘、光盘、半导体存储器、数字编码的塑性存储器、全息存储器或者任意其他的记录介质。数据存储 134 可以是单独的存储单元，也可以是由多个物理设备构成的存储单元，其中多个物理设备可以彼此位于远程位置。而且，信息可以按照各种方式存储在数据存储 134 中。例如，信息可以存储在数据库结构中，或者可以存储在文件存储系统的一个或多个文件中，其中每个文件可以或者可以不为了信息搜

索的目的而被索引。还可以可选地对存储在数据存储 134 中的信息加密，以便增加安全性。

尽管系统 100 示出了本发明的一个预期布置，但是本发明不限于所示出的精确布置。相反，在使用完成程度来确定是将缓存结果还是处理结果返回给客户端 140 的任意系统中，都可以执行所公开的方案。例如，客户端发出的请求 150 可以由服务器侧 102 组件同步地处理。客户端仍然可以发出针对内容的请求 160（例如在发生明显的延迟并且结果没有返回时），并且结果 162 可被返回，取决于所计算的完成程度，结果 162 是先前缓存的结果或者是新处理的结果。在不同的派生中，替代由客户端发出请求 160，每当服务器侧定时器指示要把针对请求 150 的结果返回给客户端 140 时，服务器侧 102 组件可以确定发出缓存的结果还是处理的结果（基于完成程度）。

图 2 是示出了根据在此公开的创造性布置的实施方式的基于结果完成比例将缓存内容或者动态处理的内容递送给客户端的交互的流程图 200。框图 200 示出了在系统 100 上下文中的和/或在能够执行请求处理进程 165 的环境的上下文中的消息流程。

在框图 200 中，客户端 210 可以将请求 230 传送给服务器 212。服务器 212 初始可以处理 232 该请求。处理 232 可选地产生初始响应 234，例如包括用于异步处理的动态内容的占位符的静态内容。在另一实施方式中（未示出），针对请求 230 而产生的所有内容都可以是异步产生的动态内容，这种情况下将不会生成和传送初始响应 234。

请求处理进程 232 还可以使服务器 212 生成用于第一进程 236（进程 A）的多个进程/线程和用于第二进程 240（进程 B）的多个进程/线程。这些进程 236、240 可以产生传送至结果服务 214 的结果 238、242。还可以将进程 236、240 的完成比例传送至服务 214，这可以是响应于来自服务 214 的完成查询（未示出）。针对请求 230 的两个进程 236、240 的显示是任意的，并且可以使用任意数目的异步进程来处理请求 230。而且，每个进程 236、240 可以由服务器 212 来处理，或者由一个或多个位于远程的服务器（未示出）来处理。

客户端 210 可以向结果服务 214 查询 244 请求 230 的结果。在一个实现中，单个查询 244 可以请求进程 A 和 B 的结果。在另一实施方式中，针对来自每个进程 A 和 B 的结果可以发出多个异步查询 244。在接收到请求 244 之后，服务 214 可以检查结果处理机 216，以确定针对该进程的结果是否已经完成。如果已完成，结果处理机 216 可以将完成的结果 252 返回给客户端。如果结果没有完成，则结果处理机 216 可以确定 248 该进程的完成比例是否高于指定的阈值。在该步骤中，可以在结果处理机 216 和进程处理服务器（236、240）之间交换消息（未示出），从而在步骤 248 中使用当前比例。当完成比例超过阈值时，处理机 216 可以延迟 250 以等待结果完成，并且可以将完成的结果发送 252 给客户端 210。在没有达到阈值时，可以从结果缓存 218 中取回 254 结果，并将其传送 256 给客户端 210。

对于请求上下文中的每个进程（进程 A 和 B），可以重复标号 244-256 所示的消息流。当接收到缓存结果 256 时，客户端可以在任意的延迟之后再次请求 258 处理结果。当返回的一部分来自缓存而另一部分来自结果 230 触发的进程时，只有缓存的返回需要在请求 258 中再次请求。例如，当进程 A 是从先前缓存返回获取的时，流程可以循环到消息 246，在此可以将针对进程 A 的结果完成消息 246 传送给结果处理机 216。当进程 B 是从先前缓存返回获取的时，流程可以循环到消息 246，在此可以将针对进程 B 的结果完成消息 246 传送给结果处理机 216。

在此记载的系统 100、进程 165 和消息流程 200 示出了一种用于选择性地使用缓存内容的方案，并且此处可以预期对特定示出的装置的派生。例如，替代于使用完成比例，可以使用归一化的完成记分来产生等同的结果。因此，应当将在此使用的术语“完成比例”宽泛地解释为包括表示处理完成程度的任何数学值。

本发明可以在硬件、软件或者硬件和软件的结合中实现。本发明可以在一个计算机系统中按照集中式方式来实现，或者可以按照不同的元件分散在多个互连的计算机系统间的分布式方式来实现。适于执

行在此描述的方法的任意类型的计算机系统或者其他装置都是适合的。硬件和软件的典型结合可以是具有计算机程序的通用计算机系统，其中，在加载和执行所述计算机程序时，其控制计算机系统，使得计算机系统执行在此描述的方法。

本发明还可以嵌入在计算机程序产品中，所述程序产品包括支持在此描述的方法的实现的所有特征，并且当所述程序产品被加载到计算机系统中时，其能够执行这些方法。本上下文中的计算机程序表示以任何语言、代码或符号表示的指令集合的任何表达式，其意在使具有信息处理能力的系统执行特定的功能，所述执行是直接的，或者是在完成以下内容的任一内容或两者之后：a）转换为其他语言、代码或符号；b）以不同的素材形式重现。

本发明可以在其他形式中实现，而不背离本发明的精神和实质属性。因此，在指示本发明的范围时，应当参考所附权利要求书而不是上述说明。

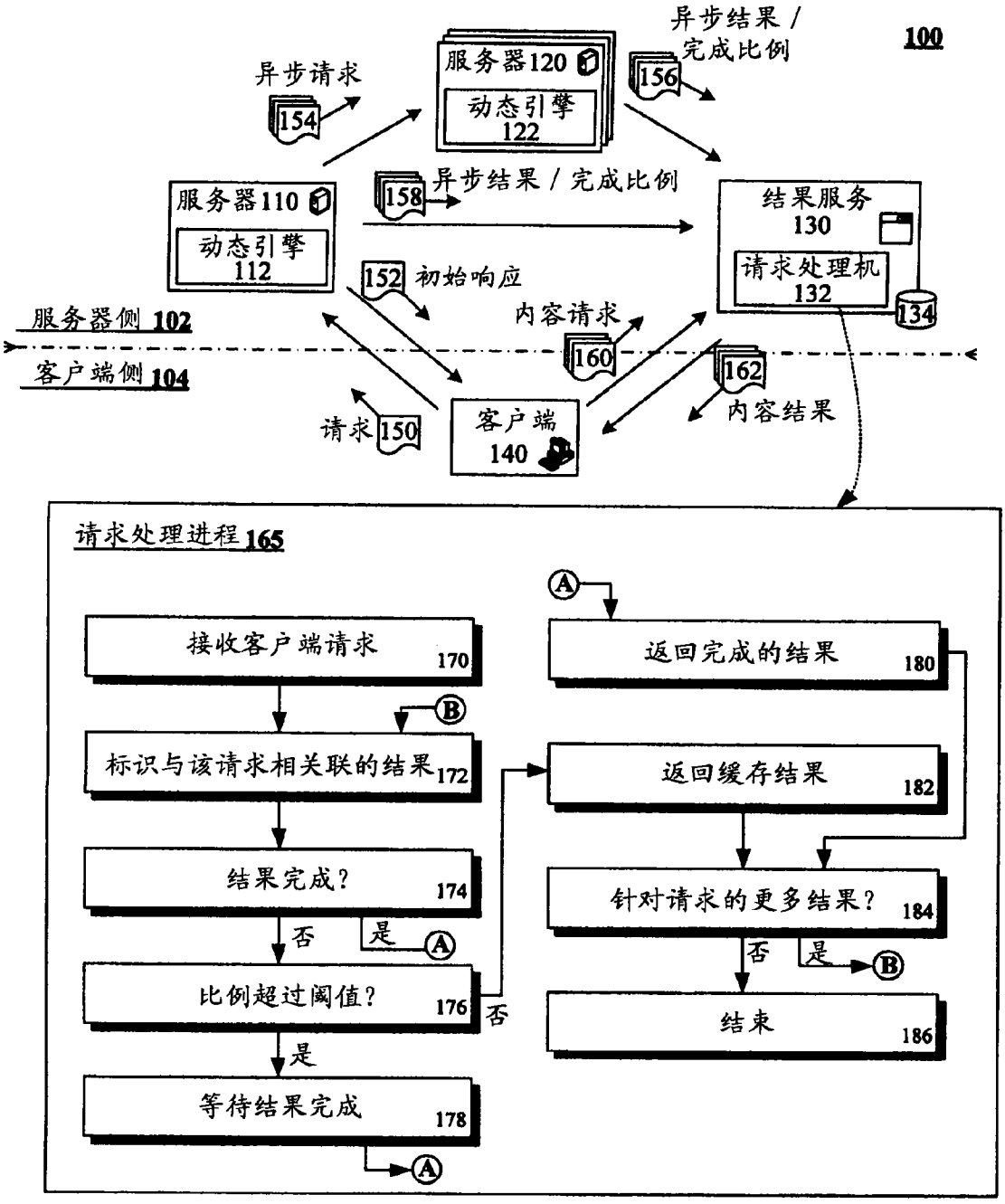

100
异步结果 / 完成比例
异步请求
154
服务器120
动态引擎
122
156
服务器110
动态引擎
112
158
异步结果 / 完成比例
结果服务
130
请求处理机
132
134
152
初始响应
内容请求
160
服务器侧 102
客户端侧 104
162
内容结果
请求 150
客户端
140
请求处理进程 165
接收客户端请求 170
标识与该请求相关联的结果 172
结果完成? 174
否
是
A
比例超过阈值? 176
否
是
等待结果完成 178
A
返回完成的结果 180
B
返回缓存结果 182
针对请求的更多结果? 184
否
是
B
结束 186

图 1

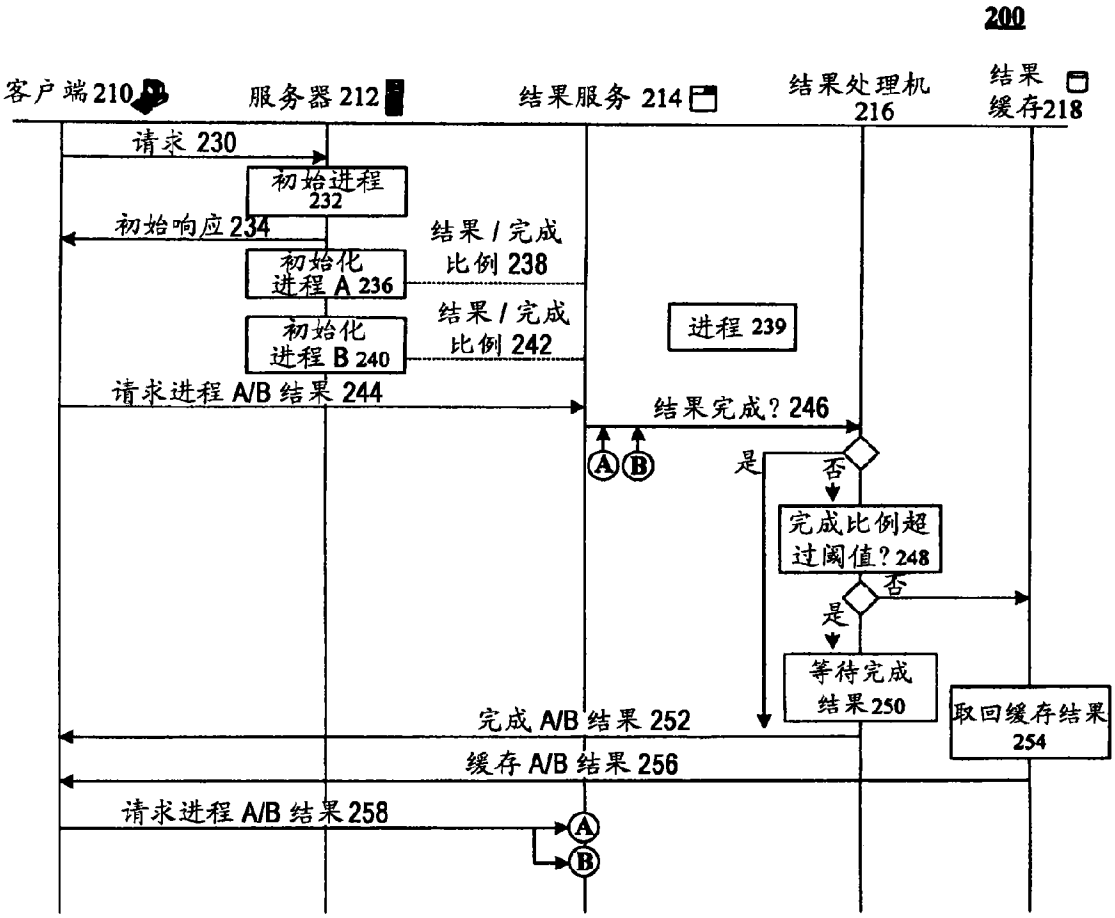

200
客户端210
服务器212
结果服务 214
结果处理机 216
结果 缓存218
请求 230
初始进程 232
初始响应 234
结果 / 完成 比例 238
初始化 进程 A 236
结果 / 完成 比例 242
初始化 进程 B 240
进程 239
请求进程 A/B 结果 244
结果完成? 246
A
B
是
否
完成比例超 过阈值? 248
否
是
等待完成 结果 250
取回缓存结果 254
完成 A/B 结果 252
缓存 A/B 结果 256
请求进程 A/B 结果 258
A
B

图 2

[19] 中华人民共和国国家知识产权局

[51] Int. Cl.
G06F 17/00 (2006.01)

[12] 发明专利申请公布说明书

[21] 申请号 200780013156.1

[43] 公开日 2009 年 4 月 29 日

[11] 公开号 CN 101421719A

[22] 申请日 2007.3.8
[21] 申请号 200780013156.1
[30] 优先权
[32] 2006. 4.14 [33] US [31] 11/404,412
[86] 国际申请 PCT/US2007/006024 2007.3.8
[87] 国际公布 WO2007/120411 英 2007.10.25
[85] 进入国家阶段日期 2008.10.13
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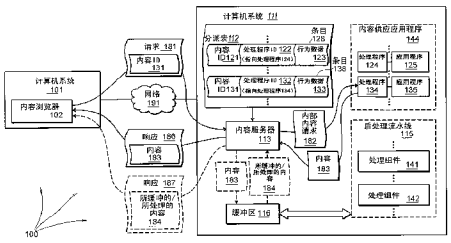
权利要求书 4 页 说明书 14 页 附图 3 页

[54] 发明名称

管理网络响应缓冲行为

[57] 摘要

本发明涉及用于管理网络响应缓冲行为的方法、系统和计算机程序产品。计算机系统从客户机接收内容请求。该计算机系统具有在传输内容时使用的默认响应缓冲行为。该计算机系统将该请求映射到被配置为提供所请求的内容的处理程序。该计算机系统访问关于该处理程序的缓冲行为数据。该计算机系统确定所请求的内容要根据至少基于该缓冲行为数据更改的响应缓冲行为来传输。经更改的响应缓冲行为作为默认响应缓冲的例外与所请求的内容相对应。该计算机系统从处理程序访问所请求的内容的一部分。该计算机系统根据经更改的响应缓冲行为向该客户机传输所请求内容的该部分。



1. 一种在计算机系统处的用于管理网络响应缓冲行为的方法，所述方法包括：

内容服务器从客户机接收内容请求的动作，所述内容服务器具有在传输内容时使用的默认响应缓冲行为；

将所述请求映射到被配置为提供所请求的内容的处理程序的动作；

访问关于所述处理程序的缓冲行为数据的动作；

确定所请求的内容要根据至少基于所述缓冲行为数据更改的响应缓冲行为来传输的动作，所述经更改的响应缓冲行为作为所述默认响应缓冲的例外与所请求的内容相对应；

从所述处理程序访问所请求的内容的一部分的动作；以及

根据所述经更改的响应缓冲行为向所述客户机传输所请求内容的所述部分的动作。

2. 如权利要求 1 所述的方法，其特征在于，所述接收内容请求的动作包括接收 URL 的动作。

3. 如权利要求 1 所述的方法，其特征在于，所述接收内容请求的动作包括 web 服务器接收内容请求的动作。

4. 如权利要求 1 所述的方法，其特征在于，所述将所述请求映射到被配置为提供所请求的内容的处理程序的动作包括将 URL 映射到所述处理程序的处理程序 ID 的动作。

5. 如权利要求 1 所述的方法，其特征在于，所述访问关于所述处理程序的缓冲行为数据的动作包括访问指示所述处理程序的响应缓冲要被关闭的缓冲行为数据的动作。

6. 如权利要求 1 所述的方法，其特征在于，所述访问关于所述处理程序的缓冲行为数据的动作包括从与所述处理程序相对应的应用程序接收响应缓冲 API 调用的动作。

7. 如权利要求 1 所述的方法，其特征在于，所述确定所请求的内容要根据经更改的响应缓冲行为来传输的动作包括确定即使所述默认响应缓冲行为是缓冲所请求的内容，但因为所述响应超过响应缓冲中的可用存储器

而仍不缓冲所请求的内容的动作。

8. 如权利要求 1 所述的方法，其特征在于，所述确定所请求的内容要根据经更改的响应缓冲行为来传输的动作包括确定所请求的内容具有首字节时间要求和传输速率要求的至少一个的动作。

9. 如权利要求 1 所述的方法，其特征在于，所述确定所请求的内容要根据经更改的响应缓冲行为来传输的动作包括确定所述处理程序提供其自己的缓冲的动作。

10. 如权利要求 1 所述的方法，其特征在于，所述确定所请求的内容要根据经更改的响应缓冲行为来传输的动作包括确定即使默认响应缓冲行为指示不要缓冲所请求的内容仍缓冲所请求的内容的动作。

11. 如权利要求 1 所述的方法，其特征在于，所述根据所述经更改的响应缓冲行为向所述客户机传输所请求的内容的所述部分的动作包括所述内容服务器直接向所述客户机传输所请求的内容的所述部分的动作。

12. 如权利要求 1 所述的方法，其特征在于，所述根据所述经更改的响应缓冲行为向所述客户机传输所请求的内容的所述部分的动作包括在响应缓冲区中缓冲所请求的内容的所述部分的动作。

13. 如权利要求 12 所述的方法，其特征在于，所述在响应缓冲区中缓冲所请求的内容的所述部分的动作包括在所述响应缓冲区中缓冲所请求的内容的所述部分连同内容的一个或多个其它部分的动作。

14. 如权利要求 12 所述的方法，其特征在于，还包括：

在所请求的内容的所述部分上执行后处理操作的动作，所述后处理操作选自压缩所述内容部分、加密所述内容部分、过滤所述内容部分以及高速缓存所述内容部分。

15. 如权利要求 14 所述的方法，其特征在于，还包括：

所述内容服务器从所述响应缓冲区中检索所请求的内容的经处理的部分的动作；以及

所述内容服务器向所述客户机传输所请求的内容的经处理的部分的动作。

16. 一种在计算机系统处的用于管理对于基于 web 的内容的网络响

应缓冲行为的方法，所述方法包括：

web 服务器从客户机接收 URL 的动作，所述内容服务器具有在传输基于 web 的内容时使用的默认响应缓冲行为；

将所述 URL 映射到被配置为向在所述 URL 中所表示的 web 服务器命名空间的所述部分提供所请求的基于 web 的内容的处理程序的动作；

访问关于所述处理程序的缓冲行为数据的动作；

确定所请求的基于 web 的内容要根据至少基于所述缓冲行为数据更改的响应缓冲行为来传输的动作，所述经更改的响应缓冲行为作为所述默认响应缓冲的例外对应于所请求的基于 web 的内容；

从所述处理程序访问所请求的基于 web 的内容的一部分的动作；以及

根据所述经更改的响应缓冲行为向所述客户机传输所请求的基于 web 的内容的所述部分的动作。

17. 如权利要求 16 所述的方法，其特征在于，所述访问关于所述处理程序的缓冲行为数据的动作包括访问关于选自所述处理程序所服务的 web 服务器的命名空间的多个部分的 web 服务器的命名空间的一部分的缓冲行为数据的动作。

18. 如权利要求 16 所述的方法，其特征在于，所述确定所请求的基于 web 的内容要根据经更改的响应缓冲行为来传输的动作包括确定所请求的基于 web 的内容要根据基于与处理程序相对应的应用程序更改的响应缓冲行为来传输的动作。

19. 如权利要求 16 所述的方法，其特征在于，所述确定所请求的基于 web 的内容要根据经更改的响应缓冲行为来传输的动作包括确定所请求的基于 web 的内容要根据基于与所请求的基于 web 的内容的内容类型更改的响应缓冲行为来传输的动作。

20. 一种计算机系统，包括：

一个或多个处理器；

系统存储器；

一种或多种计算机可读介质，所述计算机可读介质上存储有表示一内容服务器的计算机可执行指令，所述内容服务器被配置为：

具有在传输内容时的默认响应缓冲行为；

从客户机接收内容请求；

将请求映射到配置为提供所请求的内容的处理程序；

访问关于所述处理程序的缓冲行为数据；

确定所请求的内容要根据至少基于所述缓冲行为数据更改的响应缓冲行为来传输，所述经更改的响应缓冲行为作为所述默认响应缓冲的例外对应于所请求的内容；

从所述处理程序访问所请求的内容的一部分；以及

根据所述经更改的响应缓冲行为向所述客户机传输所请求内容的所述部分。

管理网络响应缓冲行为

背景

背景和相关技术

计算机系统和相关技术影响社会的许多方面。的确，计算机系统处理信息的能力已改变人们生活和工作的方式。计算机系统现在通常执行在计算机系统出现以前手动执行的许多任务（例如，文字处理、日程安排和数据库管理）。最近，计算机系统被彼此耦合并被耦合到其它电子设备，以形成计算机系统和其它电子设备可以在其上传送电子数据的有线和无线计算机网络。结果，在计算机系统处执行的许多任务（例如，语音通信、访问电子邮件、控制家用电子设备、web 浏览、以及打印文档）包括多个计算机系统和/或其他电子设备之间经由有线和/或无线计算机网络的通信（例如，电子消息交换）。

在许多计算环境中，内容以请求/响应的格式来交换。例如，在请求的计算机系统处的 web 浏览器向在服务器计算系统处的 web 服务器发送内容请求。服务器计算系统接收该请求且 web 服务器处理该请求（例如，通过协作服务侧组件流水线传递该请求）以标识所请求的内容。Web 服务器随后制定响应来包括所标识的所请求的内容。服务器计算机系统将该响应发回请求的计算机系统。该请求的计算机系统接收该响应且 web 浏览器呈现所请求的内容。

在制定响应来包括所请求的内容和发送包括所请求的内容的响应时，web 服务器可以利用各种不同的技术。流传送是一种用于制定和发送包括所请求的内容的响应的技术。流传送包括 Web 服务器在所请求的内容的各部分变得可用（例如，来自应用程序组件）时向 web 浏览器发送所请求的内容的各部分。例如，web 服务器可以将音频/视频文件以指定的速率流传送到 web 浏览器，直到该音频/视频文件的传输完成为止。

响应缓冲是用于制定包括所请求的内容的响应的另一技术。响应缓冲包括 web 服务器在将任何所请求的内容发送到 web 浏览器之前将所请求的内容的各部分存储在存储器中以在存储器中收集完整响应。在所请求的内容的收集完成后，向 web 浏览器发送完整的响应。例如，web 服务器可以在存储器中存储各

种不同的 HTML 部分，直到收集了网页的所有 HTML 部分。在收集了所有 HTML 部分后，web 服务器可以向 web 浏览器发送完整的网页。

出于各种原因，响应缓冲都可以是有益的。例如，响应缓冲能以各种方式提高服务器性能。响应缓冲对网络带宽进行更高效的使用且降低与发送包括小量所请求的内容（例如，相对于最优分组大小）的频繁响应相关联的开销。对构建动态内容的服务器应用程序来说这可以有特别的益处，因为这些应用程序频繁地生成高频率的较小的内容部分。

另外，响应缓冲允许在发送该响应之前对该响应进行后处理。例如，web 服务器可以在将响应发送到 web 浏览器之前对该响应进行压缩、加密、过滤器、高速缓存等。

然而，响应缓冲对某些应用程序和内容类型可能不适当。例如，生成大量内容的应用程序可能由于存储器开销和/或限制而不能缓冲该内容。此外，一些应用程序可能需要流传送行为（例如，视频、音频等）并且因而与响应缓冲不兼容。

web 服务器平台通常支持多种内容类型和多种应用程序技术，其每一种技术都具有不同的缓冲要求。然而，用于按内容类型和/或按应用程序来控制响应缓冲的机制是有限的。另外，缓冲要求可以随时间变化，例如，取决于响应的运行时特征（例如，大小）。

不幸的是，web 服务器通常无法适应改变了的运行时特征。由此，即使在对于特定响应可能有较多适当的响应缓冲行为时，web 服务器也可能基于先前的配置和/或内容类型或应用程序的典型特征而选择较不适当的响应缓冲行为。例如，即使所请求的内容的应用处理程序提供其自己的缓冲区（导致至少部分地加倍缓冲区），web 服务器也可能被配置为缓冲部分所请求的内容。另一方面，即使在所请求的内容包括许多较小的内容部分时，web 服务器也可能基于内容类型被配置为不缓冲所请求的内容。

此外，在一些环境中，响应缓冲可能导致违背内容的传输要求。例如，缓冲具有首字节时间要求或指定的传输速率要求的内容可以使得内容的传输超过首字节时间要求或使得内容以小于指定的传输速率的速率来发送。由此，为避免违背传输要求，web 服务器可以默认地从不缓冲任何类型的

内容（或可以根本不包括响应缓冲功能）。因此，即使那些可受益于响应缓冲的内容类型也被不允许或不能利用响应缓冲。

简要概述

本发明延及用于管理网络响应缓冲行为的方法、系统和计算机程序产品。计算机系统从客户机接收内容请求。该计算机系统具有在传输内容时使用的默认响应缓冲行为。该计算机系统将该请求映射到被配置为提供所请求的内容的处理程序。

该计算机系统访问关于该处理程序的缓冲行为数据。该计算机系统确定所请求的内容要根据至少基于该缓冲行为数据更改的响应缓冲行为来传输。经更改的响应缓冲行为作为默认响应缓冲的例外对应于所请求的内容。该计算机系统从处理程序访问所请求的内容的一部分。该计算机系统根据经更改的响应缓冲行为向该客户机发送所请求内容的该部分。

提供本概述以便以简化的形式介绍将在以下详细描述中进一步描述的一些概念。该概述不旨在标识所要求保护的主题的关键特征或必要特征，也不旨在用于帮助确定所要求保护的主题的范围。

本发明的附加特征和优点将在以下描述中叙述，且其部分根据本描述将是显而易见的，或可通过对本发明的实践来获知。本发明的特征和优点可通过在所附权利要求书中特别指出的手段和组合来实现和获得。本发明的这些和其他特征将通过以下描述和所附权利要求书变得更加完全明显，或可通过对下文中所述的本发明的实践来获知。

附图简述

为了描述可获得本发明的上述和其它优点和特征的方法，将通过参考附图中示出的本发明的特定实施例来呈现以上简要描述的本发明的更具体的描述。可以理解这些附图仅描述本发明的典型实施例，从而不因此被认为是对其范围的限制，本发明将通过使用附图用附加特征和细节来描述和说明，附图中：

图 1 示出便于管理网络响应缓冲行为的示例计算机架构。

图 2 示出用于管理网络响应缓冲行为的示例方法的流程图。

图 3 示出便于管理网络响应缓冲行为的另一示例计算机架构。

详细描述

本发明延及用于管理网络响应缓冲行为的方法、系统和计算机程序产品。一计算机系统从一客户机接收内容请求。该计算机系统具有在传输内容时使用的默认响应缓冲行为。该计算机系统将该请求映射到被配置为提供所请求的内容的处理程序。

该计算机系统访问关于该处理程序的缓冲行为数据。该计算机系统确定所请求的内容要根据至少基于该缓冲行为数据更改的响应缓冲行为来传输。经更改的响应缓冲行为作为默认响应缓冲的例外对应于所请求的内容。该计算机系统从处理程序访问所请求的内容的一部分。该计算机系统根据经更改的响应缓冲行为向该客户机发送所请求内容的该部分。

本发明的各实施例可以包括含有计算机硬件的专用或通用计算机，这将在以下做出进一步讨论。本发明的范围内的各实施例也包括用于承载或其上储存有计算机可执行指令或数据结构的计算机可读介质。这样的计算机可读介质可以是可由通用或专用计算机访问的任何可用介质。作为示例而非限制，计算机可读介质可包括计算机可读存储介质，如 RAM、ROM、EEPROM、CD-ROM 或其它光盘存储、磁盘存储或其它磁存储设备、或可用于存储计算机可执行指令或数据结构形式的所需程序代码装置且可由通用或专用计算机访问的任何其它介质。

在本说明书和所附权利要求书中，“网络”被定义为允许电子数据在计算机系统和/或模块之间的传输的一个或多个数据链路。当信息通过网络或另一通信连接（硬连线、无线或硬连线或无线的组合）传输或提供给计算机时，该计算机将该连接适当地视为计算机可读介质。因此，作为示例而非限制，计算机可读介质可包括可用于承载或存储计算机可执行指令或数据结构形式的所需程序代码装置并可由通用或专用计算机访问的网络或数据链路。

计算机可执行指令包括例如，使通用计算机、专用计算机、或专用处理设备执行某一功能或某组功能的指令和数据。例如，计算机可执行指令可以是二进制代码、诸如汇编语言等中间格式指令、或甚至源代码。尽管用结构特征和/或方法动作专用的语言描述了本主题，但可以理解，所附权利要求书中定义的主题不必限于上述特征或动作。相反，上述特征和动作是作为实现权利要求的示例形式而公开的。

本领域的技术人员将理解，可以在具有许多类型的计算机系统配置的网络计算环境中实践本发明，这些计算机系统配置包括个人计算机、台式计算机、膝上型计算机、手持式设备、多处理器系统、基于微处理器的或可编程消费电子设备、网络 PC、小型计算机、大型计算机、移动电话、PDA、寻呼机等等。本发明也可以在分布式系统环境中实践，在分布式系统环境中，通过网络链接（或者通过硬连线数据链路、无线数据链路，或者通过硬连线和无线数据链路的组合）的本地和远程计算机系统两者都执行任务。在分布式系统环境中，程序模块可以位于本地和远程存储器存储设备中。

