AO 120 (Rev. 08/10)

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

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

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

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	2/23/2022	District of Delaware

PLAINTIFF	DEFENDANT
VideoLabs, Inc. and VL Collective IP LLC	Netflix Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US 8,139,878 B2	3/20/2012	VideoLabs, Inc.
2	US 7,440,559 B2	10/21/2018	VL Collective IP LLC
3	US 7,233,790 B2	6/19/2007	VideoLabs, Inc.
4			
5			

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
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In the above---entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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

Netflix v. VideoLabs
IPR2023-00628
Netflix. Ex. 1004

AO 120 (Rev. 08/10)

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

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

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	10/13/2021	District of Delaware

PLAINTIFF	DEFENDANT
STARZ ENTERTAINMENT, LLC	VL COLLECTIVE IP, LLC and VIDEOLABS, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,233,790	6/19/2007	VIDEOLABS, INC.
2	7,440,559	10/21/2008	VL COLLECTIVE IP, LLC
3	8,605,794	12/