图 1 示出便于管理网络响应缓冲行为的示例计算机架构 100。计算机架构 100 包括计算机系统 101 和计算机系统 111。计算机系统 101 和计算机系统 111 各自都连接到网络 191。网络 191 可以是任何类型的网络，诸如，例如，局域网（“LAN”）、广域网（“WAN”）、或甚至因特网。由此，计算机系统 101 和计算机系统 111 处的各种组件以及连接到网络 191 的其它组件都可以互相接收数据和发送数据。因此，这些组件可以创建消息相关数据并通过网络 191 交换消息相关数据（例如，网际协议（“IP”）数据报和利用 IP 数据报的其它高层协议，如传输控制协议（“TCP”）、超文本传输协议（“HTTP”）等）。

通常，计算机系统 101 被配置为请求、接收和呈现内容。例如，内容浏览器 102（例如，web 浏览器）可以将包括内容 ID（例如，统一资源定位符（“URL”））和返回电子地址的内容请求发送到网络 191 上。网络 191 的组件（例如，路由器）可以将该请求路由到内容 ID 中所标识的服务器计算机系统（例如，包括 web 服务器）。计算机系统 101 可以从来自该服务器计算机系统的响应（例如，发送到返回电子地址）中接收所请求的内容。计算机系统 101 可以处理所请求的内容且内容浏览器 102 可以呈现该低频请求的内容。

通常，计算机系统 111 被配置为接收内容请求、处理这些请求以标识所请求的内容、并在对所收到的请求的响应中返回所标识的内容。例如，内容服务器 113（例如，web 服务器）可以从网络 191 接收包括内容 ID（例如，统一资源定位符（“URL”））和返回电子地址的内容请求。内容服务器 113 可以参考分派表 112 来标识可以产生所请求的内容的内容供应应用程序 114 中的应用

处理程序。内容服务器 113 可以将内部内容请求（例如，程序调用）转发到所标识的应用处理程序。

响应于该内部内容请求，标识符应用处理程序可以将所请求的内容的至少一部分返回给内容服务器 113。取决于内容类型（例如，超文本标记语言（“HTML”）文档、图像数据、音频数据、视频数据等），应用处理程序可以不同地返回所请求的内容。例如，在返回 HTML 文档时，处理程序可以将完整的 HTML 文档作为单个内容部分来返回。另一方面，对于视频数据，处理程序可以在生成视频数据的各部分时返回该视频数据的各部分。

计算机系统 111 还可以包括缓冲区 116。取决于各种输入，在发送包括所请求的内容的响应之前，内容服务器 113 可以在缓冲区 116 中缓冲或不缓冲所请求的内容。某些输入可以是运行时信息，诸如，例如响应大小和处理程序内容生成速度。其它输入可以是各个规则，诸如，例如默认缓冲行为和指示基于其它输入（例如运行时信息）要发生的响应缓冲行为的处理程序专用缓冲行为数据。

在不缓冲所请求的数据时，内容服务器 113 可以向请求该内容的计算机系统发送包括所请求的内容的响应（例如，使用返回电子地址）。当在缓冲区 116 中缓冲所请求的数据时，后处理流水线 115 的各组件可以处理（例如，加密、过滤、缓冲、高速缓存等）所请求的内容。在处理完成时，内容服务器 113 可以从缓冲区 116 中检索所缓冲的和/或所处理的内容。内容服务器 113 可以向请求该内容的计算机系统发送包括所缓冲的和/或所处理的内容的响应（例如，使用返回电子地址）。web 浏览器 102 可以接收并显示任何缓冲的和/或未缓冲的内容。

图 2 示出用于管理网络缓冲响应行为的示例方法 200 的流程图。方法 200 将参考计算机体系结构 100 中的组件和数据来描述。

方法 200 包括从客户机接收内容请求的动作（动作 201）。例如，内容服务器 113 可以从内容浏览器 102 接收包括内容 ID131（例如，URL）的请求 181。内容浏览器 102 可以发送还可以包括计算机系统 101 的电子地址的请求 181 来请求内容以供在内容浏览器 102 上呈现。

内容服务器 113 可以具有在传输内容时使用的默认响应缓冲行为。例如，内容服务器 113 的默认配置可以是在发送包括所请求的内容的响应之前，在缓冲区 116 中完全缓冲所请求的内容。由此，默认地，完整的响应可以对处理组件 141、142 等可用以便进行后处理。另选地，内容服务器 113 的默认配置可以是在发送包括所请求的内容的响应之前缓冲指定量内容（即使指定量小于所请求的内容的全部）。例如，指定量可被设为在网络 191 上使用的分组大小。另一方面，内容服务器 113 还可以被默认地被配置为发送所请求的内容而不缓冲所请求的内容。

内容服务器 113 可以具有基于内容类型的变化的默认行为。例如，HTML 文档的默认行为可以是完全缓冲。另一方面，音频数据的默认行为可以是不缓冲。图像数据可以具有最大达网络 191 的分组大小的部分缓冲。然而，应当理解，明确描述的基于内容类型的各默认缓冲行为仅是示例，因而这些和其它内容类型的其它默认缓冲行为也是可能的。

内容服务器 113 可以具有基于应用程序的变化的默认行为（不论应用程序产生相同还是不同类型的内容）。在一些实施例中，不同的应用处理程序被配置为产生同一内容类型。例如，处理程序 124 可以是被配置为产生 HTML 文档（例如，通过执行 PHP 脚本代码）的超文本预处理器（“PHP”）处理程序。同样地，处理程序 134 可以是被配置为产生 HTML 文档（例如，通过执行 VB 脚本或 Jscript 代码）的动态服务器页面（“ASP”）处理程序。还有一个处理程序甚至可以是被配置为产生 HTML 文档（例如，通过处理用冷融合标记语言（“CFML”）编写的执行标签）的代码融合处理程序。

处理程序 124 产生的 HTML 的默认缓冲行为可以不同于处理程序 134 和产生 HTML 的其它处理程序产生的 HTLP 的默认行为。例如，处理程序 124 产生的 HTML 文档的默认行为可以包括完全缓冲。另一方面，处理程序 134 产生的 HTML 文档可以包括最大达指定大小的缓冲。

在其它实施例中，不同的应用处理程序被配置为产生不同的内容类型。这些应用处理程序的默认缓冲行为也可以是变化的。然而，应当理解，明确描述的基于应用程序的各默认缓冲行为仅是示例，因而这些和其它应用程序的其它默认缓冲行为也是可能的。

方法 200 包括将该请求映射到被配置为提供所请求的内容的处理程序的动作（动作 202）。例如，响应于接收请求 181，内容服务器 113 可以将请求 181 映射到处理程序 134。如图所示，分派表 112 可以具有一个或多个条目，包括内容 ID、处理程序 ID 和行为数据。处理程序 ID 表示被配置为产生对应的内容 ID 所请求的内容的计算机系统 111 上的处理程序的身份。行为数据指示要与在所标识的处理程序处产生的内容相关联的响应缓冲行为（可能更改默认响应缓冲行为）。

为映射请求，内容服务器 113 可以参考分派表 112 来标识与接收到的内容 ID 相对应的处理程序 ID。例如，内容服务器 113 可以参考分派表 112 来确定条目 138 与内容 ID 131 相对应。在条目 138 中，处理程序 132 可以是指向处理程序 134 的指针。行为数据 133 指示要与在处理程序 134 处产生的内容相关联的响应缓冲行为（可能更改默认响应缓冲行为）。

条目 128 包括内容 ID 121、处理程序 ID 122 和行为数据 123。由此，在适当时，内容服务器 113 可以参考分派表 112 来确定条目 128 与内容 ID 121 相对应。在条目 139 中，处理程序 122 可以是指向处理程序 124 的指针。行为数据 123 指示要与在处理程序 124 处产生的内容相关联的响应缓冲行为（可能更改默认响应缓冲行为）。

方法 200 包括访问关于处理程序的缓冲行为的动作（动作 203）。例如，内容服务器 113 可以访问关于处理程序 134 的行为数据 133。行为数据 133 可以指示处理程序 134 要根据默认响应缓冲行为来缓冲在处理程序 134 处产生的内容。例如，在默认响应缓冲行为是完全缓冲所请求的数据时，行为数据可以包括指示遵循默认响应缓冲行为的值。另一方面，行为数据 133 可以指示处理程序 134 要根据与默认响应缓冲行为不同的响应缓冲行为来缓冲在处理程序 134 处产生的内容。例如，在默认响应缓冲行为是完全缓冲所请求的内容时，行为数据可以包括指示在处理程序 134 处产生的内容根本不要缓冲的值（例如，0）。

通常，行为数据可以包括指示如何管理响应缓冲行为的任何数据，例如，基于内容类型、应用程序、响应大小、处理程序内容生成速度等。

方法 200 包括确定所请求的内容要根据至少基于该缓冲行为数据更改的响应缓冲行为来传输的动作（动作 204）。例如，内容服务器 113 可以确定在处理程序 134 处产生的所请求的内容要根据行为数据 133 来传输。行为数据 133 可以指示在处理程序 134 处产生的所请求的内容要根据经更改的响应缓冲行为来传输。由此，行为数据 133 可以指示关于来自处理程序 134 的内容的响应缓冲行为是内容服务器 113 的默认响应缓冲行为的例外。

方法 200 包括访问所请求的内容的一部分的动作（动作 205）。例如，内容服务器 113 可以向处理程序 134 发送内部内容请求 182（例如，程序调用）。响应于接收内部内容请求 182，处理程序 134 可以调用应用程序 136 来产生所请求的内容。应用程序 136 随后可以将任何产生的内容传递给处理程序 134。处理程序 134 可以将内容 183 返回给内容服务器 113。在适当时，处理程序 124 可以类似地调用应用程序 126 来产生所请求的内容，并可以将所请求的内容返回给内容服务器 113。

方法 200 包括根据经更改的响应缓冲行为来传输所请求的内容的该部分的动作（动作 206）。例如，内容服务器 113 可以根据行为数据 133 中指示的经更改的响应缓冲行为来传输内容 183。

由此，取决于默认响应缓冲行为，内容服务器 113 可以缓冲或不缓冲内容 183。即使默认响应缓冲行为指示对内容 183 的（至少部分的）缓冲，也可以是经更改的响应缓冲行为指示内容 183 要被发送到内容浏览器 102 而不做任何缓冲。由此，内容服务器 113 可以向内容浏览器 102 发送包括内容 183 的响应 186 而不缓冲内容 183。

另一方面，即使默认响应缓冲行为指示对内容 183 没有缓冲，也可以是经更改的响应缓冲行为指示内容 183 要在缓冲区 116 中（至少部分地）缓冲。由此，内容服务器 113 在缓冲区 116 中缓冲内容 182。一旦被缓冲，处理组件 141、处理组件 142 以及后处理流水线 115 中的其它处理组件都可以访问并处理内容 183。在一些实施例中，内容在缓冲区 116 中被缓冲但不经历任何后处理。

在适当时，例如，在内容 183 连同其它内容表示对请求 181 的完整响应时，可以将所缓冲的/所处理的内容 184 返回给内容服务器 113。作为响应，内容服

务器 113 可以向内容浏览器 102 发送包括所缓冲的/所处理的内容 184 的响应 187。

图 3 示出便于管理网络响应缓冲行为的示例计算机架构 100。计算机架构 300 包括计算机系统 301 和计算机系统 311。计算机系统 301 和计算机系统 311 各自都连接到网络 391。从而，各组件可以创建消息相关数据并通过网络 391 交换消息相关数据（例如，网际协议（“IP”）数据报和利用 IP 数据报的其它高层协议，诸如传输控制协议（“TCP”）、超文本传输协议（“HTTP”）等）。

通常，计算机系统 301 被配置为请求、接收和呈现基于 web 的内容。例如，web 浏览器 302 可以将包括 URL 和返回电子地址（例如，IP 地址）的内容请求发送到网络 391 上。网络 391 的组件（例如，路由器）可以将该请求路由到内容 ID 中所标识的 web 服务器。计算机系统 301 可以从来自 web 服务器的响应（例如，发送返回 IP 地址）中接收所请求的内容。计算机系统 301 可以处理所请求的内容且 web 浏览器 302 可以呈现该所请求的内容。

通常，计算机系统 311 被配置为接收基于 web 的内容请求、处理这些请求以标识所请求的基于 web 的内容、并在对所接收到的请求的响应中返回所标识的基于 web 的内容。例如，web 服务器 313 可以从 web 浏览器 302 接收包括 URL 331 的请求 381。请求 381 还可以包括到 web 浏览器 302 的返回 IP 地址。内容服务器 313 可以参考分派表 312 来标识可以产生请求 381 中请求的内容的内容供应应用程序 314 中的应用处理程序。例如，web 服务器 313 可以将条目 338 标识为与 URL 331 相对应。从条目 338，web 服务器 313 可以确定处理程序 ID 322 是指向可以产生所请求的内容的处理程序 324 的指针。

计算机系统 311 还可以包括缓冲区 316。Web 服务器 313 可以用默认响应缓冲行为来配置以缓冲来自缓冲区 316 中的所有应用程序的所有内容类型来优化响应带宽并启用内容后处理特征。然而，取决于各种输入（例如，响应大小、处理程序内容生成速度、处理程序专用缓冲行为数据等），在发送包括所请求的内容的响应之前，web 服务器 313 可以在缓冲区 316 中缓冲或不缓冲所请求的内容。

响应于接收请求 318 和标识处理程序 ID 322，web 服务器 313 可以访问缓冲行为数据 333（关于处理程序 334）。缓冲行为数据的粒度可以是处理程序映射。该粒度可以使配置和管理变得容易，因为处理程序映射对应于指定响应缓冲行为的特定应用程序/内容类型。另外，可以按 URL 定义处理程序映射，以便支持按 URL 粒度的响应缓冲行为。

例如，条目 328 和 329 分别对应于 URL 321 和 331。然而，URL 321 和 331 两者都对应于处理程序 ID 322。由此，在处理程序 324 处产生 URL 321 和 331 的内容。然而，为 URL 321 产生的内容和为 URL 331 产生的内容被指示为具有不同的响应缓冲行为。URL 321 的内容对应于行为数据 323 而 URL 321 的内容对应于行为数据 333。因此，在处理程序 324 处产生的内容的不同部分可以具有不同的响应缓冲行为。

例如，可以是处理程序 324 产生图像数据。URL 321 可以与多个较小的图像相关联。由此，行为数据 323 可以指示对于这些较小的图像要利用默认响应缓冲行为（完全缓冲）。在接收到对 URL 321 处的内容的请求时，web 服务器 313 可以访问行为数据 323。

另一方面，URL 331 可以与一个非常大的图像相关联。由此，行为数据 333 可以指示对于该较大图像要关闭（例如，缓冲区大小＝0）默认响应缓冲行为（完全缓冲）。在接收到对 URL 333 处的内容的请求时，web 服务器 313 可以访问行为数据 331。

在接收到对 URL 371 处的内容的请求时，web 服务器 313 还可以访问行为数据 373 来标识关于在处理程序 374 处产生的内容的响应缓冲行为。

基于条目中的行为数据，web 服务器 313 可以确定所请求的内容是根据默认响应缓冲行为还是根据指示对默认响应缓冲行为的例外的经更改的响应缓冲行为来传输。例如，至少部分地基于行为数据 333，web 服务器 313 可以确定是要缓冲（默认）还是不缓冲（经更改的）来自处理程序 324 的内容。

在一些实施例中，关闭响应缓冲的要求可被看作硬要求和软要求。硬要求是处理程序指示的要求。例如，处理程序可以指示（通过行为数据）要求该处理程序来流传送数据。软要求可以平衡各个输入来确定关闭响应缓冲是否适当。例如，管理员可以配置行为数据来可能地关闭响应缓冲以平衡是否要流传

送内容、刚性的首字节时间要求、存储器使用率、网络带宽使用率、后处理需求、响应大小、处理程序响应生成速度等。

在一些实施例中，对一响应完全关闭响应缓冲可能是适当的。例如，在响应相当大（例如，超过缓冲区 316 中的可用存储器）时，可能对计算机系统 311 的性能是有害的或者不可能存储于存储器中。由此，在这些实施例中，对于处理程序和/或内容类型的缓冲行为数据可以指示响应缓冲要被关闭。

此外，内容可以具有传递速率要求和/或首字节时间要求。缓冲内容可以影响传递速率要求和首字节时间要求。由此，在这些其它实施例中，对于处理程序和/或内容类型的缓冲行为数据可以指示响应缓冲要被关闭。

另外，处理程序可以提供其自身的缓冲，从而无意于 web 服务器 313 来再次缓冲内容。加倍缓冲内容是对资源的低效使用。由此，在这些进一步的实施例中，对于处理程序和/或内容类型的缓冲行为数据可以指示响应缓冲要被关闭。

web 服务器 313 支持使用指示是否要缓冲在处理程序处产生的内容的响应缓冲阈值。管理员可以为处理程序设置响应缓冲阈值来实现所需响应缓冲行为。响应缓冲阈值可以是指示要缓冲多少数据的数字。响应缓冲阈值 0 可以指示响应缓冲被关闭。

如果所产生的内容的大小等于或小于对应的缓冲阈值，则可以缓冲所产生的内容。另一方面，如果所产生的内容的大小大于对应的缓冲阈值，则无法缓冲所产生的内容。在一些实施例中，响应缓冲阈值指示在将内容转储清除到客户机之前要缓冲的指定的内容量。在内容大于可用缓冲区时，可以重复填满和转储清除缓冲区，直到所有内容都被发送为止。web 服务器 313 可被配置来为每一缓冲映射自动解析缓冲阈值。

web 服务器 313 可以向处理程序 324 发送内部请求 382 以请求处理程序 324 产生通过 URL 331 访问的内容。作为响应，处理程序 324 可以将 web 内容 383 返回给 web 服务器 313。随后，处理程序 324 和可以将 web 内容 384 返回给 web 服务器 313。

如果缓冲关闭（例如，行为数据 333 具有响应缓冲阈值=0），则 web 内容 383 和 384 在其被接收到时就被发送到 web 浏览器 302。例如，web 服务器

313 可以将包括 web 内容 383 的响应 386 发送到 web 浏览器 302。随后（在接收到 web 内容 384 之后），web 服务器 313 可以将包括 web 内容 384 的响应 396 发送到 web 浏览器 302。

另一方面，如果缓冲打开，则 web 服务器 313 可以在缓冲区 316 中缓冲 web 内容 383。随后（在接收到 web 内容 384 之后），web 服务器 313 还可以在缓冲区 316 中缓冲 web 内容 384。由此，使得 web 内容 383、384 对于后处理流水线 315 可用，后处理流水线包括压缩模块 341、加密模块 342、过滤器模块 343 和高速缓存模块 344。因此，这些模块中的一个或多个可以处理 web 内容 383/384，得到缓存的经处理的 web 内容 388。

在处理完成时，web 服务器 313 可以从缓冲区 316 中检索所缓冲的和/或所处理的 web 内容 388。Web 服务器 313 可以将包括所缓冲的和/或所处理的内容 388 的响应 387 发送到（例如，使用返回 IP 地址）web 浏览器 302。然而，在一些实施例中，不经历任何后处理而缓冲 web 内容 383 和 384。Web 浏览器 302 可以接收并显示任何缓冲的和/或未缓冲的基于 web 的内容。

在一些实施例中，使用响应缓冲 API 来控制来自应用程序的响应缓冲行为。例如，在图 1 中，应用程序 126 或应用程序 136 可以调用响应缓冲 API 来控制其自身的响应缓冲行为。类似地，在图 3 中，应用程序 326 或应用程序 376 可以调用响应缓冲 API 来控制其自身的响应缓冲行为。

响应缓冲 API 可被用来控制和/或实施硬响应缓冲要求。例如，响应缓冲 API 可以被用来基于产生所请求的内容的应用程序所应用的任意规则实施流传送行为。响应缓冲 API 可被用来覆盖包括在分派表中的默认响应缓冲行为以及经更改的响应缓冲行为。

响应缓冲 API 可以包括：

WriteResponse()（写响应） – 用来向客户机发送数据，且可以基于该特定处理程序的配置信息内部地使用响应缓冲。

Flush()（转储清除） – 用来迫使将响应缓冲区转储清楚到客户机。应用程序可以使用其来控制服务器的缓冲行为。

DisableResponseBuffering()（禁用响应缓冲） – 用来为请求的剩余部分关闭响应缓冲。

因此，本发明的各实施例便于控制与内容服务器相关联的不同内容类型和应用程序部分的响应缓冲的能力。此外，各实施例提供按照诸如，例如响应大小和处理程序响应生成速度等运行时信息来定义响应缓冲行为的选项。由此，例如，内容服务器通常可被配置为利用响应缓冲，但仍实现流传送行为和/或防止响应缓冲区的较大的存储器使用率。

另外，应用程序的响应缓冲行为可通过管理员设置的配置设置来控制。由此，应用程序代码不必知道内容服务器的响应缓冲语义。另选地，通过响应缓冲 API，应用程序可以控制其自身的响应缓冲行为。

本发明可具体化为其它具体形式而不背离其精神或本质特征。所述实施例在所有方面都应被认为仅是说明性而非限制性的。从而，本发明的范围由所附权利要求书而非所述描述指示。落入权利要求书的等效方式的含义和范围内的所有改变应被权利要求书的范围涵盖。

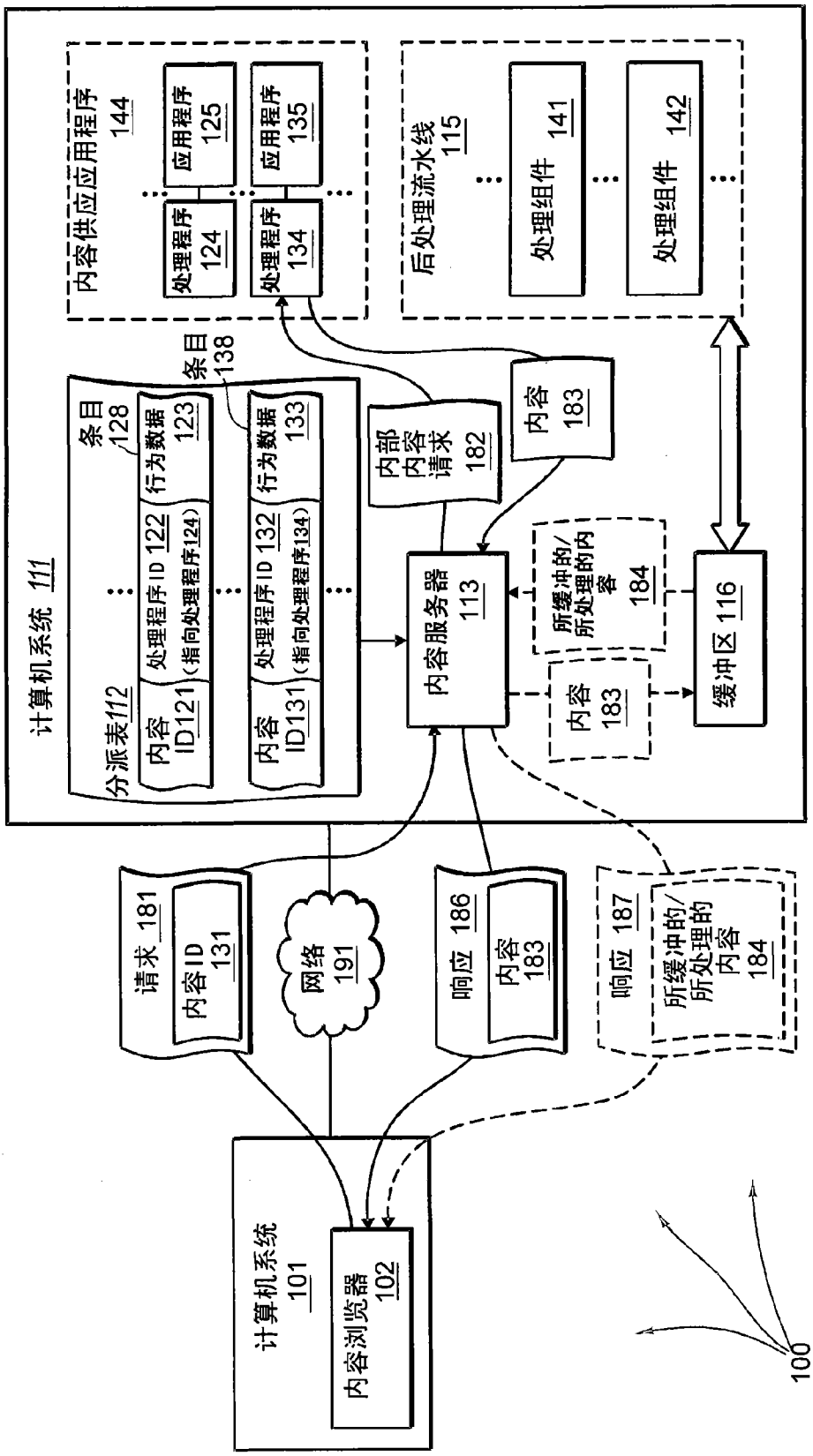

计算机系统 111
分派表112
内容 ID121
处理程序ID 122 (指向处理程序124)
行为数据 123
内容 ID131
处理程序ID 132 (指向处理程序134)
行为数据 133
条目 128
条目 138
内容供应应用程序 144
处理程序 124
应用程序 125
处理程序 134
应用程序 135
后处理流水线 115
处理组件 141
处理组件 142
内部内容请求 182
内容 183
内容服务器 113
所缓冲的/所处理的内容 184
内容 183
缓冲区 116
请求 181
内容ID 131
网络 191
响应 186
内容 183
响应 187
所缓冲的/所处理的内容 184
计算机系统 101
内容浏览器 102
100

图 1

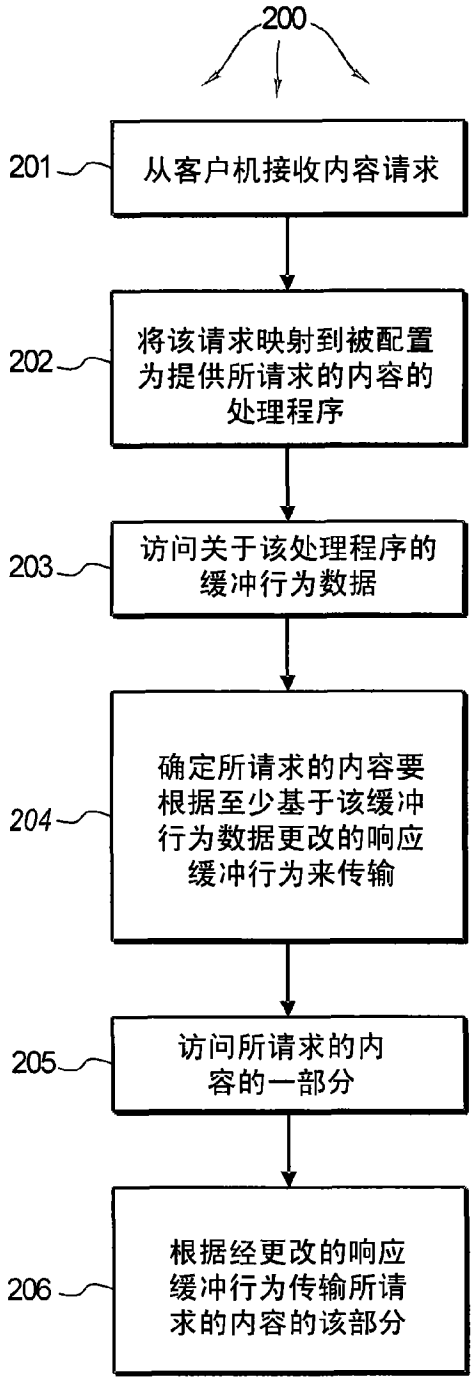

200
201
从客户机接收内容请求
202
将该请求映射到被配置为提供所请求的内容的处理程序
203
访问关于该处理程序的缓冲行为数据
204
确定所请求的内容要根据至少基于该缓冲行为数据更改的响应缓冲行为来传输
205
访问所请求的内容的一部分
206
根据经更改的响应缓冲行为传输所请求的内容的该部分

图 2

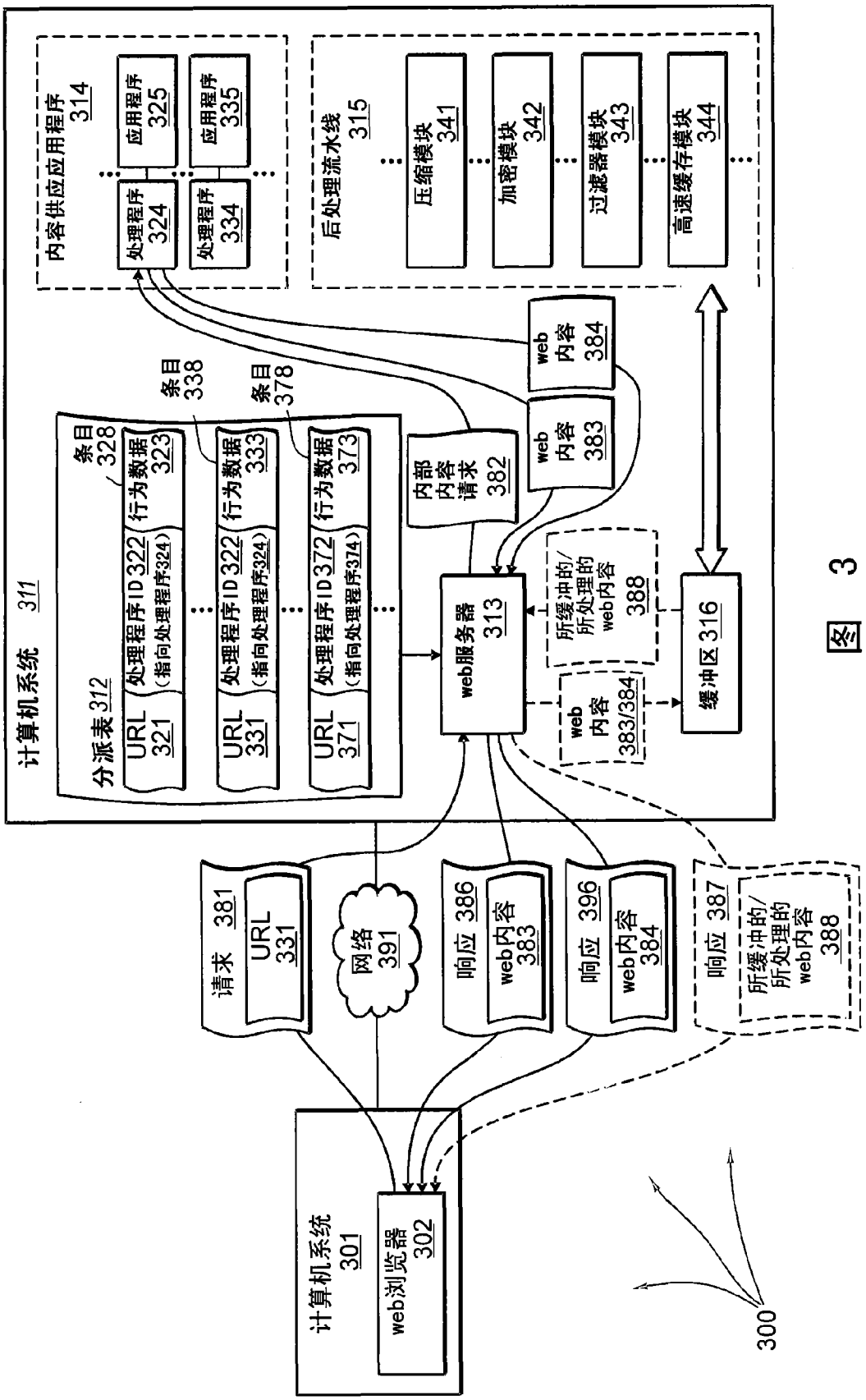

计算机系统 311
内容供应应用程序 314
处理程序 324
应用程序 325
处理程序 334
应用程序 335
后处理流水线 315
压缩模块 341
加密模块 342
过滤器模块 343
高速缓存模块 344
分派表 312
条目 328
URL 321
处理程序ID 322
(指向处理程序324)
行为数据 323
条目 338
URL 331
处理程序ID 322
(指向处理程序324)
行为数据 333
条目 378
URL 371
处理程序ID 372
(指向处理程序374)
行为数据 373
内部内容请求 382
web内容 383
web内容 384
web服务器 313
所缓冲的/所处理的web内容 388
web内容 383/384
缓冲区 316
请求 381
URL 331
网络 391
响应 386
web内容 383
响应 396
web内容 384
响应 387
所缓冲的/所处理的web内容 388
计算机系统 301
web浏览器 302
300

图 3

Electronic Acknowledgement Receipt

EFS ID:	19258588
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	10-JUN-2014
Filing Date:	14-JUL-2010
Time Stamp:	12:54:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370USU1_IDS.pdf	36167 c71c4af7845d54dd6ce09a32dfa632de117d6fb5	no	5

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Form (SB08)	370USU1_SB08.pdf	27857 d92c03ce9914aeae7ce21d3fbf4f82660fda4626	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	CN_2010800402067_ExRpt_12May14_370CN.pdf	8985907 b15ffc1147f5d14f068bedf2a279b40588c206f6	no	10
Warnings:					
Information:					
4	Foreign Reference	CN101023627A.pdf	6323833 c0196ebd33fe7bdbe0303d7becaac0bdae9bc32e	no	36
Warnings:					
Information:					
5	Foreign Reference	CN101374158A.pdf	3512400 1c9d990ab4ea5799da402e4a0281af11f17de014	no	19
Warnings:					
Information:					
6	Foreign Reference	CN101421719A.pdf	3696017 989d26760cfce01b09a554de2b353eede93a5242	no	22
Warnings:					
Information:					
		Total Files Size (in bytes):	22582181		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	MIDDLETON, Ted	Art Unit	:	2447
Filed	:	July 14, 2010	Examiner	:	Karen C. Tang
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			

Submitted Via EFS-Web

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

Sir:

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

Copies of all of the cited documents:

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant on _____.

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

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

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

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

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

III

CERTIFICATION

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

☒ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

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

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

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

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

V
REMARKS

It is respectfully requested that:

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

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted,

Date: June 10, 2014

/JCS/

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USPTO Customer No. 83579
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PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	12836418	Filing Date	2010-07-14	Docket Number (if applicable)	0370-US-U1	Art Unit	2447
First Named Inventor	Ted Middleton			Examiner Name	Karen C. TANG		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 505063

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/JCS/	Date (YYYY-MM-DD)	2014-05-23
Name	Jonathan C. Siekmann	Registration Number	58259

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Applicant:	Ted Middleton	Confirmation No:	2155
Serial No.:	12/836,418	Group Art Unit:	2447
Filed:	14 July 2010	Examiner:	TANG, Karen C.
Title:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK	Customer No.	83579

AMENDMENT AND REQUEST FOR CONTINUED EXAMINATION

Via EFS-Web
MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the final Office Action dated 26 July 2013 please amend the above-identified application as follows:

Extension of Time begins on page **2** of this paper.

Amendments to the Claims begin on page **3** of this paper.

Remarks/Arguments begin on page **7** of this paper.

Extension of Time

Applicant hereby petitions for a **TWO-**month extension of time and is electronically submitting the required fee with this response. Applicant believes no other Petitions or fees are necessary, but if this is incorrect, please consider this a Petition and authorization of payment therefor. The Commissioner is authorized to deduct any additional fees from or credit any overpayment to the account no. 50-5063.

Amendments to the Claims:

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

Listing of Claims:

1. (Currently amended) A method of providing an extensible content delivery platform, the method comprising:

identifying, by a computer system, receipt of a discrete event at a core engine of a content delivery network, the core engine comprising a structured object model having a plurality of objects instantiated and available to process a plurality of event types;

selecting a rule based on the discrete event, the rule from a set of rules defining the plurality of event types;

selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine.

~~a plurality of discrete events of a content delivery process of a content delivery network;~~

~~providing a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events; and~~

~~providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network~~.

2. (Currently amended) The method as recited in claim 1 wherein ~~the operation of identifying the plurality of discrete events comprises using a structured event model to identify the plurality of discrete events~~ the discrete event is an event of a content delivery process of a content delivery network.

3. (Currently amended) The method as recited in claim 1 wherein identifying the discrete event further comprises identifying the discrete event using the set of rules ~~the operation of~~

~~identifying the plurality of discrete events comprises using at least one rule to identify the plurality of discrete events~~.

4. (Currently amended) The method as recited in claim 1 further comprising a set of base functions to be performed at ~~the~~ a plurality of discrete events comprising the identified discrete event.

5. (Previously presented) The method as recited in claim 1 further comprising a set of base functions to be performed upon the plurality of objects.

6. (Currently amended) A cache server comprising:

a core engine executing on a processor of [[a]] the cache server, the core engine comprising a structured object module having a plurality of objects instantiated and available to process a plurality of event types in a content delivery network, the core engine being configured to:

identify receipt of a discrete event of a content delivery process;

select a rule based on the identified discrete event, the rule being from a set of rules defining the plurality of event types; and

select a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event, wherein the selected module processes the discrete event using at least one of the plurality of objects of the core engine.

~~comprising a structured event model identifying a plurality of discrete events of a content delivery process of a content delivery network, a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events, and a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.~~

7. (Currently amended) A cache server as recited in claim 6 wherein the selected module is one of a plurality of ~~logical flow of actions comprises~~ user definable modules.

8. (Canceled)

9. (Canceled)

10. (New) The method as recited in claim 1, wherein selecting the rule further comprises:

selecting the rule based on an event type of the identified discrete event.

11. (New) The method as recited in claim 1, further comprising:

adding a rule to the set of rules, the rule specifying a module to process a new event type; and

identifying receipt of an event of the new event type and processing the event using the specified module.

12. (New) The method as recited in claim 1, wherein the selected module processes the discrete event without altering logic of the core engine.

13. (New) The method as recited in claim 1, wherein the module selected is one of a plurality of user definable modules.

14. (New) The cache server as recited in claim 6, wherein the core engine is further configured to select the rule based on an event type of the discrete event.

15. (New) The cache server as recited in claim 6, wherein the selected module processes the discrete event without altering logic of the core engine.

16. (New) A system comprising:

a core engine executing on a processor of a cache server of a content delivery network, the core engine comprising a structured object model having a plurality of objects instantiated and available to process a plurality of event types in a content delivery network, the core

engine being configured to identify receipt of a discrete event of a content delivery process; and

a plurality of modules to process the plurality of event types, wherein the core engine selects one of the plurality of modules to process the identified discrete event based on identity of a user requesting processing of the discrete event, the module being configured to process the discrete event using at least one of the plurality of objects of the core engine.

17. (New) The system of claim 16, wherein the core engine selects the one of the plurality of modules based on a rule defining an event type of the discrete event.

18. (New) The system of claim 16, wherein the selected module processes the discrete event without altering logic of the core engine.

19. (New) The system of claim 16, wherein the plurality of modules are user-definable modules.

Remarks

This Response is considered fully responsive to the final Office Action mailed July 26, 2013. Claims 1-9 were pending in the application. Claims 1-9 stand rejected. In this Response, claims 1-4 and 6-7 are amended. Claims 8 and 9 are canceled. Claims 10-19 are newly added. These amendments and new claims are fully supported by the original specification including, for example, the following paragraphs:

(1) paragraph [0112] (e.g., discussing "a set of rules is used to detect certain discrete events out of multiple possible events at which various actions are to be taken through customizable modules or scripts . . .");

(2) paragraph [0118] (providing examples of a number different event types; e.g., a Receive Request, a Find Resource, a Cache Hit, a Cache Miss, a Cache Fill, etc.); and

(3) paragraph [0110](e.g., discussing selection of modules based on user identity).

Reexamination and reconsideration are respectfully requested.

Rejections Under 35 U.S.C. § 103

The Office has rejected claims 1-9 under 35 U.S.C. § 103(a) as purportedly being unpatentable over US Application Publication No. 2009/0150518 A1 to Lewin et al. ("Lewin") in view of U.S. Patent Application Publication No. 2008/0313282 A1 to Warila et al. ("Warila"). The Applicant respectfully traverses these rejections for at least the following reasons.

To establish prima facie obviousness of a claimed invention, two basic criteria must be met. First, all of the claim elements must be shown by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Second, there must be some rationale or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the references or to combine reference teaching. In other words, there should be an explicit analysis regarding whether there was an apparent reason to combine the known elements in the fashion claimed in the application at issue. *KSR Int'l Co. v. Teleflex, Inc.*, 127 S, Ct. 1727, 1741 (2007). Without conceding the second criteria, the Applicant respectfully asserts that the rejection does not satisfy the first criteria.

Lack of Elements: Independent Claim 1

Claim 1 recites, *inter alia*, "the core engine comprising a structured object model having a plurality of objects instantiated and available to process a plurality of event types" and "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event," (*emphasis added*).

Lewin and Warila do not alone or in any combination disclose at least: (1) processing a "plurality of event types" or (2) "selecting a module to process the discrete event based on the selected rule and identity of a user requesting processing of the discrete event."

Thus, the combination of Lewin and Warila fails to disclose each and every element of claim 1. The Applicant respectfully asserts that claim 1 is patentable over the 35 U.S.C. § 103(a) rejection of record. The Applicant respectfully requests allowance of claim 1.

Lack of Elements: Dependent claims 2-5

Claims 2-5 each depend from claim 1 and therefore inherit all elements of claim 1. The Applicant submits that claims 2-5 are patentable at least for their dependence from an allowable base claim as well as for their own patentable features. The Applicant respectfully requests allowance of claims 2-5.

Lack of Elements: Independent Claim 6

Claim 6 recites, *inter alia*, "the core engine comprising a structured object module having a plurality of objects instantiated and available to process a plurality of event types . . . the core engine being configured to . . . select a module to process the discrete event based on [a] selected rule and identity of a user requesting processing of the discrete event," (*emphasis added*).

Lewin and Warila do not alone or in any combination disclose at least: (1) processing a "plurality of event types" or (2) "a core engine configured to . . . select a module to process the discrete event based on the selected rule and identity of a user requesting processing of the

discrete event."

Thus, the combination of Lewin and Warila fails to disclose each and every element of claim 6. The Applicant respectfully asserts that claim 6 is patentable over the 35 U.S.C. § 103(a) rejection of record. The Applicant respectfully requests allowance of claim 6.

Lack of Elements: Dependent claims 7

Claim 7 depends from claim 1 and therefore inherits all elements of claim 1. The Applicant submits that claim 7 is patentable at least for its dependence from an allowable base claim as well as for its own patentable features. The Applicant respectfully requests allowance of claim 7.

Lack of Elements: New Dependent Claims 10-13

New claims 10-13 depend from claim 1 and therefore inherit all elements of claim 1. The Applicant submits that claims 10-13 are patentable at least for their dependence from an allowable base claim as well as for their own patentable features. The Applicant respectfully requests allowance of claims 10-13.

Lack of Elements: New Dependent Claims 14-15

New claims 14 and 15 depend from claim 6 and therefore inherit all elements of claim 6. The Applicant submits that claims 14 and 15 are patentable at least for their dependence from an allowable base claim as well as for its own patentable features. The Applicant respectfully requests allowance of claims 14 and 15.

Lack of Elements: New Independent Claim 16

New claim 16 recites, *inter alia,* "[a] core engine comprising a structured object model having a plurality of objects instantiated and available to process a plurality of event types" and "wherein the core engine selects one of the plurality of modules to process the identified discrete event based on identity of a user requesting processing of the discrete event," (*emphasis added*).

Lewin and Warila do not alone or in any combination disclose at least: (1) processing a "plurality of event types" or (2) "wherein the core engine selects one of the plurality of modules to process the identified discrete event based on identity of a user requesting processing of the discrete event."

Thus, the combination of Lewin and Warila fails to disclose each and every element of claim 16. The Applicant respectfully asserts that claim 16 is patentable over art of record. The Applicant respectfully requests allowance of claim 16.

Lack of Elements: New Dependent Claims 17-19

New claims 17-19 depend from claim 16 and therefore inherit all elements of claim 16. The Applicant submits that claims 17-19 are patentable at least for their dependence from an allowable base claim as well as for their own patentable features. The Applicant respectfully requests allowance of claims 17-19.

Conclusion

Claims 1-7 and 10-19 are currently pending in the application. Applicant has fully responded to each and every objection and rejection in the final Office Action dated July 26, 2014, and believes that claims 1-7 and 10-19 are in a condition for allowance. Applicant therefore requests that a timely Notice of Allowance be issued in this case.

The Applicant submits herewith a Request for Continued Examination (RCE) along with the requisite fee. In addition to the extension of time fee, Applicant believes no other fees or petitions are due with this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 50-5063 appropriately.

If the Examiner believes any issues could be resolved via a telephone interview, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 23 May 2014

/JCS/

Jonathan C. Siekmann
Registration No. 58,259
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Level 3 Communications, LLC
1025 Eldorado Blvd.
Broomfield, Colorado 80021
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Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

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:				
Extension - 2 months with $0 paid	1252	1	600	600

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for Continued Examination	1801	1	1200	1200
		Total in USD ($)		**1800**

Electronic Acknowledgement Receipt

EFS ID:	19118119
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	23-MAY-2014
Filing Date:	14-JUL-2010
Time Stamp:	15:47:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1800
RAM confirmation Number	2215
Deposit Account	505063
Authorized User	SIEKMANN, JONATHAN

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)

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

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	Request for Continued Examination (RCE)	sb0030e_fill.pdf	697785 4d38851da838ce2bd12d4b6c73916ef12405ff9d	no	3
Warnings:					
Information:					
2		0370_US_U1_ResponseRCE.pdf	61668 ae8e022c2128cf410b2c4caef5084586b5d1a7c7	yes	11

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Extension of Time	2	2
Claims	3	6
Applicant Arguments/Remarks Made in an Amendment	7	11

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32630 2b07fe3fa71845101383d22d9bc5b65b13603ef7	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	792083		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/836,418	Filing Date 07/14/2010	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

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

APPLICATION AS AMENDED – PART II

AMENDMENT **05/23/2014**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 3	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

AMENDMENT

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

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

LIE
/PARTHENIA D. MERRILL/

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/836,418	07/14/2010	Ted Middleton	0370-US-U1

CONFIRMATION NO. 2155

83579
LEVEL 3 COMMUNICATIONS, LLC
Attn: Patent Docketing
1025 Eldorado Blvd.
Broomfield, CO 80021

POA ACCEPTANCE LETTER

OC000000066353143

Date Mailed: 01/31/2014

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/27/2014.

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

/qtran/

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

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

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

I hereby appoint:

☑ Practitioners associated with the Customer Number: 83579

OR

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

Name	Registration Number	Name	Registration Number

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

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

☑ The address associated with Customer Number: 83579

OR

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

Assignee Name and Address:

LEVEL 3 COMMUNICATIONS, LLC
1025 Eldorado Blvd.
Broomfield, CO 80021

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

SIGNATURE of Assignee of Record

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

Signature	/David D. Wier/	Date	January 27, 2014
Name	David D. Wier	Telephone	720-888-3539
Title	VP Patent Counsel		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Privacy Act Statement

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Notice of Appeal	1401	1	800	800
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	1253	1	1400	1400
Miscellaneous:				
			Total in USD ($)	**2200**

Electronic Acknowledgement Receipt

EFS ID:	18038568
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	27-JAN-2014
Filing Date:	14-JUL-2010
Time Stamp:	18:30:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$2200
RAM confirmation Number	6154
Deposit Account	505063
Authorized User	SIEKMANN, JONATHAN

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)

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

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	Notice of Appeal Filed	sb0031.pdf	216331 95b242a028c95f7155eaf7feb185824588932e09	no	2
Warnings:					
Information:					
2	Assignee showing of ownership per 37 CFR 3.73.	sb0096.pdf	423092 53a5efb29fba2ba0f7d8a6825e42929245b77c26	no	2
Warnings:					
Information:					
3	Extension of Time	sb0022.pdf	186896 a9ceee28f7848df3b4e082eb54c31d01c8405495	no	2
Warnings:					
Information:					
4	Power of Attorney	sb0080.pdf	432933 41dfceb7e6ccf93e6aa86619087d262f23fedc1e	no	2
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	32596 1462ca45c73e2b3de9fd78f852baa764f8c824a6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1291848		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

PTO/SB/31 (09-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD

Docket Number (Optional): 0370-US-U1

I hereby certify that this correspondence is being facsimile transmitted to the USPTO EFS-Web transmitted to the USPTO, or or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)]

on N/A: via EFS-Web

Signature _____

Typed or printed name _____

In re Application of: Ted Middleton

Application Number	Filed
12/836,418	July 14, 2010

For: CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

Art Unit	Examiner
2447	Karen C. TANG

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 800

☐ Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by half, and the resulting fee is: $ _____

☐ A check in the amount of the fee is enclosed.

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

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 505063 .

☑ A petition for an extension of time under 37 CFR 1.136(a) (PTO/SB/22) is enclosed.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☑ assignee of record of the entire interest.
See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed.
(Form PTO/SB/96)

☐ attorney or agent of record.
Registration number _____.

☐ attorney or agent acting under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34. _____

/David D. Wier/
Signature

David D. Wier
Typed or printed name

720-888-3539
Telephone number

January 27, 2014
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required.
Submit multiple forms if more than one signature is required, see below*.

☑ *Total of 4 forms are submitted.

This collection of information is required by 37 CFR 41.31. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Privacy Act Statement

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

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

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

PTO/SB/96 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Ted Middleton

Application No./Patent No.: 12/836,418 Filed/Issue Date: July 14, 2010

Titled: CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

LEVEL 3 COMMUNICATIONS, LLC , a Limited Liability Company

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

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 024685, Frame 0638, or for which a copy therefore is attached.

OR

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

1. From: _____ To: _____

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

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

2. From: _____ To: _____

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

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

3. From: _____ To: _____

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

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

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

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

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

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

/David D. Wier/ January 27, 2014

Signature Date

David D. Wier VP Patent Counsel

Printed or Typed Name Title

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

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

Privacy Act Statement

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

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

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

PTO/SB/22 (03-13)
Approved for use through 3/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 0370-US-U1

Application Number: 12/836,418

Filed: July 14, 2010

For: CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

Art Unit: 2447

Examiner: Karen C. TANG

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☐ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☑ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$ 1400
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

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

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 505063.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☑ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☐ attorney or agent of record. Registration number _____.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/David D. Wier/ — Signature

January 27, 2014 — Date

David D. Wier — Typed or printed name

720-888-3539 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 4 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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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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.
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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/836,418	07/14/2010	Ted Middleton	0370-US-U1	2155

83579 7590 07/26/2013

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

EXAMINER	
TANG, KAREN C	

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
07/26/2013	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No. 12/836,418	Applicant(s) MIDDLETON, TED	
	Examiner KAREN TANG	Art Unit 2447	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* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, 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 *25 March 2013*.

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

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

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

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

Disposition of Claims

5)☒ Claim(s) *1-9* 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) *1-9* is/are rejected.

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

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

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

Application Papers

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

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

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

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

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

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

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

- Claims 1-9 are presented for further examination.
- This action is responsive to the amendment and remarks file on 3/25/2013

Response to Arguments

Applicant's arguments filed 3/25/2013 have been fully considered but they are not persuasive.

Applicant argues that the references fail to disclose the limitation of "identifying, by a computer system, a plurality of discrete events of a content delivery process of a content delivery network"

Examiner respectfully disagrees.

Lewin discloses the system is capable to receive plurality of requested contents (i.e., plurality of discrete events of a content delivery process of a content delivery network, each user may request a webpage/discrete event, refer to par 0044, 0047 and par 0050), based on the requested content, the computer system is capable to identify each discrete events (e.g., system is capable to identify the requested content, refer to par 0044, 0046-0050).

Furthermore,

Applicant argues that the combination of the references are improper.

Examiner disagrees.

It is not necessary that the inventions of the references be physically combinable to render obvious the invention under review." In re Sneed, 710 F.2d 1544, 1550 Fed. Cir. 1983 (citing Orthopedic Equip. Co. v. United States, 702 F.2d 1005, 1013 (Fed. Cir. 1983); In re Andersen, 391 F.2d 953,958 (CCPA 1968)); see also In re Nievelt, 482 F.2d 965,968 (CCPA

1973) ("Combining the teachings of references does not involve an ability to combine their specific structures."). "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the

primary reference ....

Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." In re Keller, 642 F.2d 413,425 (CCPA 1981) (citations omitted).

Therefore, the arguments are not persuasive and the rejection is maintained.

Claim Rejections - 35 USC § 103

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

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

Claims 1-9 are are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewin et al hereinafter Lewin (US 2009/0150518) in view of Warila et al hereinafter Warila (US 20080313282).

1. Referring to Claim 1. Lewin discloses a method of providing an extensible content delivery platform, the method comprising: identifying a plurality of discrete events of a content delivery process of a content delivery network (receive request, refer to par 0050; based on the request, the request contains metadata and define how the request should be treated, refer to par 0036, 0044, 0046-0050); providing a structured object model comprising a plurality of objects

instantiated and available at the plurality of discrete events (refer to par0049, 0054); and providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network (refer to par 0049- 0056).

Warila further elaborate the use of pluggable API (i.e., extensible content delivery platform) to assist in processing the request (refer to par 0031, 0004).

It would be obvious for one of ordinary skill in the art to combine the teaching of Lewin with Warila because Warila's system allow the system to operate despite of the type of original platform on the system and make the system more flexible to update and change without modify much original code/scripts.

2. Referring to Claim 2. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein the operation of identifying the plurality of discrete events comprises using a structured event model to identify the plurality of discrete events (refer to par 0054).

3. Referring to Claim 3. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein the operation of identifying the plurality of discrete events comprises using at least one rule to identify the plurality of discrete events (refer to 0056).

4. Referring to Claim 4. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed at the plurality of discrete events (refer to par 0056).

5. Referring to Claim 5. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed upon the plurality of objects (refer to par 0056).

6. Referring to Claim 6. Claim is rejected under similar rational as claim 1.

7. Referring to Claim 7. Lewin and Warila disclosed the cache server as recited in claim 6. Lewin further discloses wherein the logical flow of actions comprises user definable modules (refer to par 0056).

8. Referring to Claim 8. Claim is rejected under similar rational as claim 1.

9. Referring to Claim 9. Claim is rejected under similar rational as claim 7.

Conclusion

Examiner's Notes: Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. In the case of amending the claimed invention, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on for proper interpretation and also to verify and ascertain the metes and bounds of the claimed invention.

Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAREN TANG whose telephone number is (571)272-3116. The examiner can normally be reached on M-F 7 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOON H. HWANG can be reached on (571)272-4036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Karen C Tang/
Primary Examiner, Art Unit 2447

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	Art Unit
	KAREN TANG	2447

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	217,222,224	11/14/2012	KT

SEARCH NOTES		
Search Notes	Date	Examiner
East Search with Keyword and Class Search	11/14/2012	KT
Google Search	11/14/2012	KT
ACM Search	11/14/2012	KT
IEEE Search	11/14/2012	KT
Inventor Search	11/14/2012	KT
Double Patenting Search	11/14/2012	KT
Search Updates	7/22/2013	KT

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
709	217,222,224	7/14/2012	KT

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
	Examiner	Art Unit
	KAREN TANG	2447

✓	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	11/14/2012	07/22/2013							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Applicant : Ted Middleton	
Appln. No. : 12/836,418	Confirmation No: 2155
Filed : 14 July 2010	Group Art Unit: 2447
Title CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK CONTROL	Examiner: Tang, Karen C.
	Docket No. 0370-US-U1
Customer No.: 83579	

RESPONSE TO OFFICE ACTION

Via EFS-Web
MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action dated 23 November 2012, please amend the above-identified application as follows.

Request for an Extension of Time is made on page 2 of this paper.

Amendments to the Claims, if any, begin on page 3 of this paper.

Remarks/Arguments begin on page 5 of this paper.

EXTENSION OF TIME

Applicant hereby petitions for a **ONE-month** extension of time and is electronically submitting the required fee with this response. The Commissioner is authorized to deduct any additional fees from or credit any overpayment to the undersigned's account no. 50-5063.

Amendments to the Claims:

1. (Currently Amended) A method of providing an extensible content delivery platform, the method comprising:

identifying, by a computer system, a plurality of discrete events of a content delivery process of a content delivery network;

providing a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events; and

providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.

2. (Currently Amended) The method ~~A methods~~ as recited in claim 1 wherein the operation of identifying the plurality of discrete events comprises using a structured event model to identify the plurality of discrete events.

3. (Currently Amended) The method ~~A methods~~ as recited in claim 1 wherein the operation of identifying the plurality of discrete events comprises using at least one rule to identify the plurality of discrete events.

4. (Currently Amended) The method ~~A methods~~ as recited in claim 1 further comprising a set of base functions to be performed at the plurality of discrete events.

5. (Currently Amended) The method ~~A methods~~ as recited in claim 1 further comprising a set of base functions to be performed upon the plurality of objects.

6. (Original) A cache server comprising:

a core engine executing on a processor of a cache server, the core engine comprising a structured event model identifying a plurality of discrete events of a content delivery process of a content delivery network, a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events, and a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.

7. (Original) A cache server as recited in claim 6 wherein the logical flow of actions comprises user definable modules.

8. (Original) A cache server comprising:

a core engine executing on a processor of a cache server, the core engine comprising a set of rules configured to identify a plurality of discrete events of a content delivery process of a content delivery network, a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events, and a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.

9. (Original) A cache server as recited in claim 8 wherein the logical flow of actions comprises user definable modules.

Remarks

This Amendment and Response is considered fully responsive to the 23 November 2012 Office Action in the above-entitled matter. Claims 1-9 remain pending.

Claims Amendments

Claim 1 has been amended to include the words "by a computer system" to specify that the method involves a computer system. No new matter has been entered. Basis exists in the Application-as-filed, for example see paragraph [00123] and Figure 12. Claim 1 has been amended only for the purpose of directing claims 1-5 to statutory subject matter, and not for the purpose of narrowing their scope in the face of prior art.

Claims 2-5 have been amended to correct typographical errors. No new matter has been entered. Claims 2-5 has been amended only for this purpose, and not for the purpose of narrowing their scope in the face of prior art.

Claims Rejections under 35 U.S.C. § 101

Claims 1-9 stand rejected under 35 U.S.C. §101, as being directed to non-statutory subject matter.

With regard to claims 1-5, Applicant has added the word "by a computer system" to claim 1 in order to overcome the 35 U.S.C. §101 rejection. Applicant respectfully notes that claim 1 is now tied to a particular machine and is now a statutory process. Claims 2-5 depend from claim 1 and thus also are tied to the particular machine. Thus, Applicant respectfully asserts that claims 1-5 are now directed to statutory subject matter.

With regards to claims 6-7, Applicant notes that claim 6 already recites sufficient structure. Specifically, claim 6 recites "a core engine executing on a processor of a cache server", wherein the processor and cache server are hardware devices. Thus, claim 6 is tied to a particular machine and is a statutory claim. Claim 7 depends from claim 6 and thus also is tied to the particular machine. Thus, Applicant respectfully asserts that claims 6-7 are directed to statutory subject matter.

With regards to claims 8-9, Applicant notes that claim 8 already recites sufficient structure. Specifically, claim 8 recites "a core engine executing on a processor of a cache server", wherein the processor and cache server are hardware devices. Thus, claim 8 is

tied to a particular machine and is a statutory claim. Claim 9 depends from claim 8 and thus also is tied to the particular machine. Thus, Applicant respectfully asserts that claims 8-9 are directed to statutory subject matter.

Therefore, Applicant respectfully requests that this rejection be withdrawn.

Claims Rejections under 35 U.S.C. § 103

Claims 1-9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lewin et al., U.S. Patent Application Publication No. 2009/0150518 (hereinafter "Lewin") in view of Warila et al., U.S. Patent Application Publication No. 2008/0313282 (hereinafter "Warila").

To establish prima facie obviousness of a claimed invention, two basic criteria must be met. First, all the claim elements must be shown by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Second, there must be some rationale or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine reference teachings. In other words, there should be an explicit analysis regarding whether there was an apparent reason to combine the known elements in the fashion claimed in the Application at issue. KSR Int'l Co. v. Teleflex Inc., 127 S.Ct. 1727, 1741 (2007). Without conceding the first criteria, Applicant respectfully asserts that the rejection does not satisfy the second criteria.

Lack of Elements: Independent Claim 1

The Office Action cites Lewin for teaching various elements of the claims, and relies upon Warila for teaching an extensible content delivery platform. However, this combination, as presented, does not teach or suggest all elements of the claimed invention.

Claim 1, as amended, defines a method of providing an extensible content delivery platform, the method that includes identifying, by a computer system, a plurality of discrete events of a content delivery process of a content delivery network. The combination of Lewin and Warila does not teach at least these elements.

The Office Action cites paragraph [0050] as teaching these elements. However, paragraph [0050] is discussing the flowchart of Figure 9 that illustrates the dynamic content assembly process. There is nothing in this section of Lewin that identifies a plurality of discrete events of a content delivery process of a content delivery network. Thus, Lewin does not teach this element of claim 1. Applicant notes that Warila is not relied upon in the Office Action as teaching this element.

Thus, the combination of Lewin and Warila does not teach all of the claimed elements. Therefore, the Applicant respectfully asserts that for the above reasons claim 1 is patentable over the 35 U.S.C. § 103(a) rejection of record.

Lack of Elements: Independent Claim 6

The Office Action cites Lewin for teaching various elements of the claims, and relies upon Warila for teaching an extensible content delivery platform. However, this combination, as presented, does not teach or suggest all elements of the claimed invention.

Claim 6 defines a cache server comprising a core engine executing on a processor of a cache server, the core engine comprising a structured event model identifying a plurality of discrete events of a content delivery process of a content delivery network. The combination of Lewin and Warila does not teach at least these elements.

The Office Action does not provide an element-by-element analysis of this claim, and cites to the rejection of claim 1. The Office Action is believed to be citing to paragraph [0050] for teaching these elements. However, paragraph [0050] is discussing the flowchart of Figure 9 that illustrates the dynamic content assembly process. There is nothing in this section of Lewin that discloses a structured event model identifying a plurality of discrete events of a content delivery process of a content delivery network. Thus, Lewin does not teach this element of claim 6. Applicant notes that Warila is not relied upon in the Office Action as teaching this element.

Thus, the combination of Lewin and Warila does not teach all of the claimed elements. Therefore, the Applicant respectfully asserts that for the above reasons claim 6 is patentable over the 35 U.S.C. § 103(a) rejection of record.

Lack of Elements: Independent Claim 8

The Office Action cites Lewin for teaching various elements of the claims, and relies upon Warila for teaching an extensible content delivery platform. However, this combination, as presented, does not teach or suggest all elements of the claimed invention.

Claim 8 defines a cache server comprising a core engine executing on a processor of a cache server, the core engine comprising a set of rules configured to identify a plurality of discrete events of a content delivery process of a content delivery network. The combination of Lewin and Warila does not teach at least these elements.

The Office Action does not provide an element-by-element analysis of this claim, and cites to the rejection of claim 1. The Office Action is believed to be citing to paragraph [0050] as teaching these elements. However, paragraph [0050] is discussing the flowchart of Figure 9 that illustrates the dynamic content assembly process. There is nothing in the section of Lewin that discloses having a set of rules configured to identify a plurality of discrete events of a content delivery process of a content delivery network. Thus, Lewin does not teach this element of claim 8. Applicant notes that Warila is not relied upon in the Office Action as teaching this element.

Thus, the combination of Lewin and Warila does not teach all of the claimed elements. Therefore, the Applicant respectfully asserts that for the above reasons claim 8 is patentable over the 35 U.S.C. § 103(a) rejection of record.

Lack of Elements: Dependent Claims 2-5, 7, and 9

Claims 2-5, 7, and 9 depend from base claims 1, 6, and 8, respectively, and thus inherit all elements of respective base claim. Claims 2-5, 7, and 9 set forth features and elements not recited by the combination of Lewin and Warila. Thus, the Applicant respectfully asserts that for the above reasons claims 2-5, 7, and 9 are patentable over the 35 U.S.C. § 103(a) rejection of record.

Improper Rationale

The Office Action cites Lewin for teaching various elements of the claims, and relies upon Warila for teaching an extensible content delivery platform. In making the combination of Lewin and Warila, the Office Action presented the following rationale:

"It would be obvious for one of ordinary skill in the art to combine the teaching of Lewin with Warila because Warila's system allow the system to operate despite of the type of original platform on the system and make the system more flexible to update and change without modify much original code/scripts."

It is well settled that to facilitate review, the obvious rejection analysis should be made explicit. See In re Kahn, 441 F.3d 977, 988 (CA Fed. 2006) ([R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. KSR Int'l Co. v. Teleflex Inc., 127 S.Ct. 1727, 1741 (2007). Furthermore, Applicant notes that the Supreme Court further stated that "As is clear from cases such as Adams, a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." KSR Int'l Co. v. Teleflex Inc. 127 S.Ct. 1727, 1741 (2007).

Applicant notes that Lewin already allows the system to operate despite of the type of original platform on the system and make the system more flexible to update and change without modify much original code/scripts. The system of Lewin can operate with the base layer of a pluggable architecture from which one or more processing engines (e.g., text such as HTML, XSLT, Java, PHP, and the like), see paragraph [0014]. Furthermore, the system of Lewin can operate with different operating systems (e.g. Linux, WindowsNT, Windows 2000), see paragraph [0046]. Still furthermore, the system of Lewin can operate with different XML-based processors (e.g., Apache Xalan, Mozilla TransforMiix, IBM WebSphere XML4J, or the like) for parsing XML and XSL, a Java-based processor including a Java Virtual Machine (JVM) for processing servlets, .jsp files, and other J2EE web applications, a PHP processor for processing PHP, which is a known server-side, cross-platform, HTML embedded scripting language, a processor for processing content (e.g., ASP.NET pages) written to conform to Microsoft's .NET initiative, see paragraph [0048]. Still furthermore, the system of Lewin can operate with

any generalized server-based functionality including, without limitation, ESI, SSI, XSSI, JSP, ASP, PHP, Zope, ASP.NET, Perl, and many others, see paragraph [0075]. There is nothing in Lewin that prevents the system of Lewin from operating with different platforms or limits in the ability to update or change the system of Lewin.

The Office Action does not provide any analysis as to the rationale to support the rejection. The statement provided by the Office Action is a mere conclusion. There is no articulated reasoning and no rational underpinning. There is no discussion of how Lewin has problems because of a lack elements, or how using the teachings of Warila provides any benefit to the disclosure of Lewin. Thus, the rationale provided by the Office Action is improper, as the rationale must establish an articulated reasoning with some rational underpinning.

No valid rationale has been presented for combining Lewin and Warila. Therefore, the rejection of claims 1-9 should be withdrawn.

Conclusion

In view of the above, Applicant believes the pending application is in condition for allowance.

Applicant respectfully requests that the Examiner call the below listed attorney if the Examiner believes that such a discussion would be helpful in resolving any remaining problems.

Applicant believes no additional fee is due with this response. However, if a fee is due, please charge Deposit Account No. 50-5063 from which the undersigned is authorized to draw. Similarly, please credit any overage amount to the same account.

Respectfully submitted,

Date: March 25, 2013

/JCS/

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Electronic Patent Application Fee Transmittal

Application Number:	12836418
Filing Date:	14-Jul-2010
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

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:				
Extension - 1 month with $0 paid	1251	1	200	200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**200**

Electronic Acknowledgement Receipt

EFS ID:	15346927
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	25-MAR-2013
Filing Date:	14-JUL-2010
Time Stamp:	17:01:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$200
RAM confirmation Number	4116
Deposit Account	505063
Authorized User	SIEKMANN, JONATHAN

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)

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		0370_US_01_NFOA_Response.pdf	56414 52e90f677cb2384d03b3e1fdfe39b5c00eb508a7	yes	11

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Extension of Time	2	2
Claims	3	4
Applicant Arguments/Remarks Made in an Amendment	5	11

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30783 22f11c9e5fea249239655e38f2b1bf1434d53e84	no	2

Warnings:

Information:

Total Files Size (in bytes):	87197

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/836,418	07/14/2010	Ted Middleton	0370-US-U1	2155

83579 7590 11/23/2012

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

EXAMINER	
TANG, KAREN C	

ART UNIT	PAPER NUMBER
2447	

NOTIFICATION DATE	DELIVERY MODE
11/23/2012	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent.docketing@level3.com

Office Action Summary	Application No.	Applicant(s)	
	12/836,418	MIDDLETON, TED	
	Examiner	Art Unit	
	KAREN TANG	2447	

-- 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* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, 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 *14 July 2010*.

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) *1-9* 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) *1-9* is/are rejected.

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

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

Application Papers

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

11)☒ The drawing(s) filed on *7/14/2010* 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).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

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

a)☐ All b)☐ Some * c)☐ None of:

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

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

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

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

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/16/2010, 4/18/2012*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

- Claim 1-9 is presented for examination.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement (IDS) submitted on. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 101

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

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

Claims 1-9 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The method/apparatus that only has software operations and does not have any hardware structures thus is considered as software per se. Software per se does not fall into any of the four categories of invention.

Claim Rejections - 35 USC § 103

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

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

Claims 1-9 are are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewin et al hereinafter Lewin (US 2009/0150518) in view of Warila et al hereinafter Warila (US 20080313282).

1. Referring to Claim 1. Lewin discloses a method of providing an extensible content delivery platform, the method comprising: identifying a plurality of discrete events of a content delivery process of a content delivery network (receive request, refer to par 0050; based on the request, the request contains metadata and define how the request should be treated, refer to par 0036); providing a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events (refer to par 0054); and providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network (refer to par 0049- 0056).

Warila further elaborate the use of pluggable API (i.e., extensible content delivery platform) to assist in processing the request (refer to par 0031, 0004).

It would be obvious for one of ordinary skill in the art to combine the teaching of Lewin with Warila because Warila's system allow the system to operate despite of the type of original platform on the system and make the system more flexible to update and change without modify much original code/scripts.

2. Referring to Claim 2. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein the operation of identifying the plurality of discrete events comprises using a structured event model to identify the plurality of discrete events (refer to par 0054).

3. Referring to Claim 3. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses wherein the operation of identifying the plurality of discrete events comprises using at least one rule to identify the plurality of discrete events (refer to 0056).

4. Referring to Claim 4. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed at the plurality of discrete events (refer to par 0056).

5. Referring to Claim 5. Lewin and Warila disclosed the methods as recited in claim 1. Lewin further discloses a set of base functions to be performed upon the plurality of objects (refer to par 0056).

6. Referring to Claim 6. Claim is rejected under similar rational as claim 1.

7. Referring to Claim 7. Lewin and Warila disclosed the cache server as recited in claim 6. Lewin further discloses wherein the logical flow of actions comprises user definable modules (refer to par 0056).

8. Referring to Claim 8. Claim is rejected under similar rational as claim 1.

9. Referring to Claim 9. Claim is rejected under similar rational as claim 7.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is reminded that in amending in response to a rejection of claims, the patentable novelty must be clearly shown in view of the state of the art disclosed by the references cited and the objection made. Applicant must show how the amendments avoid such references and objections. See 37 CFR 1.111(c).

Examiner's Notes: Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. In the case of amending the claimed invention, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on for proper interpretation and also to verify and ascertain the metes and bounds of the claimed invention.

A shortened statutory period for reply to this Office action is set to expire THREE MONTH from the mailing date of this action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAREN TANG whose telephone number is (571)272-3116. The examiner can normally be reached on M-F 7 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOON H. HWANG can be reached on (571)272-4036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Karen C Tang/
Primary Examiner, Art Unit 2447

Notice of References Cited	Application/Control No. 12/836,418	Applicant(s)/Patent Under Reexamination MIDDLETON, TED	
	Examiner KAREN TANG	Art Unit 2447	Page 1 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,256,636 B1	07-2001	Choy, David Mun-Hien	707/610
*	B	US-2002/0049841 A1	04-2002	Johnson et al.	709/225
*	C	US-2002/0107699 A1	08-2002	Rivera et al.	705/1
*	D	US-2002/0165988 A1	11-2002	Khan et al.	709/246
*	E	US-2003/0093402 A1	05-2003	Upton, Mitch	707/1
*	F	US-2003/0120593 A1	06-2003	Bansal et al.	705/39
*	G	US-2004/0073596 A1	04-2004	Kloninger et al.	709/200
*	H	US-2006/0037008 A1	02-2006	Stelzer et al.	717/136
*	I	US-2006/0242167 A1	10-2006	Singh et al.	707/100
*	J	US-2007/0022093 A1	01-2007	Wyatt et al.	707/002
*	K	US-2007/0005572 A1	01-2007	Schluessler et al.	707/003
*	L	US-2007/0250560 A1	10-2007	Wein et al.	709/201
*	M	US-2007/0276951 A1	11-2007	Riggs et al.	709/229

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	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.

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
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*	B	US-7,369,540 B1	05-2008	Giroti, Sudhir K.	370/352
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Notice of References Cited	Application/Control No. 12/836,418	Applicant(s)/Patent Under Reexamination MIDDLETON, TED	
	Examiner KAREN TANG	Art Unit 2447	Page 3 of 3

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12836418
Filing Date	2010-07-14
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Unassigned
Attorney Docket Number	0370-US-U1

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	Filing Date	2010-07-14
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	Examiner Name	Unassigned
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2006 2012

From: 2006

To: 2012

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Sardar Patel Inst. of Technol., Mumbai, India (1)

PUBLICATION TITLE

TOPIC

CONFERENCE LOCATION

1. **A PnP Scheduling Algorithm and Cache Replacement Algorithm Simulation Platform for Web Server Cluster**

Zhi Xiong; Wanbin He; Ningning Liang
Computational and Information Sciences (ICCIS), 2012 Fourth International Conference on
Topic(s): Communication, Networking & Broadcasting ; Components, Circuits, Devices & Systems ; Computing & Processing (Hardware/Software) ; General Topics for Engineers (Math, Science & Engineering)
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Networking and Services, 2006. ICNS '06. International conference on
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12836418	MIDDLETON, TED
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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

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	KAREN TANG	2447

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709	217,222,224	11/14/2012	KT

SEARCH NOTES

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L6	21131977	@ad<"20100714" @rlad<"20100714"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 14:29
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S1	21131977	@ad<"20100714" @rlad<"20100714"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 09:41
S2	13289	(cache edge) near2 server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 09:43
S3	21	S2 same (API) same (existing legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 09:45
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S5	59904	content near2 (stream$3 delivery$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:09
S6	2788331	intermediate$1 gateway$1 prox$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:10

S7	139173	(multimedia content video music) near2 (stream$3 delivery$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:10
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S10	1441	S9 and S1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:11
S11	2798208	intermediate$1 gateway$1 prox$3 (cach$3 near2 (gateway$1 prox$3 server$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:13
S12	18782	(API wrapper$1) same S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:13
S13	774	S12 and S10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:14
S14	309682	intermediate$1 near2 (node$1 server$1 gateway$1 prox$3) gateway$1 prox$3 (cach$3 near2 (gateway$1 prox$3 server$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:15
S15	746	S13 and S14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:15
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S17	2799009	intermediate$1 gateway$1 prox$3 ((cach$3 edge) near2 (gateway$1 prox$3 server$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17
S18	18851	(API wrapper$1) same S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17

S19	10215	S7 same S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17
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S21	167	S20 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:17
S22	167	S21 and S8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 10:21
S23	266	(API wrapper$1 wrapped) same (existing legacy) with (infrastructure saystem)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 11:16
S24	247	S23 and S1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2012/11/13 11:18
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1 A PnP Scheduling Algorithm and Cache Replacement Algorithm Simulation Platform for Web Server Cluster
Zhi Xiong, Wanbin He, Ningning Liang
August 2012 **ICCIS '12:** Proceedings of the 2012 Fourth International Conference on Computational and Information Sciences
Publisher: IEEE Computer Society
Bibliometrics: Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 0

Web server cluster has been widely used to improve web server's performance. In order to help web providers select the appropriate pair of scheduling algorithm and cache replacement algorithm, and to help researchers evaluate new scheduling algorithm ...
Keywords: web server cluster, simulation platform, scheduling algorithm, cache replacement algorithm

2 Consistency Control Algorithm for the Cache of Voice Platform Based on VoiceXMl
Jianxin Liao, Wenlin Wang, Xiaomin Zhu
July 2006 **ICNS '06:** Proceedings of the International conference on Networking and Services
Publisher: IEEE Computer Society
Full text available: Publisher Site
Bibliometrics: Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 0

Using cache in the voice platform based on VoiceXML (Voice eXtensible Makeup Language) could reduce the cost of network bandwidth, server-load and access delay. By analyzing the cache model of voice platform, the Fitting & Predicting algorithm is proposed. ...

3 Global SOA: RSS-Based Web Services Repository and Ranking
Deven Shah, Mayank Agarwal, Mahendra Mehra, Ashish Mangal
May 2010 **ICIW '10:** Proceedings of the 2010 Fifth International Conference on Internet and Web Applications and Services
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For Global Service-Oriented Architecture (GSOA), we need to make sure that the Web Services provided by the service providers are visible to all potential consumers across the globe. In this paper, we discuss about Universal Description Discovery and ...
Keywords: GSOA, RSS, SOA, UDDI, global RSS, local RSS

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Publisher: ACM
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Bibliometrics: Downloads (6 Weeks): 71, Downloads (12 Months): 1081, Downloads (Overall): 7048, Citation Count: 30

5 DataStager: scalable data staging services for petascale applications
Hasan Abbasi, Matthew Wolf, Greg Eisenhauer, Scott Klasky, Karsten Schwan, Fang Zheng
September 2010 **Cluster Computing**, Volume 13 Issue 3
Publisher: Kluwer Academic Publishers
Bibliometrics: Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 1

Known challenges for petascale machines are that (1) the costs of I/O for high performance applications can be

http://dl.acm.org/results.cfm?h=1&cfid=200895151&cftoken=59939393[11/14/2012 2:15:34 PM]

substantial, especially for output tasks like checkpointing, and (2) noise from I/O actions can inject undesirable delays into the runtimes ...
Keywords: Data services, Datatap, GTC, I/O, Staging, WARP, XT3, XT4

6 DataStager: scalable data staging services for petascale applications
Hasan Abbasi, Matthew Wolf, Greg Eisenhauer, Scott Klasky, Karsten Schwan, Fang Zheng
June 2009 **HPDC '09:** Proceedings of the 18th ACM international symposium on High performance distributed computing
Publisher: ACM Request Permissions
Full text available: Pdf (560.96 KB)
Bibliometrics: Downloads (6 Weeks): 5, Downloads (12 Months): 40, Downloads (Overall): 335, Citation Count: 24

Known challenges for petascale machines are that (1) the costs of I/O for high performance applications can be substantial, especially for output tasks like checkpointing, and (2) noise from I/O actions can inject undesirable delays into the runtimes ...

Keywords: datatap, gtc, i/o, staging, warp, xt3, xt4

7 Just in time: adding value to the IO pipelines of high performance applications with JITStaging
Hasan Abbasi, Greg Eisenhauer, Matthew Wolf, Karsten Schwan, Scott Klasky
June 2011 **HPDC '11:** Proceedings of the 20th international symposium on High performance distributed computing
Publisher: ACM Request Permissions
Full text available: PDF (1.60 MB)
Bibliometrics: Downloads (6 Weeks): 11, Downloads (12 Months): 157, Downloads (Overall): 194, Citation Count: 4

Large scale applications are generating a tsunami of data, with understanding driven by finding information hidden within this data. The ever-increasing sizes of output, however, are making it difficult for science users to inspect the data generated ...
Keywords: datatap, gtc, i/o, infiniband, staging, warp, xt3, xt4

8 Virtualizing stream processing
Michael Duller, Jan S. Rellermeyer, Gustavo Alonso, Nesime Tatbul
December 2011 **Middleware'11:** Proceedings of the 12th ACM/IFIP/USENIX international conference on Middleware
Publisher: Springer-Verlag
Full text available: Publisher Site
Bibliometrics: Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 0

Stream processing systems have evolved into established solutions as standalone engines but they still lack flexibility in terms of large-scale deployment, integration, extensibility, and interoperability. In the last years, a substantial ecosystem of ...
Keywords: federation, stream processing, virtualization

9 Modeling and verification of a protocol for operational support using coloured petri nets
Michael Westergaard, Fabrizio M. Maggi
June 2011 **PETRI NETS'11:** Proceedings of the 32nd international conference on Applications and theory of Petri Nets
Publisher: Springer-Verlag
Full text available: Publisher Site
Bibliometrics: Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 3

In this paper, we describe the modeling and analysis of a protocol for operational support during workflow enactment. Operational support provides online replies to questions such as "is my execution valid?" and "how do I end the execution in the fastest/cheapest ...

10 Managing Variability in the IO Performance of Petascale Storage Systems
Jay Lofstead, Fang Zheng, Qing Liu, Scott Klasky, Ron Oldfield, Todd Kordenbrock, Karsten Schwan, Matthew Wolf
November 2010 **SC '10:** Proceedings of the 2010 ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis
Publisher: IEEE Computer Society
Full text available: PDF (892.52 KB)
Bibliometrics: Downloads (6 Weeks): 8, Downloads (12 Months): 82, Downloads (Overall): 220, Citation Count: 9

Significant challenges exist for achieving peak or even consistent levels of performance when using IO systems at scale. They stem from sharing IO system resources across the processes of single largescale applications

and/or multiple simultaneous programs ...

11 Trail of bytes: efficient support for forensic analysis
Srinivas Krishnan, Kevin Z. Snow, Fabian Monrose
October 2010 **CCS '10:** Proceedings of the 17th ACM conference on Computer and communications security
Publisher: ACM Request Permissions
Full text available: PDF (905.37 KB)
Bibliometrics: Downloads (6 Weeks): 15, Downloads (12 Months): 240, Downloads (Overall): 813, Citation Count: 3

For the most part, forensic analysis of computer systems requires that one first identify suspicious objects or events, and then examine them in enough detail to form a hypothesis as to their cause and effect. Sadly, while our ability to gather vast ...
Keywords: audit, forensics, provenance, virtualization

12 Discovering and using web services in m-commerce
Debopam Acharya, Nitin Prabhu, Vijay Kumar
August 2004 **TES'04:** Proceedings of the 5th international conference on Technologies for E-Services
Publisher: Springer-Verlag
Full text available: Publisher Site
Bibliometrics: Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 0

Web Services is slowly evolving to be a promising technology for developing application in open, loosely coupled and distributed computing environments and in mobile commerce. The web is no longer a repository of information and has evolved into a medium ...

13 An Extensible Platform for Evaluating Security Protocols
Seny Kamara, Darren Davis, Lucas Ballard, Ryan Gaudy, Fabian Monrose
April 2005 **ANSS '05:** Proceedings of the 38th annual Symposium on Simulation
Publisher: IEEE Computer Society
Full text available: Pdf (246.99 KB)
Bibliometrics: Downloads (6 Weeks): 1, Downloads (12 Months): 20, Downloads (Overall): 387, Citation Count: 1

We present a discrete-event network simulator, called Simnet, designed specifically for analyzing network-security protocols. The design and implementation is focused on simplicity of abstraction and extensibility. Moreover, its modular architecture ...

14 Uniting online social networks with places and things
Michael Blackstock, Rodger Lea, Adrian Friday
June 2011 **WoT '11:** Proceedings of the Second International Workshop on Web of Things
Publisher: ACM Request Permissions
Full text available: PDF (327.64 KB)
Bibliometrics: Downloads (6 Weeks): 9, Downloads (12 Months): 168, Downloads (Overall): 214, Citation Count: 0

As the Web of Things (WoT) broadens real world interaction via the internet, there is an increasing need for a user centric model for managing and interacting with real world objects. We believe that online social networks can provide that capability ...
Keywords: Internet of Things, Web of Things, social networks

15 Sessionlock: securing web sessions against eavesdropping
Ben Adida
April 2008 **WWW '08:** Proceeding of the 17th international conference on World Wide Web
Publisher: ACM
Full text available: Pdf (1.59 MB)
Bibliometrics: Downloads (6 Weeks): 4, Downloads (12 Months): 51, Downloads (Overall): 563, Citation Count: 4

Typical web sessions can be hijacked easily by a network eavesdropper in attacks that have come to be designated "sidejacking." The rise of ubiquitous wireless networks, often unprotected at the transport layer, has significantly aggravated this problem. ...

Keywords: web security

16 NexusDS: a flexible and extensible middleware for distributed stream processing
Nazario Cipriani, Mike Eissele, Andreas Brodt, Matthias Grossmann, Bernhard Mitschang

September 2009 **IDEAS '09:** Proceedings of the 2009 International Database Engineering & Applications Symposium

Publisher: ACM

Full text available: PDF (1.32 MB)

Bibliometrics: Downloads (6 Weeks): 2, Downloads (12 Months): 37, Downloads (Overall): 160, Citation Count: 2

Techniques for efficient and distributed processing of huge, unbound data streams have made some impact in the database community. Sensors and data sources, such as position data of moving objects, continuously produce data that is consumed, e.g., by ...

Keywords: P2P and networked data management, data stream processing, database services and applications, middleware platforms for data management, stream databases

17 Metadata driven memory optimizations in dynamic binary translator

Chaohao Xu, Jianhui Li, Tao Bao, Yun Wang, Bo Huang

June 2007 **VEE '07:** Proceedings of the 3rd international conference on Virtual execution environments

Publisher: ACM Request Permissions

Full text available: Pdf (3.42 MB)

Bibliometrics: Downloads (6 Weeks): 4, Downloads (12 Months): 43, Downloads (Overall): 427, Citation Count: 4

A dynamic binary translator offers solutions for translating and running source architecture binaries on target architecture at runtime. Regardless of its growing popularity, practical dynamic binary translators usually suffer from the limited optimizations ...

Keywords: dynamic binary translator, memory optimizations, metadata

18 Keeping information safe from social networking apps

Bimal Viswanath, Emre Kiciman, Stefan Saroiu

August 2012 **WOSN '12:** Proceedings of the 2012 ACM workshop on Workshop on online social networks

Publisher: ACM Request Permissions

Full text available: PDF (598.78 KB)

Bibliometrics: Downloads (6 Weeks): 31, Downloads (12 Months): 41, Downloads (Overall): 41, Citation Count: 0

The ability of third-party applications to aggregate and re-purpose personal data is a fundamental privacy weakness in today's social networking platforms. Prior work has proposed sandboxing in a hosted cloud infrastructure to prevent leakage of user ...

Keywords: data privacy, differential privacy, facebook, information flow control, online social networks, social apps

19 Model comparison: a foundation for model composition and model transformation testing

Dimitrios S. Kolovos, Richard F. Paige, Fiona A.C. Polack

May 2006 **GaMMa '06:** Proceedings of the 2006 international workshop on Global integrated model management

Publisher: ACM

Full text available: Pdf (282.91 KB)

Bibliometrics: Downloads (6 Weeks): 5, Downloads (12 Months): 51, Downloads (Overall): 747, Citation Count: 15

In the context of Model Driven Development, Model Transformation and Model Composition are two essential model management tasks. In this paper, we demonstrate how both tasks can benefit, in different ways, from the automation of another fundamental task: ...

Keywords: model comparison, model composition, model driven development, model transformation testing

20 Letras: an architecture and framework for ubiquitous pen-and-paper interaction

Felix Heinrichs, Jürgen Steimle, Daniel Schreiber, Max Mühlhäuser

June 2010 **EICS '10:** Proceedings of the 2nd ACM SIGCHI symposium on Engineering interactive computing systems

Publisher: ACM Request Permissions

Full text available: Pdf (401.35 KB)

Bibliometrics: Downloads (6 Weeks): 8, Downloads (12 Months): 49, Downloads (Overall): 142, Citation Count: 3

Paper remains a prevalent medium in mobile usage contexts due to its inherent flexibility and robustness. Mobile computing solutions begin to provide powerful and convenient functionality, while the gap between paper documents and digital applications ...

Keywords: anoto, development tools/toolkits/programming environments, digital pen, handheld devices and mobile computing, pen and tactile input, ubiquitous computing/smart environments

Result page: **1** 2 3 4 5 6 7 8 9 10 next >>>

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BIB DATA SHEET

CONFIRMATION NO. 2155

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/836,418	07/14/2010 RULE	709	2447	0370-US-U1

APPLICANTS
Ted Middleton, Moorpark, CA;

**** CONTINUING DATA ***************************
This appln claims benefit of 61/241,306 09/10/2009 *
(*)Data provided by applicant is not consistent with PTO records.

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
07/26/2010

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /KAREN C TANG/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CA	12	9	3

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

TITLE
CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

FILING FEE RECEIVED	FEES: Authority has been given in Paper	☐ All Fees
1090	No._____ to charge/credit DEPOSIT ACCOUNT	☐ 1.16 Fees (Filing)
	No._____ for following:	☐ 1.17 Fees (Processing Ext. of time)
		☐ 1.18 Fees (Issue)
		☐ Other _____
		☐ Credit

BIB (Rev. 05/07).

PTO/SB/08a (01-08)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

	Complete if Known
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

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

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		, "International Preliminary Report on Patentability, dated March 22, 2012", PCT/US10/48483, filed September 10, 2010, Dkt. No. 0370-WO-01 , 5 pgs.	

EXAMINER /Karen Tang/ **DATE CONSIDERED** 11/14/2012

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.T./

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/836,418
Filing Date	Jul 14, 2010
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Karen C. Tang

Sheet	1	of	1	Attorney Docket No: 0370-US-U1

US PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

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

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Examiner Initials*	Cite No [1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		, "International Preliminary Report on Patentability, dated March 22, 2012", PCT/US10/48483, filed September 10, 2010, Dkt. No. 0370-WO-01 , 5 pgs.	

EXAMINER **DATE CONSIDERED**

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

PATENT COOPERATION TREATY

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From the INTERNATIONAL BUREAU

To:

80449.207W01

OSBORNE, Thomas
Level 3 Communications, LLC
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402
ETATS-UNIS D'AMERIQUE

NOTIFICATION CONCERNING TRANSMITTAL OF COPY OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (CHAPTER I OF THE PATENT COOPERATION TREATY)
(PCT Rule 44bis.1(c))

Date of mailing *(day/month/year)*	
22 March 2012 (22.03.2012)	
Applicant's or agent's file reference	IMPORTANT NOTICE
0370-WO-01	

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2010/048483	10 September 2010 (10.09.2010)	10 September 2009 (10.09.2009)

Applicant
LEVEL 3 COMMUNICATIONS, LLC et al

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

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The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

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Authorized officer
Nora Lindner

e-mail: pt03.pct@wipo.int

Form PCT/IB/326 (January 2004)

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 0370-WO-01	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2010/048483	International filing date *(day/month/year)* 10 September 2010 (10.09.2010)	Priority date *(day/month/year)* 10 September 2009 (10.09.2009)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant LEVEL 3 COMMUNICATIONS, LLC		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 13 March 2012 (13.03.2012)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt03.pct@wipo.int

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: THOMAS OSBORNE
HAMILTON, DESANCTIS & CHA LLP
FINANCIAL PLAZA AT UNION SQUARE
225 UNION BLVD., STE. 150
LAKEWOOD, CO 80228

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	01 NOV 2010

Applicant's or agent's file reference	FOR FURTHER ACTION
0370-WO-01	See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 10/48483	10 September 2010 (10.09.2010)	10 September 2009 (10.09.2009)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G06F 15/16 (2010.01)
USPC - 709/217

Applicant LEVEL 3 COMMUNICATIONS, LLC

1. This opinion contains indications relating to the following items:

- [X] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [X] Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	22 October 2010 (22.10.2010)	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 10/48483

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

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

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

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-19	YES
	Claims	None	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-19	NO
Industrial applicability (IA)	Claims	1-19	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-19 lack an inventive step under PCT Article 33(3) as being obvious over US 2004/0073596 A1 to Kloninger et al. (hereinafter 'Kloninger') in view of US 2002/0049841 A1 to Johnson et al. (hereinafter 'Johnson').

As per claims 1, 8, and 14, Kloninger discloses a method of providing an extensible content delivery platform, the method comprising: providing a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events (Para [0041] - steps for requested content); and providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network (Para [0040] - content delivered if in cache; retrieved from origin if not in cache). However, Kloninger does not disclose identifying a plurality of discrete events of a content delivery process of a content delivery network. However, Johnson does disclose identifying a plurality of discrete events of a content delivery process of a content delivery network (Para [0045]). It would have been obvious to one of ordinary skill in the art to have modified the method of Kloninger so as to include identifying discrete events, as taught by Johnson, since such would allow the method to pipeline the different events to be performed, thereby allowing faster delivery of content to the user.

As per claim 2, Kloninger further discloses the method of claim 1 wherein the operation of identifying the plurality of discrete events comprises using a structured event model to identify the plurality of discrete events (Para [0044] - DNS mapping request).

As per claim 3, Kloninger further discloses the method of claim 1 wherein the operation of identifying the plurality of discrete events comprises using at least one rule to identify the plurality of discrete events (Para [0035]).

As per claims 4, 10 and 16, Kloninger further discloses the method of claim 1 further comprising a set of base functions to be performed at the plurality of discrete events (Para [0050] - metafile mapping of request)

As per claims 5, 11, and 17, Kloninger further discloses the method of claim 1 further comprising a set of base functions to be performed upon the plurality of objects (Para [0041] - determining availability; Para [0044] - mapping; Para [0024] - streaming).

As per claims 6, 9, and 15, Kloninger further discloses the method of claim 1 wherein the logical flow of actions comprises user definable modules (Para [0059] - user controls functions; Para [0084] - filters are user customized).

As per claim 7, Kloninger further discloses the method of claim 1 wherein the operations of identifying, providing a structured object model and providing a programmatic grammar are performed within a cache server of a content delivery network (Para [0093]).

As per claims 12 and 18, Kloninger further discloses the cache server of claim 8 wherein the core engine comprises an event-based application programming interface (Para [0067] and [0084] - filters respond to events).

As per claim 13 and 19, Kloninger further discloses the cache server of claim 12 wherein the event-based application programming interface comprises a wrapper application programming interface constructed around an existing rule base (Para [0032] and [0035]).

Claims 1-19 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

Electronic Acknowledgement Receipt

EFS ID:	12568598
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Kathleen McInnish
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	18-APR-2012
Filing Date:	14-JUL-2010
Time Stamp:	13:03:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	370_US_U1_IDS.pdf	36103 f92b6089c0355fd1d5138019caee62bca6cdb9fd	no	5

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Form (SB08)	370_US_US_SB08.pdf	27183 ff791ff864c4802815ecd04ff4fdd8dbcd24d936	no	1
Warnings:					
Information:					
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3	Non Patent Literature	IPER_370_WO_01_US10_48483.pdf	881968 15c37d131f48344ab78aa00103276dc5fd1ddea2	no	5
Warnings:					
Information:					
		Total Files Size (in bytes):	945254		

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	MIDDLETON, Ted	Art Unit	:	2447
Filed	:	July 14, 2010	Examiner	:	Karen C. Tang
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			

Submitted Via EFS-Web

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

Sir:

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

Copies of all of the cited documents:

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant on _____.

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

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

II
FEES

Any required fee is being paid as indicated below:

☒ No fee is due.

☐ The $180 fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ This fee is paid by credit card.

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

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

III

CERTIFICATION

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

☒ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

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

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

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

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

V
REMARKS

It is respectfully requested that:

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

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted,

Date: April 18, 2012

/JCS/

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Registration No. 58,259
USPTO Customer No. 83579
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Broomfield, Colorado 80021
Tel: 720-888-2140
Fax: 720-888-5619

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/836,418	07/14/2010	Ted Middleton	0370-US-U1

CONFIRMATION NO. 2155

83579
LEVEL 3 COMMUNICATIONS, LLC
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402

PUBLICATION NOTICE

OC000000046470893

Title:CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

Publication No.US-2011-0060812-A1
Publication Date:03/10/2011

NOTICE OF PUBLICATION OF APPLICATION

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

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

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

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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

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

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12836418
Filing Date	2010-07-14
First Named Inventor	Ted Middleton
Art Unit	2447
Examiner Name	Unassigned
Attorney Docket Number	0370-US-U1

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6968329	B1	2005-11-22	CHUNG et al.	

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

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020049841	A1	2002-04-25	JOHNSON et al.	
	2	20040073596	A1	2004-04-15	KLONINGER et al.	
	3	20070250560	A1	2007-10-25	WEIN et al.	
	4	20090150518	A1	2009-06-11	LEWIN et al.	

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

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12836418
	Filing Date	2010-07-14
	First Named Inventor	Ted Middleton
	Art Unit	2447
	Examiner Name	Unassigned
	Attorney Docket Number	0370-US-U1

	1							☐

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

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	International Search Report from WIPO, International Application No. PCT/US2010/048483, International Filing Date 10 September 2010, Date of mailing ISR 1 November 2010, 3 pages.	☐
	2	Written Opinion, International Application No. PCT/US2010/048483, International Filing Date 10 September 2010, Date of mailing Written Opinion 1 November 2010, 3 pages.	☐

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

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

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

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	12836418
	Filing Date	2010-07-14
	First Named Inventor	Ted Middleton
	Art Unit	2447
	Examiner Name	Unassigned
	Attorney Docket Number	0370-US-U1

CERTIFICATION STATEMENT

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

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

OR

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

☐ See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Thomas J. Osborne, Jr./	Date (YYYY-MM-DD)	2010-12-16
Name/Print	Thomas J. Osborne, Jr.	Registration Number	39,796

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

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
THOMAS OSBORNE
HAMILTON, DESANCTIS & CHA LLP
FINANCIAL PLAZA AT UNION SQUARE
225 UNION BLVD., STE. 150
LAKEWOOD, CO 80228

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 0370-WO-01	Date of mailing *(day/month/year)* 01 NOV 2010 **FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US 10/48483	International filing date *(day/month/year)* 10 September 2010 (10.09.2010)
Applicant LEVEL 3 COMMUNICATIONS, LLC	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

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

Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 0370-WO-01	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US 10/48483	International filing date *(day/month/year)* 10 September 2010 (10.09.2010)	(Earliest) Priority Date *(day/month/year)* 10 September 2009 (10.09.2009)
Applicant LEVEL 3 COMMUNICATIONS, LLC		

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

This international search report consists of a total of 7 sheets.

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

1. **Basis of the report**

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

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

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

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

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

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

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

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

   ☒ the text is approved as submitted by the applicant.

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

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

   ☒ the text is approved as submitted by the applicant.

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

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

   a. the figure of the **drawings** to be published with the abstract is Figure No. 1

   ☒ as suggested by the applicant.

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

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

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

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/48483

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06F 15/16 (2010.01)
USPC - 709/217
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC - 709/217

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 709/201,203,213,217,220,222,225,227,228,229,238,239; 370/229; 718/105 370/254,329,351,355,400; 711/100, 163 (keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Dialog; Google
Edge, cache, server, flexible, extensible, customize, integration, application, service, module, script, metadata, metacode, wrapper, API, interface, media, access, content, distribution, origin, rule, constraint, model, events, requests, grammar, logical, flow, structured, platfor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/0073596 A1 (KLONINGER et al.) 15 April 2004 (15.04.2004), Para [0024], [0035], [0040]-[0041], [0044], [0050], [0059], [0093]	1-19
Y	US 2002/0049841 A1 (JOHNSON et al.) 25 April 2002 (25.04.2002), Para [0045]	1-19
A	US 6,968,329 B1 (CHUNG et al.) 22 November 2005 (22.11.2005)	1-19
A	US 2007/0250560 A1 (WEIN et al.) 25 October 2007 (25.10.2007)	1-19
A	US 2009/0150518 A1 (LEWIN et al.) 11 June 2009 (11.06.2009)	1-19

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 October 2010 (22.10.2010)	01 NOV 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: THOMAS OSBORNE
HAMILTON, DESANCTIS & CHA LLP
FINANCIAL PLAZA AT UNION SQUARE
225 UNION BLVD., STE. 150
LAKEWOOD, CO 80228

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	01 NOV 2010
Applicant's or agent's file reference: 0370-WO-01	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 10/48483	10 September 2010 (10.09.2010)	10 September 2009 (10.09.2009)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G06F 15/16 (2010.01)
USPC - 709/217

Applicant LEVEL 3 COMMUNICATIONS, LLC

1. This opinion contains indications relating to the following items:

- [X] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [X] Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	22 October 2010 (22.10.2010)	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 10/48483

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

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

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

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

   ☐ on paper

   ☐ in electronic form

   b. (time)

   ☐ in the international application as filed

   ☐ together with the international application in electronic form

   ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Form PCT/ISA/237 (Box No. I) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 10/48483

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-19	YES
	Claims	None	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-19	NO
Industrial applicability (IA)	Claims	1-19	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-19 lack an inventive step under PCT Article 33(3) as being obvious over US 2004/0073596 A1 to Kloninger et al. (hereinafter 'Kloninger') in view of US 2002/0049841 A1 to Johnson et al. (hereinafter 'Johnson').

As per claims 1, 8, and 14, Kloninger discloses a method of providing an extensible content delivery platform, the method comprising: providing a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events (Para [0041] - steps for requested content); and providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network (Para [0040] - content delivered if in cache; retrieved from origin if not in cache). However, Kloninger does not disclose identifying a plurality of discrete events of a content delivery process of a content delivery network. However, Johnson does disclose identifying a plurality of discrete events of a content delivery process of a content delivery network (Para [0045]). It would have been obvious to one of ordinary skill in the art to have modified the method of Kloninger so as to include identifying discrete events, as taught by Johnson, since such would allow the method to pipeline the different events to be performed, thereby allowing faster delivery of content to the user.

As per claim 2, Kloninger further discloses the method of claim 1 wherein the operation of identifying the plurality of discrete events comprises using a structured event model to identify the plurality of discrete events (Para [0044] - DNS mapping request).

As per claim 3, Kloninger further discloses the method of claim 1 wherein the operation of identifying the plurality of discrete events comprises using at least one rule to identify the plurality of discrete events (Para [0035]).

As per claims 4, 10 and 16, Kloninger further discloses the method of claim 1 further comprising a set of base functions to be performed at the plurality of discrete events (Para [0050] - metafile mapping of request)

As per claims 5, 11, and 17, Kloninger further discloses the method of claim 1 further comprising a set of base functions to be performed upon the plurality of objects (Para [0041] - determining availability; Para [0044] - mapping; Para [0024] - streaming).

As per claims 6, 9, and 15, Kloninger further discloses the method of claim 1 wherein the logical flow of actions comprises user definable modules (Para [0059] - user controls functions; Para [0084] - filters are user customized).

As per claim 7, Kloninger further discloses the method of claim 1 wherein the operations of identifying, providing a structured object model and providing a programmatic grammar are performed within a cache server of a content delivery network (Para [0093]).

As per claims 12 and 18, Kloninger further discloses the cache server of claim 8 wherein the core engine comprises an event-based application programming interface (Para [0067] and [0084] - filters respond to events).

As per claim 13 and 19, Kloninger further discloses the cache server of claim 12 wherein the event-based application programming interface comprises a wrapper application programming interface constructed around an existing rule base (Para [0032] and [0035]).

Claims 1-19 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

Electronic Acknowledgement Receipt

EFS ID:	9048979
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	Thomas Joseph Osborne/Sara McPeak
Filer Authorized By:	Thomas Joseph Osborne
Attorney Docket Number:	0370-US-U1
Receipt Date:	16-DEC-2010
Filing Date:	14-JUL-2010
Time Stamp:	11:20:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	PA_IDS_Cert_State_no_fee_0370_US_U1.pdf	39062 805ed4438f425f04c033db9158773809806 0e16e	no	5

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Filed (SB/08)	PA_1449_SB_08a_08b_0370_US_U1.pdf	38471 45be974409bf1914df306b5eb3a7ff8982c3e958	no	4
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	NPL Documents	PA_ISR_0370_WO_01_PCTUS1048483.pdf	481838 a0e818605ea15d29d4dd360c436b28f968347614	no	3
Warnings:					
Information:					
4	NPL Documents	PA_WO_0370_WO_01_PCTUS1048483.pdf	405815 05204bd17d131d047eb8d055de26461afbbacf6e	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	965186		

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	12/836,418	Confirmation No.	:	2155
First Applicant	:	Ted Middleton	Art Unit	:	2447
Filed	:	14 July 2010	Examiner	:	Unassigned
Title	:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK			
Docket No.	:	0370-US-U1			
Customer No.	:	83579			

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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

Sir:

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

Copies of all of the cited documents

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

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

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

I
BASIS

This information disclosure statement is filed pursuant to

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

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

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

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

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

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

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

was mailed to the Applicant(s) on _____. The issue fee has not been paid herein.

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

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

II
FEES

Any required fee is being paid as indicated below by an enclosed check or our deposit account.

☒ No fee is due.

☐ The $_____ fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.197(c) or (d) is due.

☐ A check is enclosed for the required fee.

☐ Please charge the required fee to our deposit account no. 503199. A duplicate copy of this information disclosure statement is enclosed.

☐ The Commissioner is hereby authorized to charge any additional required fees or credit any overpayments associated with this information disclosure statement to our deposit account no. 503199. A duplicate copy of this information disclosure statement is enclosed.

III
CERTIFICATION

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

☒ No statement is necessary.

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

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

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

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

IV
FOREIGN LANGUAGE REFERENCES

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

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

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

☐ According to the procedural policy adopted by the PTO with regard to disclosure requirements, the Applicant is satisfying the disclosure requirement pursuant to MPEP § 609(III)(A)(3) by submitting herewith the following:

- ☐ English language versions of any non-English language documents.
- ☐ English language versions of one or more search reports or other actions by one or more foreign patent offices in one or more counterpart foreign applications, which indicate the degree of relevance found by the foreign office(s).

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

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

V
REMARKS

☒ Pursuant to the doctrines established by the Court of Appeals for the Federal Circuit in *McKesson Information Solutions, Inc. v. Bridge Medical, Inc.*, 487 F.3d 897 (Fed. Cir. 2007) and *Dayco Products, Inc. v. Total Containment, Inc.*, 329 F.3d 1358 (Fed. Cir. 2003), Applicant(s) submit documents herewith reflecting the prosecution history of applications that Applicant(s) believe may be considered related to the present application.

1. International Search Report from WIPO, International Application No. PCT/US 2010/048483, International Filing Date 10 September 2010, Date of mailing of ISR 01 November 2010, 3 pages.

2. Written Opinion, International Application No. PCT/US2010/048483, International Filing Date 10 September 2010, Date of mailing of WO 01 November 2010, 3 pages.

It is respectfully requested that

(1) the Examiner sign the enclosed Form PTO/SB/08a to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application; and

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

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

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

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

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

VI
CONCLUSION

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

Respectfully submitted this 16th day of December 2010.

/Thomas J. Osborne, Jr./
Thomas J. Osborne, Jr.
Registration No. 39,796
Customer No. 83579
HAMILTON, DESANCTIS & CHA LLP
TEL: 303-278-2516
FAX: 720-362-5211

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/836,418	07/14/2010	2447	1090	0370-US-U1	9	3

CONFIRMATION NO. 2155

83579
LEVEL 3 COMMUNICATIONS, LLC
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402

FILING RECEIPT

OC000000042752268

Date Mailed: 07/30/2010

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**

Applicant(s)

Ted Middleton, Moorpark, CA;

Assignment For Published Patent Application

Level 3 Communications, LLC

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/241,306 09/10/2009 *
(*)Data provided by applicant is not consistent with PTO records.

Foreign Applications

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 07/26/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/836,418**

Projected Publication Date: 03/10/2011

Non-Publication Request: No

Early Publication Request: No

Title

CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

Preliminary Class

709

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

PTO/SB/05 (08-08)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office. U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	0370-US-U1
First Inventor	Ted Middleton
Title	CACHE SERVER WITH EXTENSIBLE PR
Express Mail Label No.	N/A - via EFS-Web

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form** (e.g., PTO/SB/17)
2. ☐ **Applicant claims small entity status.** See 37 CFR 1.27.
3. ☑ **Specification** [*Total Pages* 34]
   Both the claims and abstract must start on a new page
   (For information on the preferred arrangement, see MPEP 608.01(a))
4. ☑ **Drawing(s)** (*35 U.S.C. 113*) [*Total Sheets* 12]
5. **Oath or Declaration** [*Total Sheets* _____]
   a. ☑ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
   (for continuation/divisional with Box 18 completed)
   i. ☐ DELETION OF INVENTOR(S)
   Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**
   (if applicable, items a. – c. are required)
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ACCOMPANYING APPLICATION PARTS

9. ☑ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee Level 3 Communications, LLC
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503)
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15. ☐ **Certified Copy of Priority Document(s)**
    (if foreign priority is claimed)
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ Other:_____

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 12/017,321

Prior application information: *Examiner* _____ *Art Unit:* _____

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 83579 ***OR*** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/JCS/	Date	07/14/2010
Name (Print/Type)	Jonathan C. Siekmann	Registration No. (Attorney/Agent)	58259

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

Inventor:

Ted Middleton

Cross-Reference to Related Applications

[001] This application claims the benefit of priority to U.S. Provisional Patent Application 61/241,306, filed September 11, 2009, titled "Cache Server with Extensible Programming Framework," which is incorporated herein by reference for all purposes.

Technical Field

[002] Embodiments presently disclosed relate to an extensible content delivery platform for a content delivery network.

Background

[003] Internet use has grown tremendously in recent years. The types and sources of content on the Internet have also grown. For example, computer users often access the Internet to download video, audio, multimedia, or other types of content for business, entertainment, education, or other purposes. Today, users can view live presentations of events, such as sporting events, as well as stored content, such as videos and pictures. The providers of such content typically want to have some level of control over the manner in which the content is viewed and by whom. For example, the provider of videos may want certain videos (e.g., selected videos, or type or class of videos) to be encrypted upon distribution. Users typically want content "on-demand", and would prefer not to wait a long time for download before viewing the content. Certain types of content tend to take longer than others to download. For example, download of a movie can take many minutes or hours, depending on the type of download technology used and the size of the movie file.

[004] Typically providers of Internet content are separate entities from the network providers that provide the infrastructure to distribute the content. To reach a very large audience, content providers typically purchase the services of a content delivery network provider, which generally has a large network infrastructure for distributing the content. However, because

content providers typically do not have control over distribution, the providers typically have limited control over how, or to whom, the content is distributed.

[005] A cache server is a dedicated network server or service acting as a server in a content delivery network that temporarily stores content for access by users. Cache servers both speed up access to data and reduce demand on an enterprise's bandwidth. Cache servers also allow users to access content when a content server is offline or otherwise unavailable, including rich media files or other documents.

[006] Cache servers can be feature rich. Features are complex, sometimes interdependent, and often inconsistent in style and configuration. Features of traditional cache servers have been historically challenging to describe, document, and train users. New features require significant code changes resulting in extended lead times, code complexity, testing and bug fix cycles, and the like. New features are also typically implemented in a reasonably flexible way – anticipating multiple possible use cases, configuration scenarios, and the like – that further increases the complexity of the solution.

Summary

[007] An extensible content delivery platform is provided upon which applications and services can be built around underlying content to be served. Rich and well-formed metadata and "metacode" can be associated with content and/or requests in a consistent and programmatic manner. In an exemplary embodiment, the applications and services (e.g., modules and/or scripts) are executed based upon an event that occurs (e.g., an event that occurs in processing a request for content). The event can be identified in a number of different ways. In one implementation, for example, a set of rules is used to identify one or more events for which applications and/or services are identified and executed. In another exemplary implementation, a system provides a structured "event" model, primitive functions, and language constructs to create a service layer that can be leveraged in flexible ways without requiring core code changes.

[008] In one particular implementation of such a system, a "wrapper" is constructed around existing rule-based and other configuration tables without a wholesale replacement of existing techniques. In this implementation, the "wrapper" allows the system to be presented as a consistent, single interface to access underlying capabilities of an existing cache server in a logically represented way.

[009] The extensible content delivery platform provides for reduced code complexity and enhanced maintainability. A core code provides a set of underlying operating services that supports existing and future features that can be built using the core underlying operating services rather than requiring core code changes. In one such implementation, for example, the core underlying operating services include object caching, instruction interpretation, instruction execution, and the like.

[0010] In an embodiment, the extensible content delivery platform also provides for flexible implementation (e.g., enriched extensibility, customization, and application integration potential) without core code changes. Using such an extensible content delivery platform, developers could create virtually unlimited potential applications on the platform.

[0011] In one implementation, an extensible content delivery platform comprises: (1) a structured event model, a (2) structured object model, (3) a set of base functions or actions, and (4) a basic programmatic grammar. In this implementation, the structured event model comprises a consistently described documented process for receiving, processing, and servicing requests for content. A discrete number of "events" in a processing pipeline provide "action points" in the content delivery process at which various actions can be taken (e.g., by custom logic). The event model thus provides a more fluid event driven paradigm instead of a rigid rule based system.

[0012] The structured object model instantiates a series of objects. In an embodiment, for example, requests, resources, responses, and other "objects" are defined to obtain and/or manipulate various consistent properties and/or attributes.

[0013] The base functions or actions provide for functions or actions to be performed at discrete events and upon various objects. In an embodiment, for example, functions or actions comprise operations such as string parsing and/or manipulation, hypertext transfer protocol (HTTP) message construction and/or decomposition, resource manipulation, and the like.

[0014] In an embodiment, the basic programmatic grammar is used to create a logical flow of actions being applied against objects on an occurrence of an event. The programmatic grammar, for example, may be as rich as one of the more common web-development languages (PHP, Python, Javascript, Perl, or the like) or a specialty sub-set that provides a restricted set of "safe" or other restricted functions.

[0015] Other implementations are also described and recited herein.

Brief Descriptions of the Drawings

[0016] FIG. 1 illustrates an example network environment suitable for distributing content within an extensible content delivery platform according to various embodiments.

[0017] FIG. 2 illustrates a system in terms of functional modules for distributing content within an extensible content delivery platform according to various embodiments.

[0018] FIG. 3 is a functional module diagram illustrating one possible implementation of a streaming cache module according to various embodiments.

[0019] FIG. 4 is a state diagram illustrating one possible set of states that a streaming cache module can enter according to various embodiments.

[0020] FIGS. 5-7 are flowcharts illustrating example processes for streaming content.

[0021] FIG. 8 illustrates another example network environment suitable for distributing content within an extensible content delivery platform according to various embodiments.

[0022] FIG. 9 illustrates yet another example network environment suitable for distributing content within an extensible content delivery platform according to various embodiments.

[0023] FIG. 10 illustrates an example extensible programming framework implemented within a cache server of a content delivery network.

[0024] FIG. 11 illustrates a block diagram of an example structured content delivery event model.

[0025] FIG. 12 is an example block diagram of a computer system configured with a content streaming application and process according to embodiments herein.

Detailed Descriptions

[0026] Embodiments presently disclosed relate to an extensible content delivery platform for a content delivery network.

[0027] FIG. 1 illustrates an example network environment 100 suitable for distributing content supporting an extensible content delivery platform according to various embodiments. A computer user may access a content distribution network (CDN) 102 using a computing device, such as a desktop computer 104. The CDN 102 is illustrated as a single network for ease of

illustration, but in actual operation as described in more detail below, CDN 102 may typically include one or more networks.

[0028] For example, network 102 may represent one or more of a service provider network, a wholesale provider network and an intermediate network. The user computer 102 is illustrated as a desktop computer, but the user may use any of numerous different types of computing devices to access the network 102, including, but not limited to, a laptop computer, a handheld computer, a personal digital assistant (PDA), or a cell phone.

[0029] The network 102 may be capable of providing content to the computer 104 and supporting an extensible content delivery platform for the network environment 100. Content may be any of numerous types of content, including video, audio, images, text, multimedia, or any other type of media. The computer 104 includes an application to receive, process and present content that is downloaded to the computer 104. For example, the computer 104 may include an Internet browser application, such as Internet Explorer™ or Firefox™, and a streaming media player, such as Flash Media Player™ or Quicktime™. When the user of computer 104 selects a link (e.g., a hyperlink) to a particular content item, the user's web browser application causes a request to be sent to a directory server 106, requesting that the directory server provide a network address (e.g., and Internet protocol (IP) address) where the content associated with the link can be obtained.

[0030] In some embodiments, directory server 106 is a domain name system (DNS), which resolves an alphanumeric domain name to an IP address. Directory server 106 resolves the link name (e.g., a universal resource locator (URL)) to an associated network address and then notifies the computer 104 of the network address from which the computer 104 can retrieve the selected content item. When the computer 104 receives the network address, the computer 104 then sends a request for the selected content item to a computer, such as streaming server computer 108, associated with the network address supplied by the directory server 106.

[0031] In the particular embodiment illustrated, streaming server computer 108 is an edge server (or cache server) of the CDN 102. Edge server computer 108 may be more or less strategically placed within the network 102 to achieve one or more performance objectives such as reducing load on interconnecting networks, freeing up capacity, scalability and lowering delivery costs. The edge server 108, for example, may cache content that originates from another server, so that the cached content is available in a more geographically or logically

proximate location to the end user. Such strategic placement of the edge server 108 could reduce content download time to the user computer 104.

[0032] Edge server computer 108 is configured to provide requested content to a requester. As used herein, the term "requester" can include any type of entity that could potentially request content, whether the requester is the end user computer or some intermediate device. As such, a requester could be the user computer 104, but could also be another computer, or a router, gateway or switch (not shown) requesting the content from the edge server computer 108. As will be understood, requests generated by the computer 104 are typically routed over numerous "hops" between routers or other devices to the edge server computer 108. Accordingly, a requester of content could be any of numerous devices communicably coupled to the edge server computer 108.

[0033] As part of the function of providing requested content, the edge server computer 108 is configured to determine whether the requested content is available locally from the edge server computer 108 to be provided to the requester. In one embodiment, the requested content is available if the content is stored locally in cache and is not stale. In one particular implementation, stale is a condition in which the content is older than a prescribed amount of time, typically designated by a "time-to-live" value, although other measures may also be used. The edge computer server 108 is configured with media streaming server software, such as Flash Media Server™ (FMS) or Windows Media Server™ (WMS). As such, if the requested content is found to be locally stored on the edge computer server 108 and the cached content is not stale, the media streaming software can stream the requested content to the requester, in this case, the computer 104.

[0034] If the edge server computer 108 determines that requested content is not available (e.g., is either not locally stored or is stale), the edge server computer 108 takes a remedial action to accommodate the request. If the content is locally stored but is stale, the remedial action involves attempting to revalidate the content. If the content is not locally stored or revalidation fails (in the case of stale content), the edge server computer 108 attempts to retrieve the requested content from another source, such as a media access server. A media access server (MAS) is a server computer that may be able to provide the requested content.

[0035] The edge server 108 comprises an extensible content delivery platform, such as an event-based application programming interface (API) that provides an extensible content

delivery platform. The extensible content delivery platform provides for applications and services to be built around underlying content to be served. Rich and well-formed metadata and "metacode" can be associated with content and/or requests in a consistent and programmatic manner. In one implementation, for example, a system provides a structured "event" model, a structured object model, primitive functions, and language constructs to create a service layer that can be leveraged in flexible ways without requiring core code changes.

[0036] In one particular implementation of such a system, an API "wrapper" is constructed around existing rule base and other configuration tables without a wholesale replacement of existing techniques. The "wrapper" allows the system to be presented as a consistent, single interface to access underlying capabilities of an existing edge/cache server in a logically represented way.

[0037] The extensible content delivery platform provides for reduced code complexity and enhanced maintainability. A core code provides a set of underlying operating services to support existing and future features that can be built using the core underlying operating services rather than requiring core code changes. In one such implementation, for example, the core underlying operating services includes object caching, instruction interpretation, instruction execution, and the like.

[0038] In one particular implementation, for example, geo-IP services are instantiated within the platform as a primitive function. In this implementation, an incoming IP address can be used as a key into a database of various geographic or other codes related to that IP address. The database or lookup table would serve as a system "primitive" function that would expose a resulting derived code to a higher-level program module for use in other functions like restricting or allowing access to content, serving alternate variants of content, or the like.

[0039] In an embodiment, the extensible content delivery platform also provides for flexible implementation (e.g., enriched extensibility, customization, and application integration potential) without core code changes. In this embodiment, developers can use such an extensible content delivery platform to create virtually unlimited potential applications on the platform.

[0040] In the illustrated embodiment, two possible media access servers are shown: a content distribution server computer 110 and a content origin server 112. Content origin server 112 is a server computer of a content provider. The content provider may be a customer of a

content distribution service provider that operates the network 102. The origin server 112 may reside in a content provider network 114.

[0041] In some embodiments, the content origin server 112 is an HTTP server that supports virtual hosting. In this manner, the content server can be configured to host multiple domains for various media and content resources. During an example operation, an HTTP HOST header can be sent to the origin server 112 as part of an HTTP GET request. The HOST header can specify a particular domain hosted by the origin server 112, wherein the particular domain corresponds with a host of the requested content.

[0042] The content distribution server 110 is typically a server computer within the content distribution network 102. The content distribution server 110 may reside logically in between the content origin server 112, in the sense that content may be delivered to the content distribution server 110 and then to the edge server computer 108. The content distribution server 110 may also employ content caching.

[0043] In some embodiments, the edge server computer 108 locates the media access server by requesting a network address from the directory server 106, or another device operable to determine a network address of a media access server that is capable of providing the content. The edge server computer 108 then sends a request for content to the located media access server. Regardless of which media access server is contacted, the media access server can respond to a request for specified content in several possible ways. The manner of response can depend on the type of request as well as the content associated with the request.

[0044] For example, the media access server could provide information to the edge computer server 108 that indicates that the locally cached version of the content on the edge computer server 108 is not stale. Alternatively, the media access server could send the specified content to the edge computer server 108, if the media access server has a non-stale copy of the specified content. In one embodiment, the media access server includes data transport server software, such as a Hypertext Transport Protocol (HTTP) server, or web server. In this case, the edge server computer 108 interacts with the media access server using the data transport protocol employed by the media access server.

[0045] With further regard to the communications between the edge server computer 108 and the media access server computer (e.g., either the content origin server 112 or the content distribution server 110), the two servers may communicate over a channel. These channels are

illustrated as channel 116a between the edge server computer 108 and the content distribution server 110 and channel 116b between the edge server computer 108 and the content origin server 112. According to various embodiments described herein, channels 116 are data transport, meaning the channels 116 carry data using a data transport protocol, such as HTTP.

[0046] The edge server 108 is configured to retrieve content using a data transport protocol while simultaneously streaming content to the content requester. For example, the edge server computer 108 is operable to simultaneously stream requested content to the requester (e.g., the computer 104) while receiving the content from the origin server computer 112 over the data transport protocol channel 116b. Operations carried out by the edge server computer 108 and modules employed by the edge server computer 108 can perform simultaneous streaming and content retrieval.

[0047] FIG. 2 illustrates a streaming content delivery framework 200 adapted to supporting an extensible content delivery platform including an edge server computer 202 and a media access server computer 204. Edge server computer 202 is configured with modules operable to retrieve content from the MAS 204, if necessary, while streaming the content to an entity that has requested the content. In some embodiments, retrieval of requested content from the MAS 204 is simultaneous with streaming of the content to the requester.

[0048] In the embodiment illustrated in FIG. 2, the edge server computer 202 includes a media streaming server 206, a media streaming broker 208, a stream caching module 210 and a content cache 212. In an illustrative scenario, a content request 214 is received from a requester. The content request has various information, including, but not limited to, an identifier of the content being requested. The request 214 may identify a particular portion of the content being requested.

[0049] The request 214 is initially received by the media streaming server. The media streaming server 206 could be a Flash Media Server™ (FMS), Windows Media Server™ (WMS), or other streaming media service. The media streaming server 206 is configured to communicate data with a content requester using a data streaming protocol (e.g., Real Time Messaging Protocol (RTMP)) in response to content requests. Upon receipt of request 214, the media streaming server 206 passes the request 214 to the media streaming broker 208 and waits for a response from the broker 208. As such, the media streaming broker 208 maintains the state of the media streaming server 206.

[0050] The media streaming broker 208 is operable to serve as a go-between for the media streaming server 206 and the stream caching module 210. As such, the media streaming broker 208 facilitates communications between the media streaming server 206 and the stream caching module 210 to thereby support streaming of content. In one embodiment, the media streaming broker 208 is a software plug-in that uses application programming interfaces (APIs) of the media streaming server 206 to communicate with the media streaming server 206. The media streaming broker 208 is operable to handle requests from the media streaming server 206, maintain some state of the media streaming server 206, and notify the media streaming server when content is in the cache 212. When the media streaming broker 208 receives a content request, the broker 208 generates a content request to the stream caching module 210.

[0051] The stream caching module (SCM) 210 includes functionality for responding to content requests from the broker 208. In one embodiment, shown in FIG. 3, which is discussed in conjunction with FIG. 2, the SCM 210 includes a streaming request handler 302, a cache manager 304 and a data transport interface 306. The streaming request handler 302 receives the request from the broker 208 and queries the cache manager 304 whether the requested content is in the cache 212. The cache manager 304 determines if the requested content exists in the cache 212.

[0052] If the requested content is in the cache 212, the cache manager 304 of the SCM 210 checks the age of the content to determine if the content is stale. Generally, each content item has an associated time-to-live (TTL) value. The cache manager 304 notifies the request handler 302 of the results of the checks on the requested content; i.e., whether the content exists, and if so, whether the content is stale.

[0053] If the content exists in the cache 212 and is not stale, the request handler 302 notifies the media streaming server 206 via the media streaming broker that the content is ready to be streamed and provides a location in the cache 212 from which the content can be read. If the content is not in the cache 212, or the content is stale, the request handler 302 notifies the data transport interface 306. The data transport interface 306 is configured to communicate over a data transport channel, such as an HTTP channel 216, to the MAS 204.

[0054] The data transport interface 306 transmits a request 218 to the MAS 204 identifying the requested content. The request 218 may be one of several different types of requests, depending on the situation. For example, if it was determined that the requested content

was in the cache 212, but the content was stale, the data transport interface 306 transmits a HEAD request (in the case of HTTP) to the MAS 204 indicating that the current state of the requested content in the local cache is stale. If the requested content is not in the cache 212, the data transport interface 306 transmits a GET (in the case of HTTP) request to the MAS 204 to retrieve at least a portion of the content from the MAS 204. The MAS 204 includes a data transport server 220, which receives and processes the request 218.

[0055] The data transport server 220 is configured to communicate via a data transport protocol, such as HTTP, over the data transport channel 216. Initially, the data transport server 220 determines if the content identified in the request 218 is in a content database 222 accessible to the MAS 204. The data transport server 220 queries the content database 222 for the requested content. Based on the response of the content database 222, the data transport server 220 generates a response 224, the contents of which depend on whether the requested content is in the database 222.

[0056] The response 224 generally includes a validity indicator, which indicates that the request 218 was or was not successfully received, understood and accepted. If the data transport protocol is HTTP, the response 224 indicator is a numerical code. If the requested content is not in the database 222, the code indicates invalidity, such as an HTTP 404 code, indicating the content was not found in the database 222.

[0057] If the requested content, for example file 226, is found in the database 222, the response 224 code will be a valid indicator, such as HTTP 2XX, where "X" can take on different values according to the HTTP definition. If the request 218 to the MAS 204 is a HEAD request, and the content is found in the database 222, the response 224 typically includes an HTTP 200 code. The response 224 to a HEAD request also includes information indicating whether the TTL of the content in cache 212 is revalidated or not. In the case of a GET request, and the requested content, e.g., file 226, is found in the database 222, the response 224 includes an HTTP code, along with a portion of the content 226.

[0058] The data transport interface 306 of the stream cache module 210 receives the response 224 and determines the appropriate action to take. In general, the data transport interface 306 notifies the streaming request handler 302 as to whether the content was found by the MAS 204 or not. If the content was not found by the MAS 204, and, assuming the cache manager 304 did not find the content in cache 212, the streaming request handler 302 notifies the

media streaming server 206 via the media streaming broker 208 that the requested content is not found.

[0059] If the response 224 is a valid response to a HEAD request, the response 224 will indicate whether the TTL of stale content in cache 212 has been revalidated. If the TTL is revalidated, the cache manager 304 updates the TTL of the validated content and notifies the streaming request handler 302 that the content is available in cache 212 and is not stale. If the response 224 indicates that the stale content in cache 212 is not revalidated, the cache manager 304 deletes the stale content and indicates that the content is not in cache 212. The streaming request handler 302 then requests the content from the data transport interface 306.

[0060] A GET request can specify a portion of the content to be retrieved and if the GET request is valid, the response 224 will generally include the specified portion of the identified content. The request 218 can be a partial file request, or a range request, which specifies a range of data in the file 226 to be sent by the data transport server 220. The range may be specified by a beginning location and an amount; e.g., a byte count. Range requests are particularly useful for certain types of content and in response to certain requests, or other situations.

[0061] For example, if the requested file 226 is a Flash™ file, the first one or more GET requests will specify the portion(s) of the file 226 that are needed for the media streaming server 206 to immediately start streaming the file 226 to the requester. The entire file 226 is not required in order for the media streaming server 206 to start streaming the file 226 to the requester. In some cases, a particular portion of the content includes metadata about the content that enables the media streaming server 206 needs to start the streaming. Metadata may include file size, file format, frame count, frame size, file type or other information.

[0062] It has been found that for a Flash™ file, such as file 226, only a head portion 228 of the file 226 and a tail portion 230 of the file 226 are initially needed to start streaming the file 226 because the head 228 and the tail 230 include metadata describing the file 226. The remainder 232 of the file 226 can be obtained later. In one embodiment, the head portion 228 is the first 2 megabytes (MB) and the tail portion 230 is last 1MB of the file 226, although these particular byte ranges may vary depending on various factors.

[0063] In the case of Flash™ file 226, after the head portion 228 and tail portion 230 of file 226 have been received by the data transport interface 306, the data transport interface 306 stores those portions in the cache 212, and the streaming request handler 302 is notified that the

initial portions of the requested content are available in cache 212. The request handler 302 then notifies the streaming media server 206 of the location of the initial portions of the content in the cache 212. The streaming media server 206 then begins reading content from the cache 212 and sending streaming content 234 to the requester.

[0064] While the media streaming server 206 is streaming content to the requester, the SCM 210 continues to retrieve content of the file 226 from the MAS 204 until the remainder 232 is retrieved. The data transport interface 306 of the SCM 210 sends one or more additional GET requests to the data transport server 220 of the MAS 204, specifying range(s) of content to retrieve. In some embodiments, the data transport interface 306 requests sequential portions of the file 226 in set byte sizes, such as 2MB or 5MB at a time until the entire file 226 has been retrieved. The amount requested with each request can be adjusted depending on various parameters, including real time parameters, such as the latency of communications to and from the MAS 204.

[0065] During streaming of the requested content, the requester may issue a location-specific request requesting that data be streamed from a particular specified location within the content. The specified location may or may not yet be stored in the content cache 212. Such a location-specific request is received by the streaming media server 206 and passed to the media streaming broker 208. The streaming media broker 208 sends a request to the request handler 302 of the SCM 210. The request handler 302 requests that the cache manager 304 provide data from the specified location. The cache manager 304 attempts to retrieve data at the specified location in the file from the cache 212.

[0066] If the specified location is not yet in the cache 212, the cache manager 304 notifies the request handler 302. The request handler 302 then requests that the data transport interface 306 retrieve content at the specified location. In response, the data transport interface 306 sends a GET request specifying a range of data starting at the specified location, regardless of whether and where the data transport interface 306 was in the midst of downloading the file 226.

[0067] For example, if the location specified by the requester is at the end of the file 226, and the data transport interface 306 is in the process of sequentially downloading the file 226 and is at the beginning of the file 226, the data transport interface 306 interrupts its sequential download and sends a range request for data starting at the specified location. After content is

retrieved from the specified location the data transport interface 306 resumes its sequential download from where it left off prior to receiving the location-specific request.

[0068] The components of the edge server 202, the MAS 204 and the stream cache module of FIG. 3 may be combined or reorganized in any fashion, depending on the particular implementation. For example, the data stores (e.g., content cache 212 and content data base 222) may be separate from their associated servers. The data stores may be any type of memory or storage and may employ any type of content storage method. The data stores, such as content cache 212 and database 222, may include database server software, which enables interaction with the data stores.

[0069] FIG. 4 is a state diagram 400 illustrating states that a streaming cache module, such as stream caching module 210 (FIG. 2), or similar component, may enter, and conditions that cause entry into and exit from those states. Initially, in this example scenario, the SCM 210 may enter state A 402 when the SCM 210 receives a request for specified content. It will be understood that the SCM 210 may enter another state initially, but for purposes of illustration, it is assumed here that the content specified in the request is not in local cache. In state A 402, the SCM determines that the specified content is not in the local cache. Upon determining that the specified content is not in the local cache, the SCM enters state B 404.

[0070] Upon entry into state B 404, the SCM outputs one or more range requests to a media access server and begins receiving content and/or metadata from the media access server (MAS). It is assumed in this case that the MAS has, or can obtain, a non-stale copy of the requested file.

[0071] With regard to range requests generated by the SCM 210, each of the one or more range requests specifies a beginning location of data and a range of data to be retrieved. The range request is a type of request supported by a data transport protocol, such as HTTP, and is recognized by the MAS, which includes a data transport server, such as an HTTP or web server. Thus, the MAS is able to read the range request(s) and respond with portions of the requested content identified in the range request(s).

[0072] An initial range request may specify a location in the file that includes metadata about the file that enables the streaming media server to promptly begin streaming the requested content. Such metadata can include control data or definitions that are used by the streaming media server to stream the content.

[0073] For example, in the case of a Flash™ file, the initial range request may specify the head of the Flash™ file, which gives information about the layout of the file, such as entire file size, frame size, total number of frames, and so on. In the case of Flash™ files, the initial range request, or one of the first range requests typically also specifies an end portion of the file because the end portion includes information used by the streaming media server to begin streaming the content of the file. For example, in some embodiments, the SCM generates a range request for the first two megabytes of a specified Flash™ file and the last one MB of the Flash™ file.

[0074] In state B 404, the SCM continues to request and receive content data until the entire file is retrieved. The content may be retrieved in sequential order from beginning to end of the content file, or the content may be retrieved in some other order. Out of sequential order retrieval may occur in response to a location-specific request from a user viewing the content to move to another specified location in the file. For example, the user may advance (or "rewind") to a particular place in the streaming content file through the user's streaming media player.

[0075] When the user moves to a particular location in the streaming file, a request is sent to the SCM specifying the particular location in the file to move to. In response, in state B 404, the SCM generates a range request specifying the requested place in the file. The SCM may also notify the streaming media server (e.g., via the media streaming broker 208) when a portion or portions of the content have been stored in local cache, so that the streaming media server can begin streaming those portion(s).

[0076] After the requested content file is completely downloaded, the SCM may generate an output indicating the file is downloaded. The SCM then enters state C 406. In state C 406, the SCM waits until the content becomes stale. In state C 406, the SCM checks the age of the content file and compares the age to a specified "time-to-live" (TTL) value, which may be provided in a message from the MAS. When the content file becomes stale, the SCM enters state D 408.

[0077] In state D 408, the SCM sends a request to the MAS to revalidate the content file. The MAS may send a message indicating successful revalidation and a new TTL value. If so, the SCM returns to state C 406, where the SCM again waits until the TTL expires. On the other hand, while in state D 408, if the MAS does not revalidate the content, or generates a message

indicating a revalidation failure, the SCM returns to state A 402. Before entering state A from state D, the SCM deletes the stale content.

[0078] With further regard to the revalidation of content, one embodiment involves the use of HTTP headers. In this embodiment the SCM sends a HEAD request and will expect one of the HTTP headers: Cache-Control or Expires. Those headers provide TTL information. After a given content file is fully downloaded, the SCM checks the TTL of the given content file in response to each incoming request for the file. If the content file ages past the TTL, then the SCM will send another HEAD request to revalidate the content. The response will depend on the media access server. For example, the Apache HTTP Server responds with a "200" response. Upon receipt of the "200" response SCM checks both the modifying time and the file size to make sure the cache content is still valid. As another example, the Microsoft's IIS™ HTTP server responds to a HEAD request with a "200" if the content is modified and stale, or "304" (not modified) if the content is still valid.

[0079] FIGS. 5 – 7 are flow charts illustrating processes for handling a request to deliver content. As described below, the extensible content delivery platform is supported in the processes. In general, the processes include determining whether content in a local cache is available to be streamed and, if so, streaming the requested content to the requester from the local cache; if not, content is revalidated and/or retrieved from a media access server and simultaneously streamed to the requester. The operations need not be performed in the particular order shown. The operations can be performed by functional modules such as one or more of the media streaming server 206, streaming media broker 208 and stream caching module 210 (FIG. 2), or other modules.

[0080] Referring specifically now to FIG. 5, in content request handling operation 500, a request is initially received for specified content in receiving operation 502. The requested content is identified in the request. A query operation 504 determines if the requested content exists in local cache. If it is determined that the requested content exists in local cache, another query operation 506 determines if the content in local cache is stale. In one embodiment, query operation 506 compares the age of the locally cached content to a TTL value associated with the content, and if the age is greater than the TTL value, the content is stale; otherwise the content is not stale.

[0081] If the locally cached content is determined to be not stale, the operation 506 branches "NO" to streaming operation 508. In streamlining operation 508, the locally cached content is streamed to the requester. On the other hand, if the locally cached content is determined to be stale, the operation 506 branches "YES" to sending operation 510.

[0082] In sending operation 510, a HEAD request is sent to a media access server (MAS) to revalidate the locally cached content. In another query operation 512 checks the response from the MAS to determine whether the locally cached content is revalidated. If the content is revalidated, the operation 512 branches "YES" to updating operation 514. Updating operation 514 updates the TTL value associated with the locally cached content, so that the locally cached content is no longer stale. The locally cached content is then streamed in streaming operation 508.

[0083] Returning to query operation 512, if the response from the MAS indicates that the locally cached content is not revalidated, the operation 512 branches "NO" to deleting operation 516. Deleting operation 516 deletes the locally cached content. After deleting operation 516, and if, in query operation 504 it is determined that the requested content is not in the local cache, the operation 504 branches to retrieving operation 518. In retrieving operation 518, the requested content is retrieved from the MAS while the content is simultaneously streamed to the requester.

[0084] In one embodiment retrieving operation 518 retrieves the content using a data transport protocol (e.g., HTTP) while simultaneously delivering the content using a streaming media protocol. Examples of the retrieving operation 518 are shown in FIGS. 6 – 7 and described below.

[0085] FIG. 6 is a flow chart illustrating a simultaneous retrieval and streaming operation 518. The operations shown in FIGS. 6 – 7 are typically performed by a stream caching module, such as SCM 210 (FIG. 2), or similar component. The descriptions and scenarios described with respect to FIGS. 6 – 7 assume that the media access server (MAS) has a non-stale copy of the requested content.

[0086] In the case of HTTP, GET requests are sent to the MAS in sending operation 602. The initial one or more GET requests request portion(s) of the content that include metadata describing the layout of the content so that streaming of the content can begin. In one embodiment, for example, when the content to be retrieved in Flash™ media, the first one or two

GET requests are range requests for a front portion of the content and an end portion of the content, which contain metadata used to begin streaming.

[0087] A storing operation 604 stores the retrieved portions of the content in cache. A notifying operation 606 notifies the streaming media server that the initial portions of the requested content are in cache and ready for streaming. The streaming media server will responsively begin streaming the requested content. Meanwhile, the SCM will continue to retrieve portions of the requested content in retrieving operation 608.

[0088] The retrieving operation 608 includes sending one or more additional GET requests for ranges of data in the requested content to the MAS. Content data received from the MAS is stored in cache where the streaming media server can access the content for continued streaming. In one embodiment, retrieving operation 608 retrieves portions of the content sequentially. The portions of content are of a size specified in the range requests. The portion sizes may be set or adapted, depending on various design or real-time parameters. In some embodiments, the portion size is set to 5 MB, but other sizes are possible and likely, depending on the implementation. Retrieving operation 608 continues until the entire content file has been retrieved and stored in cache.

[0089] During retrieving operation 608, a location-specific request may be received in receiving operation 610. When a location-specific request is received, the usual order of content retrieval (e.g., sequential) is temporarily interrupted to retrieve content data from the particular location specified in the location-specific request. A particular embodiment of a process of handling a location-specific request is shown in FIG. 7 and described further below.

[0090] After handling a location-specific request, the retrieving process 608 resumes. Retrieving operation 608 can continue to retrieve data sequentially after the location specified in the location-specific request, or the retrieving operation 608 could resume retrieval sequentially from where it was when the location-specific request was received.

[0091] FIG. 7 is a flow chart illustrating a location-specific requesting handling operation 700, which can be used to respond to a location-specific request when content is being streamed to the requester. As discussed, a location-specific request is a request to provide data at a particular location within content that is currently being streamed. Streaming media protocols are adapted to promptly move to a requested location within a content file.

[0092] However, in progressive download protocols, such as progressive download schemes often used with HTTP, moving to a particular place in the content while the content is being downloaded often causes delays because progressive download requires that all data prior to the desired location is downloaded first. Using the scheme shown in FIGS. 6 – 7 enables streaming of content that would otherwise be delivered via progressive download over a data transport channel, thereby reducing or removing delay associated with a move to a particular location in the content.

[0093] Initially, in moving operation 700, a query operation 702 determines whether data at the particular location specified in the location-specific request is stored in local cache. Query operation 702 may utilize a tolerance, whereby it is checked that at least a certain minimum amount of data after the specific location is stored in the local cache. For example, query operation 702 may check that at least 1MB (or some other amount) of data after the specified location is stored in local cache. By using a tolerance, the moving operation 700 can avoid delays by ensuring that at least a minimum amount of data at the specified location is available for streaming.

[0094] If it is determined that at least the minimum amount of data is stored in local cache, the query operation 702 branches "YES" to notifying operation 704. Notifying operation 704 notifies the media streaming server of the location in cache that the requested data is at for delivery. After notifying operation 704, the operation 700 returns to retrieving operation 608 (FIG. 6). As discussed above, retrieving operation 608 may continue retrieving portions of the content after the location specified in the location-specific request, or resume retrieval from the location prior to receiving the location-specific request.

[0095] Referring again to query operation 702, if it is determined that the minimum amount of data at the specified location is not stored in cache, the query operation 702 branches "NO" to sending operation 706. Sending operation 706 generates a GET request specifying a range of data after the specified location. The amount of data specified in the range request can be the byte count retrieved in GET requests generated in operation 602 (FIG. 6), or some other byte count. A storing operation 708 receives the requested data and stores the data in the local cache. After storing operation 708, the moving operation 700 branches to notifying operation 704 where the media streaming server is notified of the location of the requested data in cache.

[0096] FIG. 8 is a block diagram of another exemplary network environment 800 having a content delivery network 805 that includes an origin server 810, a cache server 820-1, a cache server 820-2 and a cache server 820-3 (hereinafter collectively cache server 820). Each cache server 820 has a respective cache memory 822-1, 822-2, and 822-3, and a respective storage system 824-1, 824-2, and 824-3 (e.g., disk-based or other persistent storage). Cache server 820-1 services requests and provides content to end users 832, 834, and 836 (e.g., client computers) associated with Internet Service Provider 8 (ISP1). Cache server 820-2 services requests and provides content to end users 842, 844, and 846 associated with ISP2. Cache server 820-3 services requests and provides content to end users 852, 854, and 856 associated with ISP3. FIG. 8 shows a cache server dedicated for each ISP for simplicity. Many other implementations are also possible. For example, in various embodiments, one or more ISPs do not have a dedicated cache server, one or more ISPs have a plurality of dedicated cache servers, or the cache servers are not even be correlated to ISPs at all. In one embodiment, for example, one or more cache servers are located remotely (e.g., within an ISP's infrastructure or at an end user's site, such as on a local area network (LAN)) and interact with a remote origin server (e.g., the origin server 810 shown in FIG. 8).

[0097] The network environment 800 in FIG. 8 portrays a high-level implementation of content delivery network 805 suitable for implementing and facilitating functionality of the various embodiments described herein. Content delivery network 805 represents just one example implementation of a content delivery network and, as such, it should be noted that the embodiments described herein are similarly applicable for being implemented in any content delivery network configuration commonly practiced in the art. One example content delivery network is described in United States Published Patent Application no. US 2003/0065762 A1 entitled "Configurable adaptive global traffic control and management" filed by Paul E. Stolorz et al. on September 30, 2002, which is incorporated by reference herein in its entirety.

[0098] During general operation, the origin server 810 distributes various content (e.g., depending on geography, popularity, etc.) to cache server 820 as shown by lines 860. Assume, for example, that end user 836 requests certain content (e.g., music, video, software, etc.) that is stored on the origin server 810. In this embodiment, the origin server 810 is configured to use the content delivery network 805 to serve content that it contains and optionally has already distributed the requested content to cache server 820-1. The end user 836 is redirected using any

number of known methods to instead request the content from cache server 820-1. As shown in the exemplary embodiment of FIG. 8, the cache server 820-1 is configured/located to deliver content to end users in ISP1. The cache server 820-1 can be selected from the group of cache servers 820 using any number of policies (e.g., load balancing, location, network topology, network performance, etc.). End user 836 then requests the content from cache server 820-1 as shown by line 880. Cache server 820-1 then serves the content to end user 836 (line 890) either from cache 822-1 or, if the content is not in the cache, the cache server 820-1 retrieves the content from the origin server 810.

[0099] Although FIG. 8 shows the origin server 810 located as part of the content delivery network 805, the origin server 810 can also be located remotely from the content delivery network (e.g, at a content provider's site). FIG. 9 shows such an embodiment, in which a content delivery network 905 interacts with one or more origin servers 910 located at various content provider's sites 908. In this embodiment, the content delivery network 905 includes a plurality of cache servers 920. The cache servers 920 service requests and provide content to end users 932, 942, and 952 (e.g., client computers). The origin servers 910 distribute various content to cache servers 920 as described above with respect to FIG. 8.

[00100] The cache server 820 (or 920) comprises an extensible content delivery platform, such as an event-based application programming interface (API) that provides the extensible content delivery platform. The extensible content delivery platform provides for applications and services to be built around underlying content to be served. Rich and well-formed metadata and "metacode" can be associated with content and/or requests in a consistent and programmatic manner. In one implementation, for example, a system provides a structured "event" model, a structured object model, primitive functions, and language constructs to create a service layer that can be leveraged in flexible ways without requiring core code changes.

[00101] In one particular implementation of such a system, an API "wrapper" is constructed around existing rule base and other configuration tables without a wholesale

replacement of existing techniques. The "wrapper" allows the system to be presented as a consistent, single interface to access underlying capabilities of an existing cache server in a logically represented way.

[00102] The extensible content delivery platform provides for reduced code complexity and enhanced maintainability. A core code provides a set of underlying operating services to support existing and future features that can be built using the core underlying operating services rather than requiring core code changes. In one such implementation, for example, the core underlying operating services includes object caching, instruction interpretation, instruction execution, and the like.

[00103] In one particular implementation, for example, geo-IP services are instantiated within the platform as a primitive function. In this implementation, an incoming IP address can be used as a key into a database of various geographic or other codes related to that IP address. The database or lookup table would serve as a system "primitive" function that would expose a resulting derived code to a higher-level program module for use in other functions like restricting or allowing access to content, serving alternate variants of content, or the like.

[00104] In an embodiment, the extensible content delivery platform also provides for flexible implementation (e.g., enriched extensibility, customization, and application integration potential) without core code changes. In this embodiment, developers can use such an extensible content delivery platform to create virtually unlimited potential applications on the platform.

[00105] FIG. 10 shows an embodiment of an extensible programming framework 1000 (e.g., an event-based extensible programming framework) to be incorporated within a cache server (e.g., the cache server 120-1 shown in FIG. 8). The framework 1000 comprises a core engine 1002, configuration files 1004, and modules 1006, 1008, and 1010. The core engine 1002 is provided with a core code that provides a set of underlying operating services that support existing and future features that can be built using the core underlying operating services rather than requiring core code changes. In an embodiment, the underlying operating services comprise base functions or actions that the core engine 1002 can perform. Rather than creating complexity in the core engine 1002 to provide various features or services, the core engine 1002 of the extensible programming framework 1000 allows scripts or modules to be associated with the various features or services. In FIG. 10, for example, the modules 1006, 1008, and 1010 provide

various customizable features or services without requiring added complexity in the core engine 1002.

[00106] In an exemplary embodiment, the underlying operating services of the core engine 1002 include a structured event model, a structured object model, primitive functions or actions that are performed at discrete events and upon various objects, and a programmatic grammar that allows for applications and/or services to be built around the core engine 1002. The structured event model provides a discrete number of events in a content delivery network processing pipeline at which various actions can be taken. The structured object model instantiates a series of objects (e.g., requests, resources, responses, and other objects) that are defined such that various consistent properties and attributes could be obtained and/or manipulated. The set of primitive functions or actions can be performed at discrete events and upon various objects. Examples of such actions comprise operations, such as string parsing and manipulation, HTTP message construction, and decomposition, resource manipulation, and the like.

[00107] The modules 1006, 1008, and 1010 provide scripts, instructions, or other code using the defined programmatic grammar. In an embodiment, for example, the modules 1006, 1008, 1010, include specific instantiations developed to exercise functions implemented in the core engine 1002. The modules 1006, 1008, 1010 can be controlled by owners or operators of a content delivery network or can be documented so that many different people can configure a system. Customers, resellers, content partners, or other individuals can be allowed to customize features or services of the content delivery network by providing modules or scripts to be used with the extensible programming framework 1000.

[00108] In an example implementation, features are provided that operate on one or more of the following: (1) a property-wide basis (e.g., all requests/content can be affected the same way); (2) resources or groups of resources (e.g., operations can be based on whether a resource being requested matches a set of conditions); (3) request metadata (e.g., a request contains information that can be used to determine one or more operations to be performed); (4) response metadata (e.g., information conveyed from an origin or intermediate content delivery network node during the course of obtaining a requested resource); and (5) combinations of the above conditions with metadata instantiated within the cache server or from external applications/services.

[00109] The core engine 1002 interprets scripts, instructions, or other code within the modules 1006, 1008, and 1010 and executes the scripts, instructions, or other code to provide customized features or services within the content delivery network. The modules 1006, 1008, and 1010 alleviate the need for detailed configuration files within the core engine to provide similar features and services directly from the core engine. The modules 1006, 1008, and 1010 provide an extensible platform to write custom logic for features and services within a content delivery network. In one particular embodiment, scripts within modules 1006, 1008, and 1010 are associated with particular content available via a content delivery network. The scripts are then executed every time a user attempts to access that particular content.

[00110] In an embodiment, the modules 1006, 1008, and 1010 provide for authentication services for different customers. In one example, the modules 1006, 1008, and 1010 provide instructions that result in blocking and/or allowing access to particular sets of content (e.g., by geographic region, permission, or the like). The first module 1006, for example, provides instructions that result in blocking access to users in one particular set of regions, while the second module 1008 provides instructions that result in blocking access to users in a different set of regions for a different set of content. These modules are invoked for different users and/or requests at different times depending upon a specific combination of configuration files 1004; rules, metadata, or other information resident in the core module 1002; and/or metadata in a request for content (see, e.g., request 180 shown in FIG. 1). In such an example, the first module 1006 is executed for all users requesting content of a certain profile (e.g., directory, name, file-type, or the like). The second module 1008, however, is applied to requests for a different set of content (and/or for content having a different property or profile). The modules 1006, 1008, and 1010, for example, are created and/or stored within a content delivery network (e.g., the content delivery network 105 shown in FIG. 1). The modules are then applied to transactions and/or requests for content based upon specific rules and/or events.

[00111] In an embodiment, a set of tables is used to allow for a definition of rules, modules, procedures, plug-ins, or the like. Modules, for example, could be stored as named procedures having optional input arguments and output return values. The modules could also be named for invocation using a rules engine or explicit invocation via request/response headers or other HTTP constructs such as query string elements. In an embodiment, a decoupling of named modules and rule base or script allows for a single module to be authored and stored in a

content delivery network once, but invoked using various criteria/rules (e.g., via optional arguments that trigger different behavior).

[00112] FIG. 11 is a block diagram of one possible implementation of a structured content delivery event model 1100. In the embodiment of FIG. 11, the event model 1100 identifies discrete events within one or more content delivery process at which various actions can be taken through customizable modules or scripts within an extensible content delivery platform. The event model 1100 is, however, merely one example of an event model that can be used to identify discrete events within a content delivery network. Many different ways of identifying certain events at which one or more modules are invoked at various points in a processing pipeline are possible. In another example implementation, for example, a set of rules is used to detect certain discrete events out of multiple possible events at which various actions are to be taken through customizable modules or scripts within the extensible content delivery platform.

[00113] In the event model 1100 shown in FIG. 11, a content delivery process is initiated when a connection with a user is established at operation 1102. A request for a content resource is received over the connection in operation 1104. If the content resource is found in the cache of the cache server, a "Cache Hit" is identified in operation 1106. Alternatively, if the content resource is not found in the cache, a "Cache Miss" is identified in operation 1108.

[00114] Where a Cache Hit indicates that the requested content resource is found in the cache, the event model next proceeds to operation 1110 at which a response to the request is ready to be sent to the user.

[00115] Where a Cache Miss indicates that the requested content resource is not found in the cache, however, the event model proceeds to operation 1112 at which a Cache Fill request is prepared to request the content resource from another source (e.g., the origin server 110 shown in FIG. 1 or the remote content provider origin server 110A shown in FIG. 1A). The event model also establishes a connection to the alternate content source in operation 1114, and determines if the connection succeeds or fails. If the connection to the alternate content source is determined to have succeeded in operation 1116, the event model 1100 proceeds to operation 1118 in which a Cache Fill request is ready and to operation 1120 in which the Cache Fill request is sent to the alternative content source. When the Cache Fill is complete in operation 1122, the event model 1100 proceeds to operation 1110 indicating that a response to the user's request for content is ready to be sent to the user.

[00116] Once the response is ready to be sent to the user at operation 1110 (whether from a Cache Hit in operation 1106 or from a Cache Fill in operations 1112 through 1122), the event model 1100 proceeds to operation 1124 in which the response serving the requested content to the user is initiated. If the response serving the requested content to the user completes successfully, the event model 1100 indicates the success in operation 1126. If the response fails, however, the event model indicates the failure in operation 1128.

[00117] If the connection to the alternate content source to fill the cache is determined to have failed in operation 1130, however, the event model 1100 proceeds to operation 1128 to indicate the failure to serve the content.

[00118] From the event model 1100, discrete events at which customizable modules or scripts can be implemented to provide custom features or services are identified. In one embodiment of a content delivery network servicing HTTP/S requests, for example, events in the process comprise a Receive Request (e.g., an HTTP request received by the content delivery network), a Find Resource (e.g., a determination of whether a resource is present in the cache of a cache server or a consultation of a service to determine whether the resource can be found in the content delivery network), a Cache Hit (e.g., an indication that the resource is found in the cache), a Cache Miss (e.g., an indication that the resource is not found in the cache), a Cache Fill (e.g., an indication that the resource has been retrieved from a source within the content delivery network), an Authenticate Request (e.g., an indication that the request is authenticated), a Construct Response (e.g., a response built by the content delivery network cache server that include associated headers, response bodies, and/or the like), and an Issue Response (e.g., an indication that the response is sent to a requesting user). These events are merely examples of discrete events that can be identified within a process of serving content delivery requests at a cache server of a content delivery network. Other discrete events can also be identified.

[00119] In an embodiment, an extensible programming framework of a cache server also provides several types of objects that could be operated on during the processing of requests such as those described above with respect to Figure 11. Examples of the types of objects include connections (e.g., TCP layer information, client properties, and the like), requests (e.g., request headers and request body), resources (e.g., resource body and resource metadata such as attributes of object and cache control settings), responses, (e.g., response headers and response body), and servers (e.g., attributes relating to the content delivery network server, node, or

cluster). These object types are merely examples of types of objects that can be operated on during processing of requests for content. Other object types can also be operated on.

[00120] The objects and their attributes can be instantiated and available for appropriate points in an event pipeline. In an embodiment, attributes (e.g., geography codes, server region, and the like) are available via function calls. In an embodiment, for example, the calls are events or part of the programming grammar to be used in developing customized features or services.

[00121] Various actions can also be performed during the processing of a request for content. In an embodiment, for example, these actions include manipulating aspects of the transaction, result in additional transactions being spawned, and the like. Examples of actions to be performed include creating a custom header and/or body for a response (e.g., content watermarking, application of security check summing, file chunking/unchunking, streaming of a continuous stream of bytes from a single response, etc.), creating a new request (e.g., on the basis of an authentication request, a request of an alternate or related resource, and the like), deleting a response header that would otherwise be present, setting a new value of a response header, and sending a constructed request to a location (e.g., an arbitrary location), await the response, and act on one or more attributes of the response. Other actions can be viewed as functions or primitives of the programmatic grammar language itself, such as operations common to many programming languages (e.g., string functions and math functions). Still other actions can be specific operations for obtaining metadata known to the content delivery network. In one embodiment, for example, an operation of ClientGeography("Country") returns a country code of a requesting client (e.g., by finding an IP address of a client or connection object or by extracting the code from an object and passed as a more generic type of function such as a GetGeography(<level>,<address>) function). Similarly, in an embodiment, a GetServerIP() function or a GetHeader("name") operation is used to obtain metadata.

[00122] In an embodiment, scripts or other customizable code are used to provide features or services with a cache server of a content delivery network. In one implementation, for example, a script is associated with a resource available on the content delivery network and is pre-configured (e.g., stored in a table), attached to a resource (e.g., attached to a response header or body), or otherwise associated with the resource. Many possible mechanisms for associating a script or module with a request are possible. In an implementation, for example, a script (along with its associated functions, arguments, and the like) is stored as a named resource within the

system. The named resource is then executed (1) via a registered event within the core engine, (2) via a matching rule set (e.g., execute module "X" if a request for a specific set of content is received), (3) via an explicit association by a content publisher of a request with a module that could be implemented as a query string parameter, a custom header and/or body, or the like, or (4) via an invocation from another script or module.

[00123] FIG. 12 is a schematic diagram of a computer system 1200 upon which embodiments of the present invention may be implemented and carried out. For example, one or more computing devices 1200 may be used to support an extensible content delivery platform (e.g., for streamed content within a content distribution network). Computer system 1200 generally exemplifies any number of computing devices, including general purpose computers (e.g., desktop, laptop or server computers) or specific purpose computers (e.g., embedded systems).

[00124] According to the present example, the computer system 1200 includes a bus 1201 (i.e., interconnect), at least one processor 1202, at least one communications port 1203, a main memory 1204, a removable storage media 1205, a read-only memory 1206, and a mass storage 1207. Processor(s) 1202 can be any known processor, such as, but not limited to, an Intel® Itanium® or Itanium 2® processor(s), AMD® Opteron® or Athlon MP® processor(s), or Motorola® lines of processors. Communications ports 1203 can be any of an RS-232 port for use with a modem based dial-up connection, a 10/100 Ethernet port, a Gigabit port using copper or fiber, or a USB port. Communications port(s) 1203 may be chosen depending on a network such as a Local Area Network (LAN), a Wide Area Network (WAN), or any network to which the computer system 1200 connects. The computer system 1200 may be in communication with peripheral devices (e.g., display screen 1230, input device 1216) via Input/Output (I/O) port 1209.

[00125] Main memory 1204 can be Random Access Memory (RAM), or any other dynamic storage device(s) commonly known in the art. Read-only memory 1206 can be any static storage device(s) such as Programmable Read-Only Memory (PROM) chips for storing static information such as instructions for processor 1202. Mass storage 1207 can be used to store information and instructions. For example, hard disks such as the Adaptec® family of Small Computer Serial Interface (SCSI) drives, an optical disc, an array of disks such as

Redundant Array of Independent Disks (RAID), such as the Adaptec® family of RAID drives, or any other mass storage devices may be used.

[00126] Bus 1201 communicatively couples processor(s) 1202 with the other memory, storage and communications blocks. Bus 1201 can be a PCI / PCI-X, SCSI, or Universal Serial Bus (USB) based system bus (or other) depending on the storage devices used. Removable storage media 1205 can be any kind of external hard-drives, floppy drives, IOMEGA® Zip Drives, Compact Disc – Read Only Memory (CD-ROM), Compact Disc – Re-Writable (CD-RW), Digital Video Disk – Read Only Memory (DVD-ROM), etc.

[00127] Embodiments herein may be provided as a computer program product, which may include a machine-readable medium having stored thereon instructions, which may be used to program a computer (or other electronic devices) to perform a process. The machine-readable medium may include, but is not limited to, floppy diskettes, optical discs, CD-ROMs, magneto-optical disks, ROMs, RAMs, erasable programmable read-only memories (EPROMs), electrically erasable programmable read-only memories (EEPROMs), magnetic or optical cards, flash memory, or other type of media/machine-readable medium suitable for storing electronic instructions. Moreover, embodiments herein may also be downloaded as a computer program product, wherein the program may be transferred from a remote computer to a requesting computer by way of data signals embodied in a carrier wave or other propagation medium via a communication link (e.g., modem or network connection).

[00128] As shown, main memory 1204 is encoded with extensible content delivery application 1250-1 that supports functionality as discussed herein. Extensible content delivery application 1250-1 (and/or other resources as described herein) can be embodied as software code such as data and/or logic instructions (e.g., code stored in the memory or on another computer readable medium such as a disk) that supports processing functionality according to different embodiments described herein.

[00129] During operation of one embodiment, processor(s) 1202 accesses main memory 1204 via the use of bus 1201 in order to launch, run, execute, interpret or otherwise perform the logic instructions of the extensible content delivery application 1250-1. Execution of extensible content delivery application 1250-1 produces processing functionality in extensible content delivery process 1250-2. In other words, the extensible content delivery process 1250-2

represents one or more portions of the extensible content delivery application 1250-1 performing within or upon the processor(s) 1202 in the computer system 1200.

[00130] It should be noted that, in addition to the extensible content delivery process 1250-2 that carries out operations as discussed herein, other embodiments herein include the extensible content delivery application 1250-1 itself (i.e., the un-executed or non-performing logic instructions and/or data). The extensible content delivery application 1250-1 may be stored on a computer readable medium (e.g., a repository) such as a floppy disk, hard disk or in an optical medium. According to other embodiments, the extensible content delivery application 1250-1 can also be stored in a memory type system such as in firmware, read only memory (ROM), or, as in this example, as executable code within the main memory 1204 (e.g., within Random Access Memory or RAM). For example, extensible content delivery application 1250-1 may also be stored in removable storage media 1205, read-only memory 1206, and/or mass storage device 1207.

[00131] Example functionality supported by computer system 1200 and, more particularly, functionality associated with extensible content delivery application 1250-1 and extensible content delivery process 1250-2 is discussed above with reference to FIGS. 1 – 11.

[00132] In addition to these embodiments, it should also be noted that other embodiments herein include the execution of the extensible content delivery application 1250-1 in processor(s) 1202 as the extensible content delivery process 1250-2. Thus, those skilled in the art will understand that the computer system 1200 can include other processes and/or software and hardware components, such as an operating system that controls allocation and use of hardware resources.

[00133] As discussed herein, embodiments of the present invention include various steps or operations. A variety of these steps may be performed by hardware components or may be embodied in machine-executable instructions, which may be used to cause a general-purpose or special-purpose processor programmed with the instructions to perform the operations. Alternatively, the steps may be performed by a combination of hardware, software, and/or firmware. The term "module" refers to a self-contained functional component, which can include hardware, software, firmware or any combination thereof.

[00134] The embodiments described herein are implemented as logical steps in one or more computer systems. The logical operations are implemented (1) as a sequence of processor-

implemented steps executing in one or more computer systems and (2) as interconnected machine or circuit modules within one or more computer systems. The implementation is a matter of choice, dependent on the performance requirements of the computer system implementing the invention. Accordingly, the logical operations making up the embodiments of the invention described herein are referred to variously as operations, steps, objects, or modules. Furthermore, it should be understood that logical operations may be performed in any order, unless explicitly claimed otherwise or a specific order is inherently necessitated by the claim language.

[00135] Various modifications and additions can be made to the example embodiments discussed herein without departing from the scope of the present invention. For example, while the embodiments described above refer to particular features, the scope of this invention also includes embodiments having different combinations of features and embodiments that do not include all of the described features. Accordingly, the scope of the present invention is intended to embrace all such alternatives, modifications, and variations together with all equivalents thereof.

Claims

WHAT IS CLAIMED IS:

1. A method of providing an extensible content delivery platform, the method comprising:

identifying a plurality of discrete events of a content delivery process of a content delivery network;

providing a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events; and

providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.

2. A methods as recited in claim 1 wherein the operation of identifying the plurality of discrete events comprises using a structured event model to identify the plurality of discrete events.

3. A methods as recited in claim 1 wherein the operation of identifying the plurality of discrete events comprises using at least one rule to identify the plurality of discrete events.

4. A methods as recited in claim 1 further comprising a set of base functions to be performed at the plurality of discrete events.

5. A methods as recited in claim 1 further comprising a set of base functions to be performed upon the plurality of objects.

6. A cache server comprising:

a core engine executing on a processor of a cache server, the core engine comprising a structured event model identifying a plurality of discrete events of a content delivery process of a content delivery network, a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events, and a

programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.

7. A cache server as recited in claim 6 wherein the logical flow of actions comprises user definable modules.

8. A cache server comprising:

a core engine executing on a processor of a cache server, the core engine comprising a set of rules configured to identify a plurality of discrete events of a content delivery process of a content delivery network, a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events, and a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.

9. A cache server as recited in claim 8 wherein the logical flow of actions comprises user definable modules.

CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK

ABSTRACT

Embodiments generally disclosed herein include methods, systems and devices for providing an extensible content delivery platform. The methods, systems and devices include identifying a plurality of discrete events of a content delivery process of a content delivery network and providing a structured object model comprising a plurality of objects instantiated and available at the plurality of discrete events. The methods, systems and devices further include providing a programmatic grammar configured to provide a logical flow of actions being applied against the plurality of objects on occurrence of at least one of the plurality of discrete events of the content delivery process of the content delivery network.

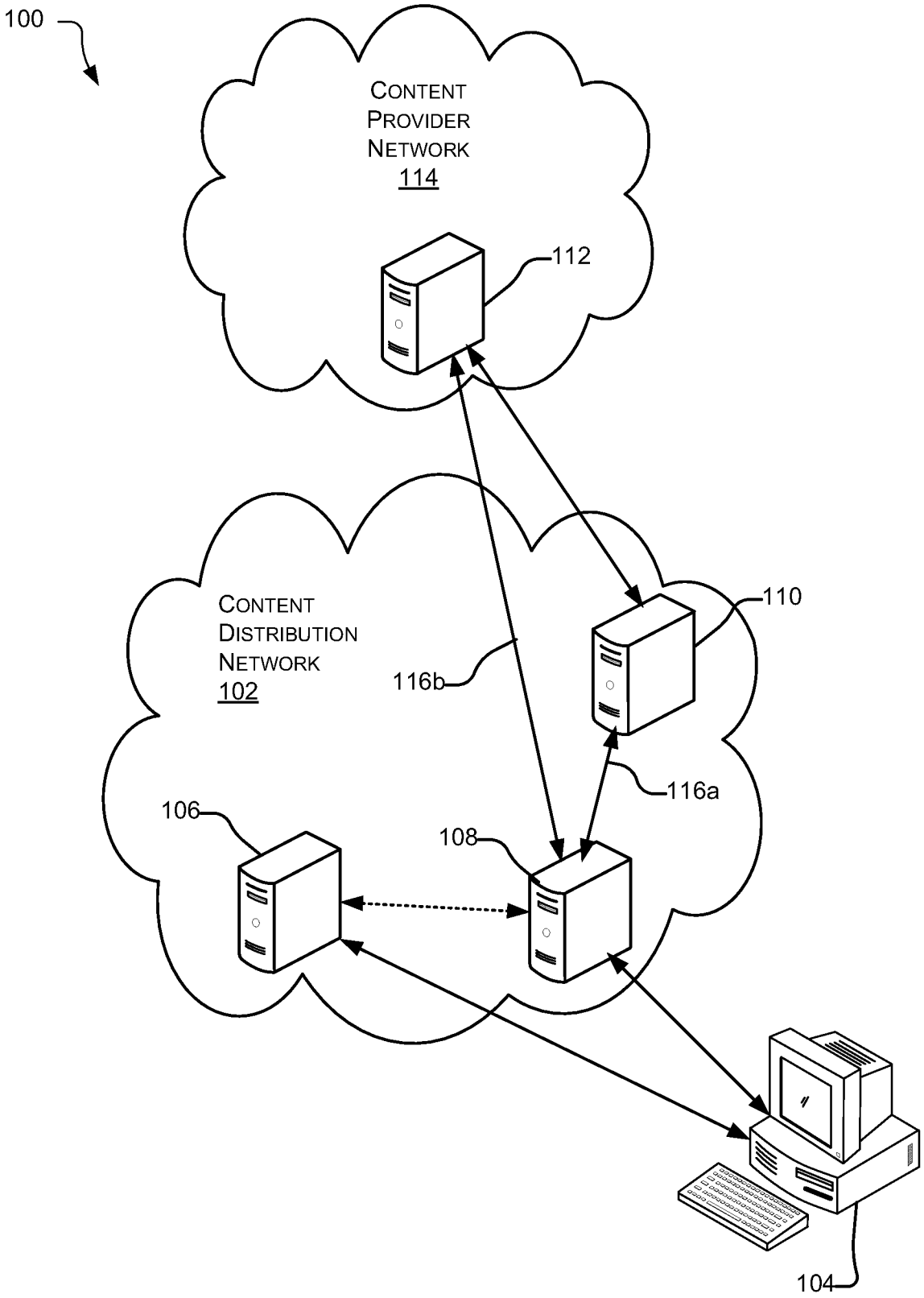
100
CONTENT
PROVIDER
NETWORK
114
112
CONTENT
DISTRIBUTION
NETWORK
102
116b
110
116a
106
108
104

FIG. 1

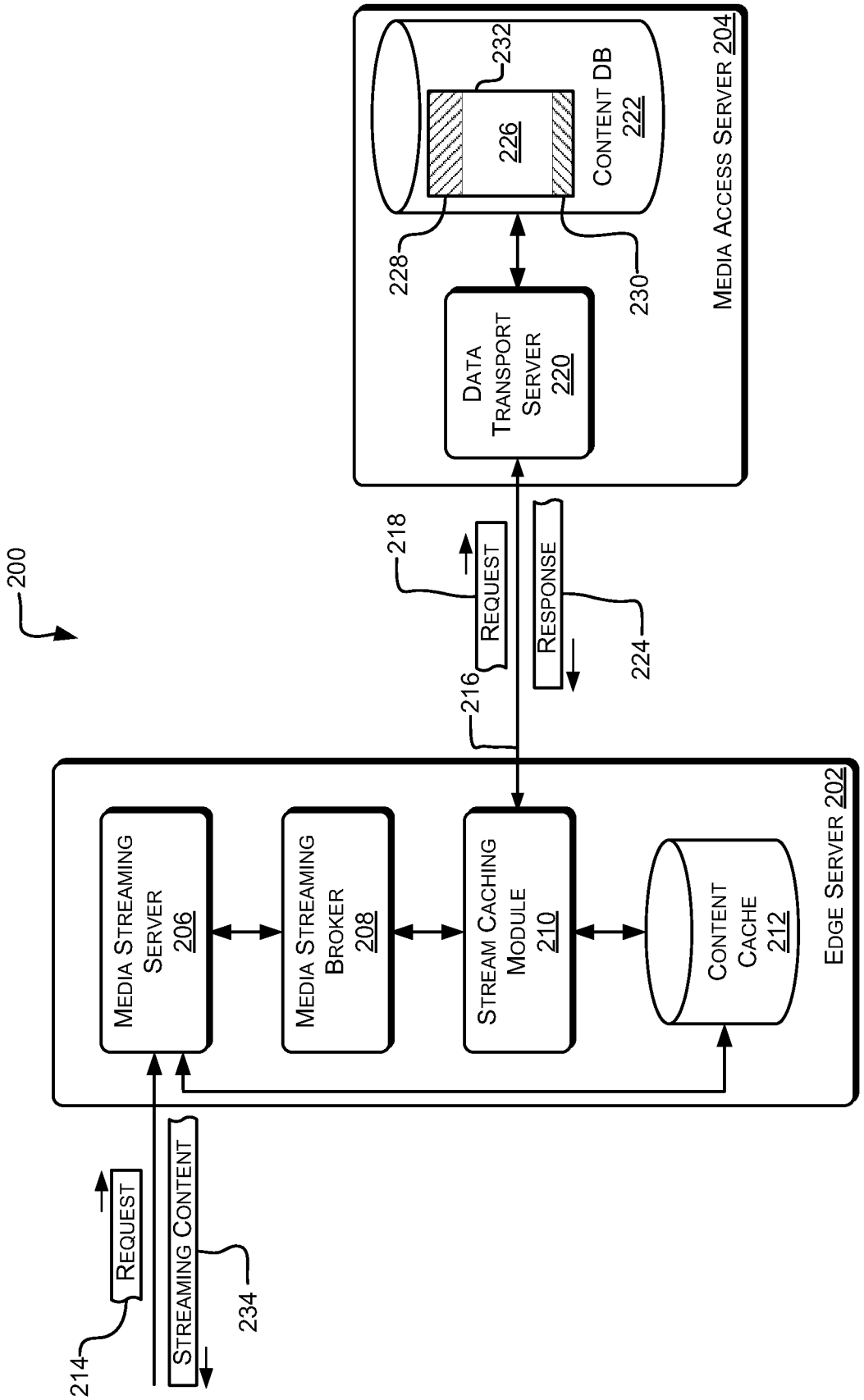
200
214
REQUEST
STREAMING CONTENT
234
EDGE SERVER 202
MEDIA STREAMING SERVER 206
MEDIA STREAMING BROKER 208
STREAM CACHING MODULE 210
CONTENT CACHE 212
216
REQUEST
218
RESPONSE
224
MEDIA ACCESS SERVER 204
DATA TRANSPORT SERVER 220
228
230
232
226
CONTENT DB 222

Fig. 2

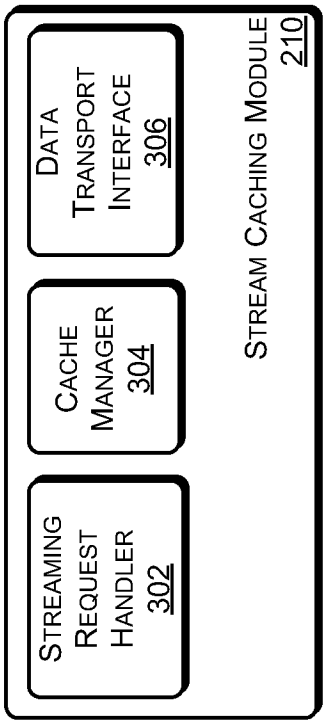
STREAMING REQUEST HANDLER 302
CACHE MANAGER 304
DATA TRANSPORT INTERFACE 306
STREAM CACHING MODULE 210

Fig. 3

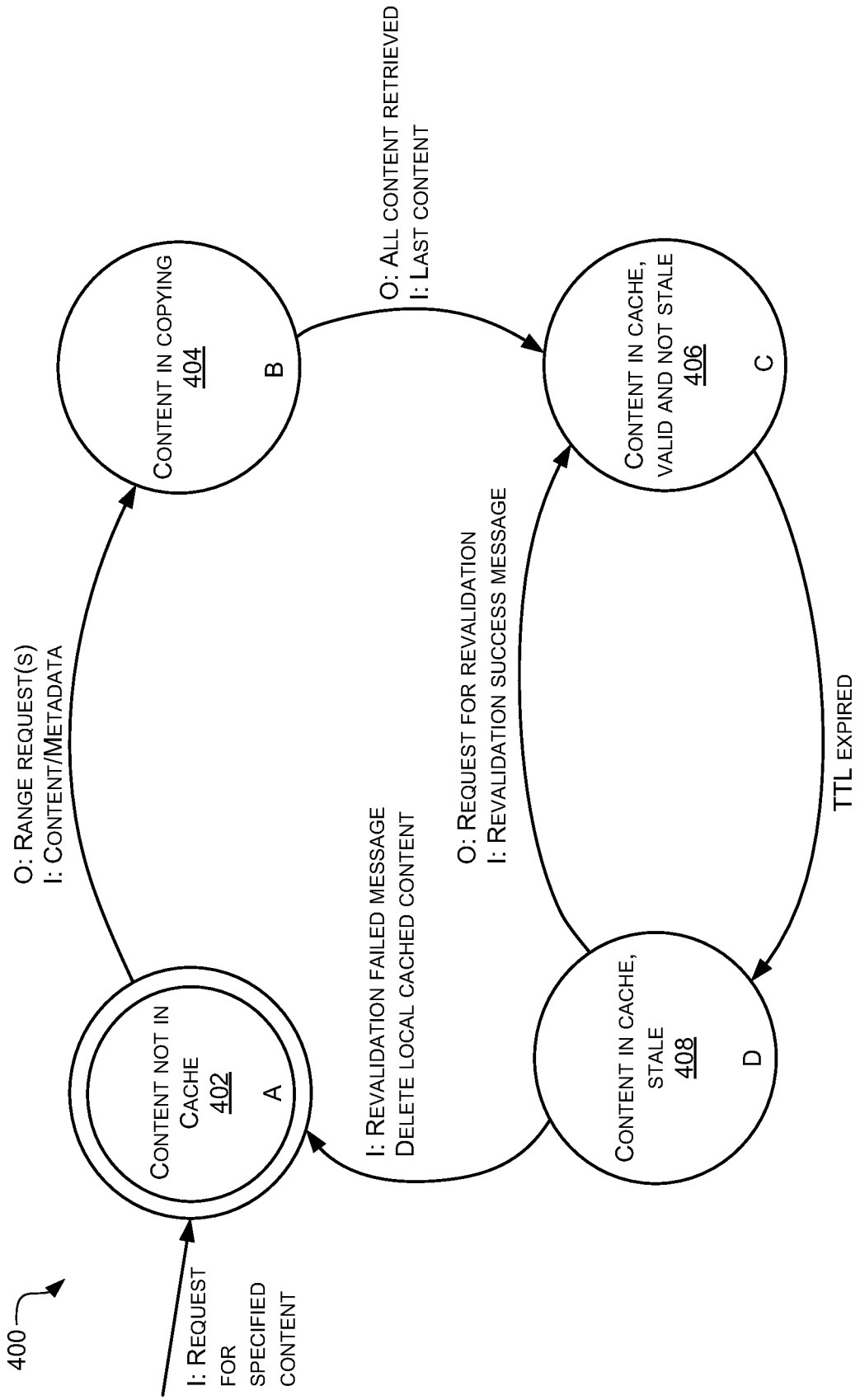
400
I: REQUEST FOR SPECIFIED CONTENT
CONTENT NOT IN CACHE 402
A
O: RANGE REQUEST(S)
I: CONTENT/METADATA
CONTENT IN COPYING 404
B
O: ALL CONTENT RETRIEVED
I: LAST CONTENT
CONTENT IN CACHE, VALID AND NOT STALE 406
C
TTL EXPIRED
CONTENT IN CACHE, STALE 408
D
O: REQUEST FOR REVALIDATION
I: REVALIDATION SUCCESS MESSAGE
I: REVALIDATION FAILED MESSAGE
DELETE LOCAL CACHED CONTENT

FIG. 4

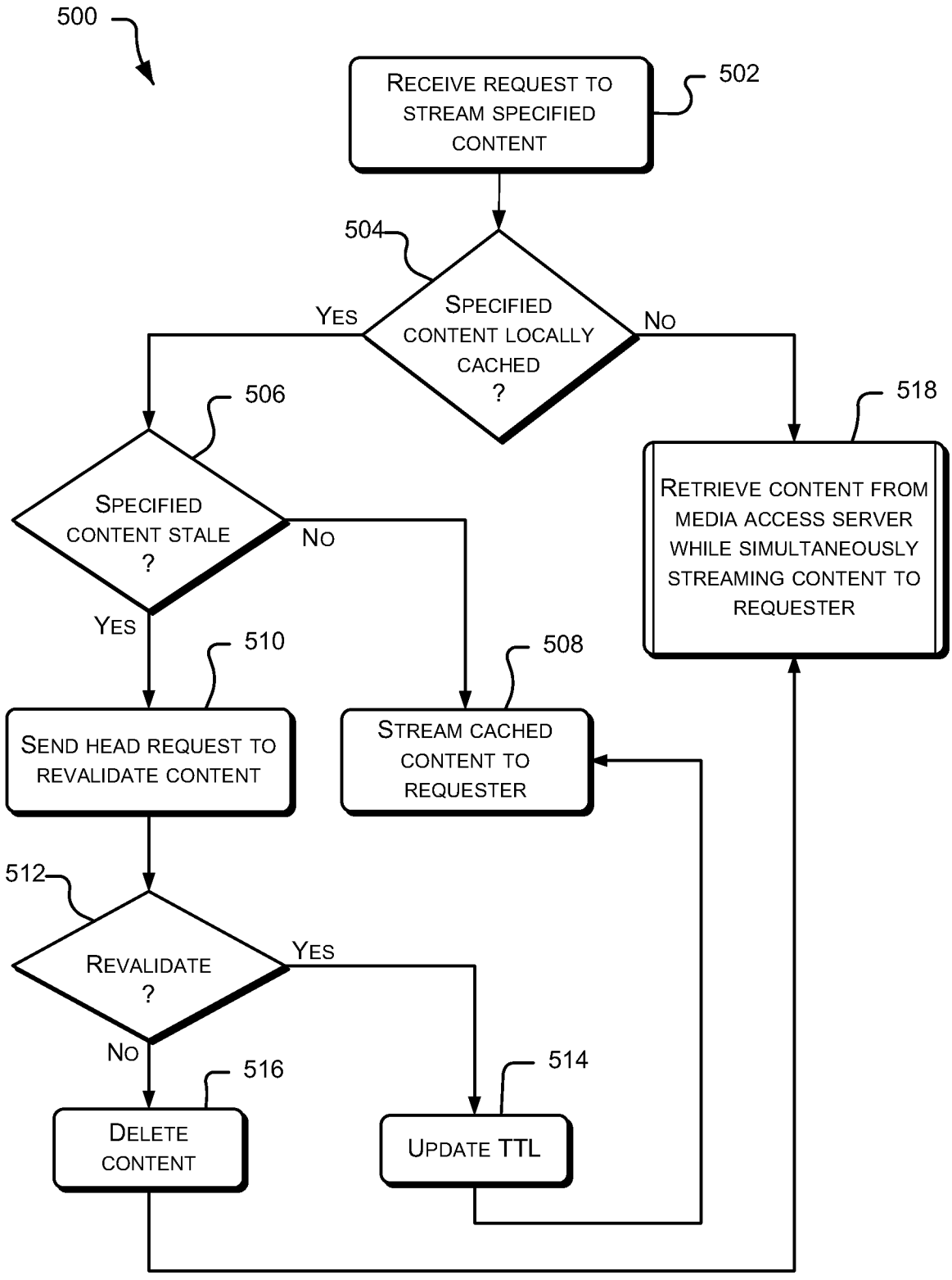
500
RECEIVE REQUEST TO STREAM SPECIFIED CONTENT
502
504
SPECIFIED CONTENT LOCALLY CACHED ?
YES
NO
506
SPECIFIED CONTENT STALE ?
NO
YES
510
SEND HEAD REQUEST TO REVALIDATE CONTENT
508
STREAM CACHED CONTENT TO REQUESTER
518
RETRIEVE CONTENT FROM MEDIA ACCESS SERVER WHILE SIMULTANEOUSLY STREAMING CONTENT TO REQUESTER
512
REVALIDATE ?
YES
NO
516
DELETE CONTENT
514
UPDATE TTL

FIG. 5

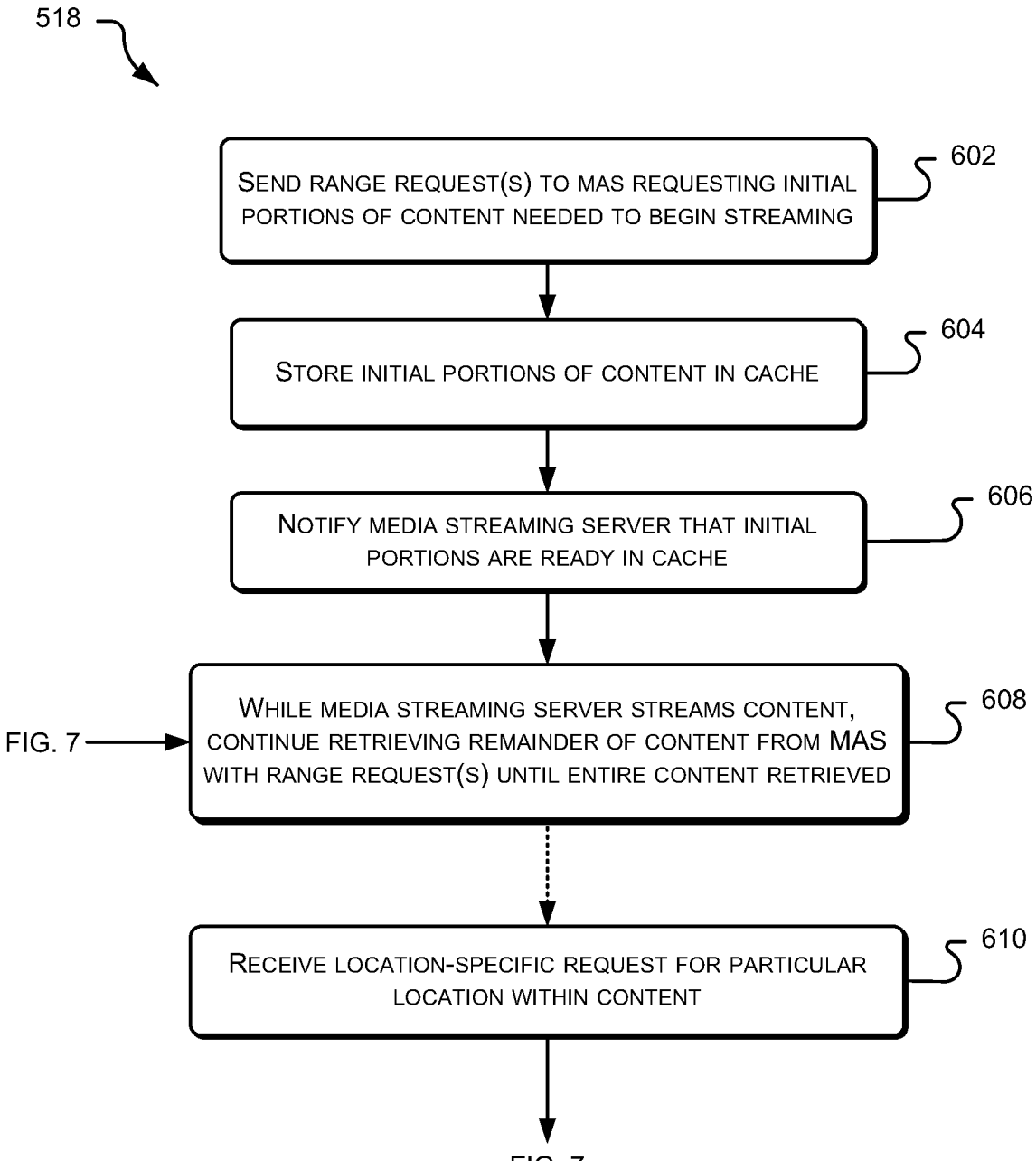
518
SEND RANGE REQUEST(S) TO MAS REQUESTING INITIAL PORTIONS OF CONTENT NEEDED TO BEGIN STREAMING
602
STORE INITIAL PORTIONS OF CONTENT IN CACHE
604
NOTIFY MEDIA STREAMING SERVER THAT INITIAL PORTIONS ARE READY IN CACHE
606
WHILE MEDIA STREAMING SERVER STREAMS CONTENT, CONTINUE RETRIEVING REMAINDER OF CONTENT FROM MAS WITH RANGE REQUEST(S) UNTIL ENTIRE CONTENT RETRIEVED
608
RECEIVE LOCATION-SPECIFIC REQUEST FOR PARTICULAR LOCATION WITHIN CONTENT
610
FIG. 7

FIG. 6

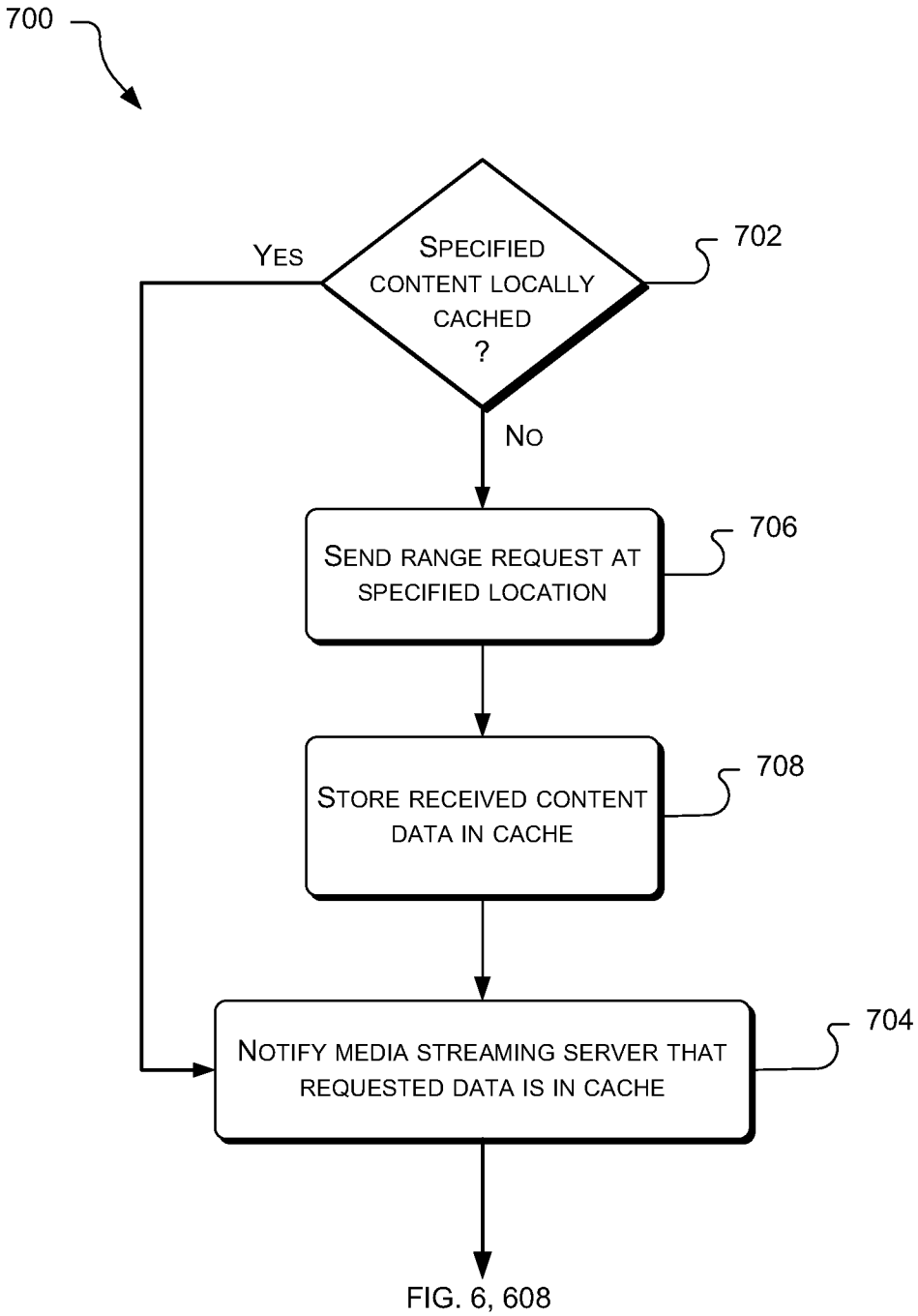

FIG. 6, 608

FIG. 7

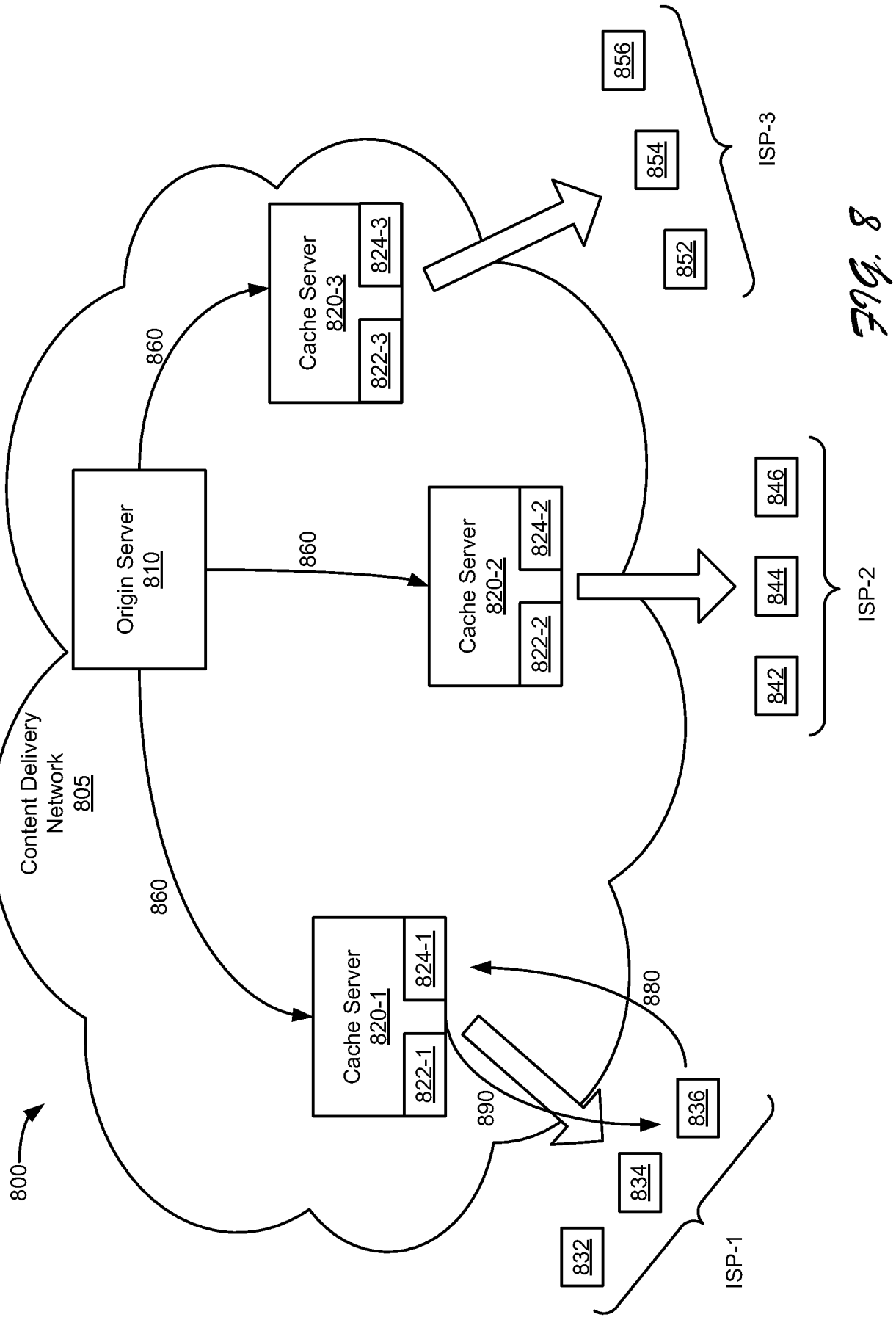
800
Content Delivery Network 805
Origin Server 810
Cache Server 820-1
822-1
824-1
Cache Server 820-2
822-2
824-2
Cache Server 820-3
822-3
824-3
860
860
860
880
890
832
834
836
ISP-1
842
844
846
ISP-2
852
854
856
ISP-3

Fig. 8

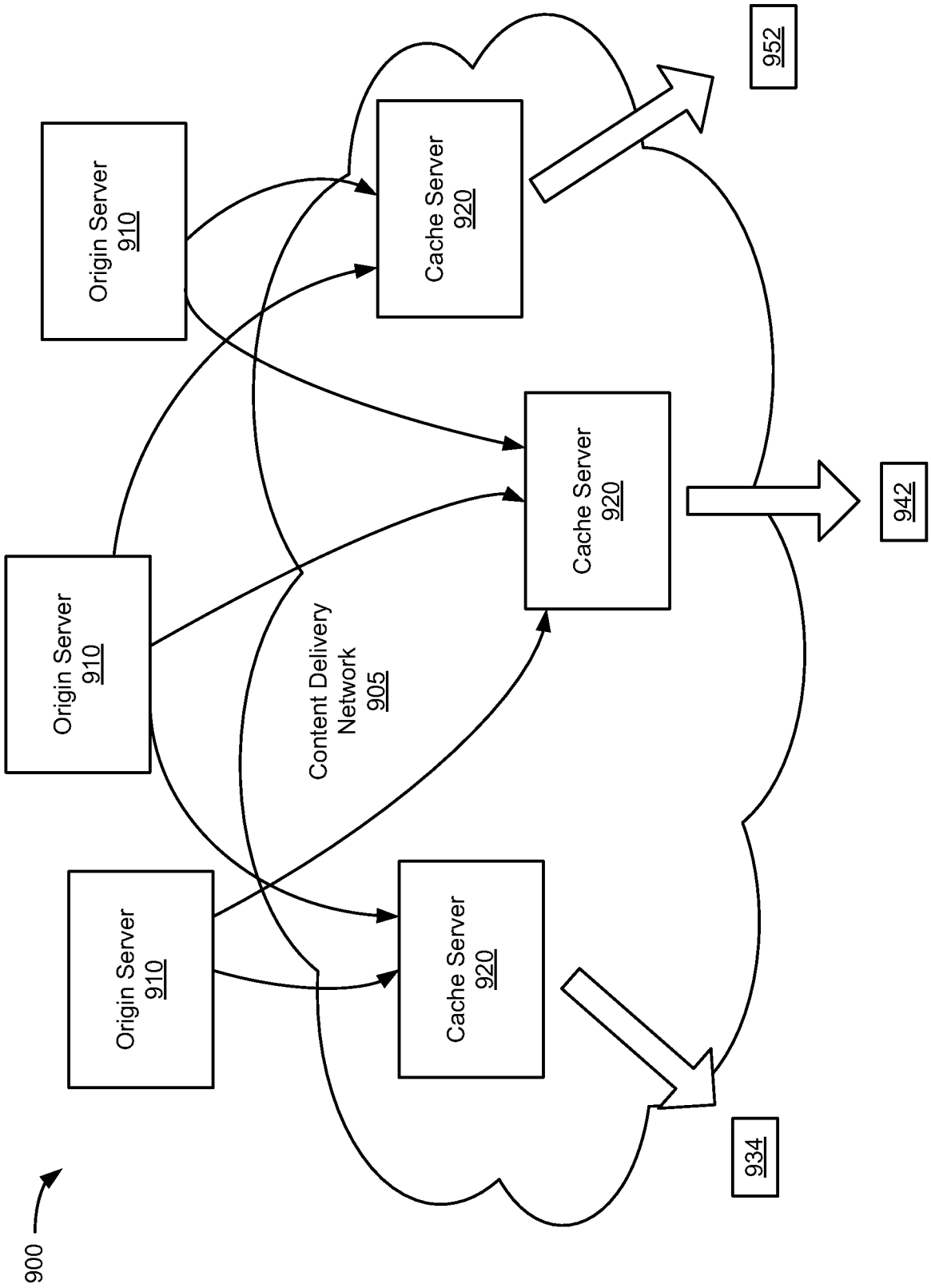
900
Origin Server 910
Origin Server 910
Origin Server 910
Content Delivery Network 905
Cache Server 920
Cache Server 920
Cache Server 920
952
942
934

FIG. 9

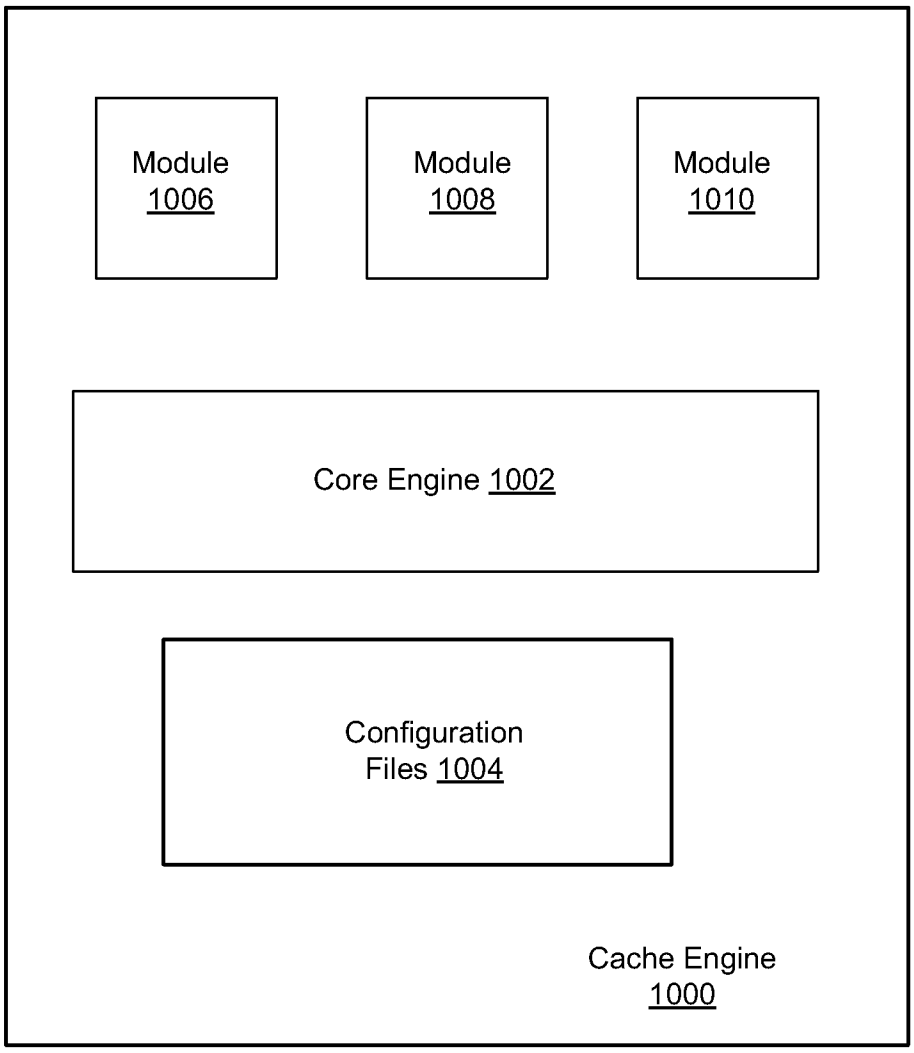
Module 1006
Module 1008
Module 1010
Core Engine 1002
Configuration Files 1004
Cache Engine 1000

FIG. 10

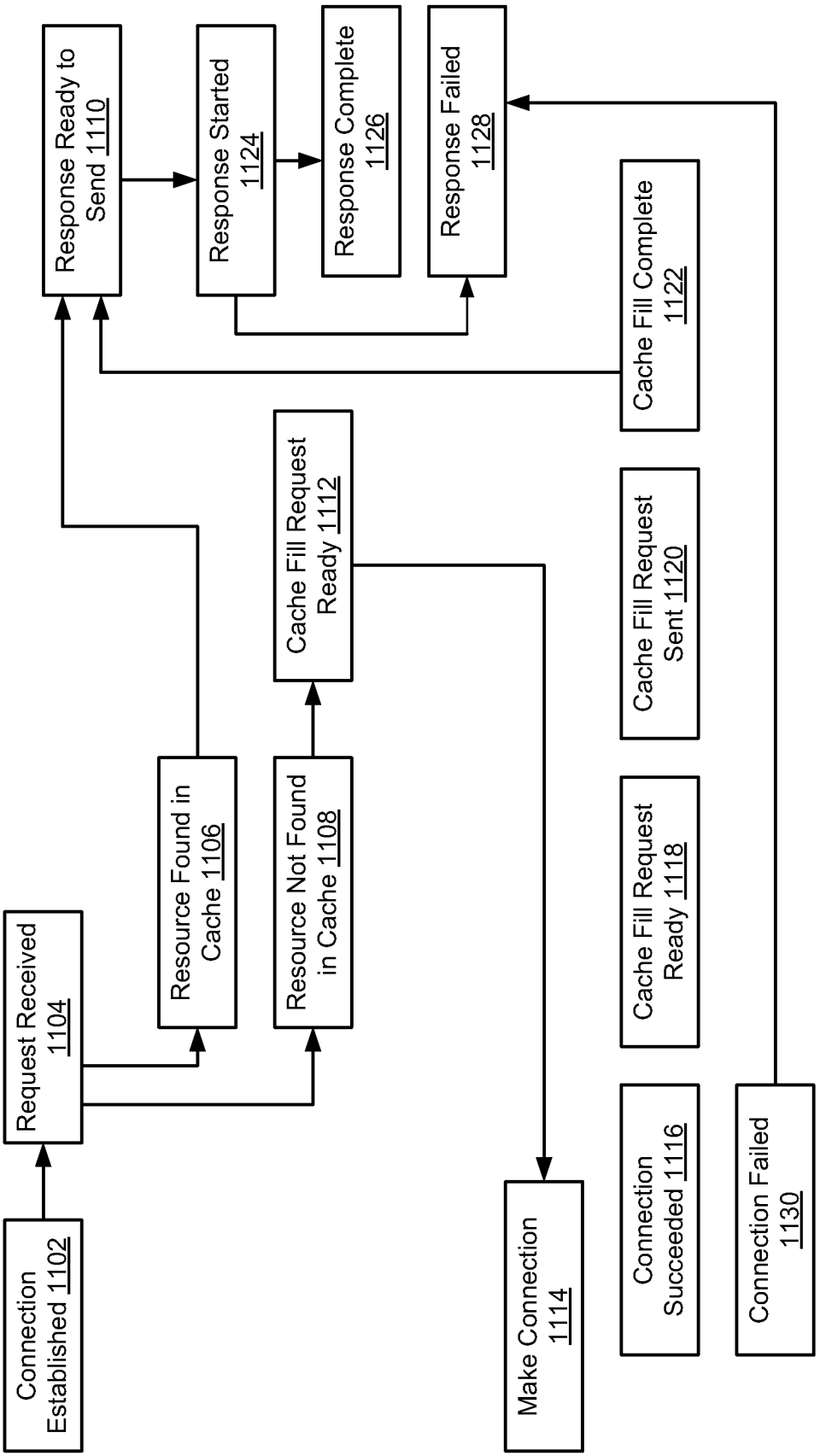
Connection Established 1102
Request Received 1104
Resource Found in Cache 1106
Resource Not Found in Cache 1108
Cache Fill Request Ready 1112
Make Connection 1114
Connection Succeeded 1116
Cache Fill Request Ready 1118
Cache Fill Request Sent 1120
Cache Fill Complete 1122
Response Ready to Send 1110
Response Started 1124
Response Complete 1126
Response Failed 1128
Connection Failed 1130

Fig. 11

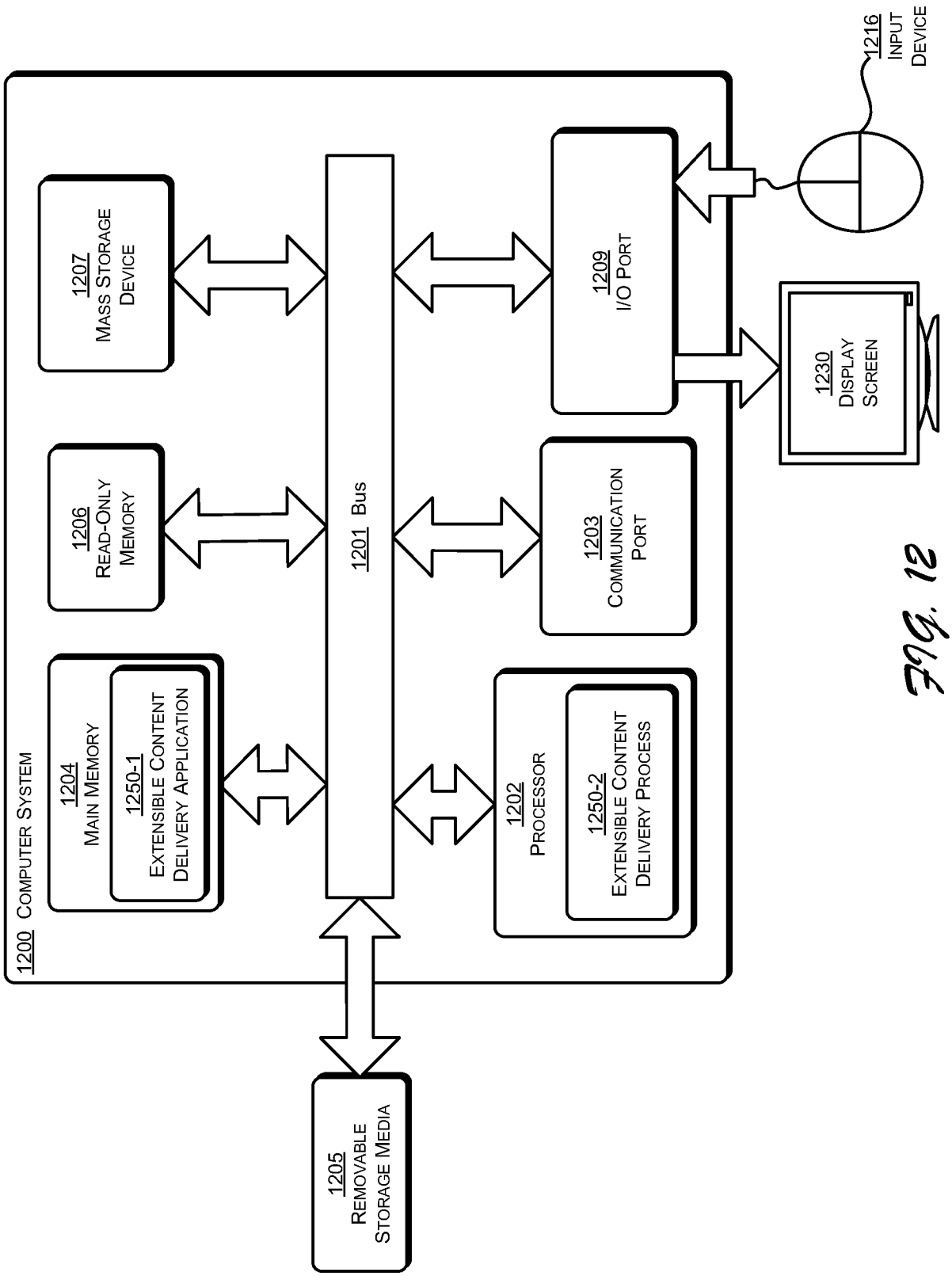
1200 COMPUTER SYSTEM
1201 Bus
1202 PROCESSOR
1203 COMMUNICATION PORT
1204 MAIN MEMORY
1205 REMOVABLE STORAGE MEDIA
1206 READ-ONLY MEMORY
1207 MASS STORAGE DEVICE
1209 I/O PORT
1216 INPUT DEVICE
1230 DISPLAY SCREEN
1250-1 EXTENSIBLE CONTENT DELIVERY APPLICATION
1250-2 EXTENSIBLE CONTENT DELIVERY PROCESS

Fig. 12

Doc Code: Oath
Document Description: Oath or declaration filed

PTO/SB/01 (04-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☒ Declaration Submitted With Initial Filing OR ☐ Declaration Submitted After Initial Filing (surcharge (37 CFR 1.16(f)) required)

Attorney Docket Number	0370-US-U1
First Named Inventor	Ted Middleton
COMPLETE IF KNOWN	
Application Number	
Filing Date	
Art Unit	
Examiner Name	

I hereby declare that: (1) Each inventor's residence, mailing address, and citizenship are as stated below next to their name; and (2) I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention titled:

Cache Server with Extensible Programming Framework

(Title of the Invention)

the application of which

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) _____ as United States Application Number or PCT International Application Number _____ and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.

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Claim of Foreign Priority Benefits

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application number(s) are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR:	☐ A petition has been filed for this unsigned inventor
Given Name (first and middle [if any])	Family Name or Surname
Ted	Middleton

Inventor's Signature		Date	7/7/2010
Residence: City	State	Country	Citizenship
MOORPARK	CA	USA	USA
Mailing Address			
4086 BENDING OAK CT.			
City	State	Zip	Country
MOORPARK	CA	93021	USA

☐ Additional inventors or a legal representative are being named on the _____ supplemental sheet(s) PTO/SB/02A or 02LR attached hereto

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Filer:	David Dewey Wier/Jonathan Siekmann
Attorney Docket Number:	0370-US-U1

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	330	330
Utility Search Fee	1111	1	540	540
Utility Examination Fee	1311	1	220	220
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1090**

Electronic Acknowledgement Receipt

EFS ID:	8017859
Application Number:	12836418
International Application Number:	
Confirmation Number:	2155
Title of Invention:	CACHE SERVER WITH EXTENSIBLE PROGRAMMING FRAMEWORK
First Named Inventor/Applicant Name:	Ted Middleton
Customer Number:	83579
Filer:	David Dewey Wier/Jonathan Siekmann
Filer Authorized By:	David Dewey Wier
Attorney Docket Number:	0370-US-U1
Receipt Date:	14-JUL-2010
Filing Date:	
Time Stamp:	18:17:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1090
RAM confirmation Number	6679
Deposit Account	505063
Authorized User	SIEKMANN,JONATHAN

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	New_Application_Transmittal_Sheet_cute.pdf	66597 2cc2a04306954ac24104677386bcb246ee24b9b7	no	1
Warnings:					
Information:					
2		0370_US_U1_Specification.pdf	181753 f3314117a782654c7e86aada1602d5eb63a5c434	yes	34

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	31
	Claims	32	33
	Abstract	34	34

Warnings:					
Information:					
3	Drawings-only black and white line drawings	0370_US_U1_Figures.pdf	83139 7cbfd51d97afbb0e4d32b4b276d3022831f56562	no	12
Warnings:					
Information:					
4	Oath or Declaration filed	0370_US_U1_Declaration_cute.pdf	159257 66c36e7d114f9b1f08ead288584e8d5f45c39dc8	no	3
Warnings:					
Information:					
5	Fee Worksheet (PTO-875)	fee-info.pdf	33233 a0de5311bb4061ff1cab68700fb2318829212d80	no	2
Warnings:					
Information:					
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PTO/SB/06 (10-07)
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PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number: **12/836,418**

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	330
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	540
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	220
TOTAL CLAIMS (37 CFR 1.16(i))	9	*	X 26=		OR	X 52=	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	*	X 110=			X 220=	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			195			390	
			TOTAL			TOTAL	1090

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDI-TIONAL FEE ($)		RATE ($)	ADDI-TIONAL FEE ($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N.A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

		(Column 1)		(Column 2)	(Column 3)			OR		
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDI-TIONAL FEE ($)		RATE ($)	ADDI-TIONAL FEE ($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T 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.

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

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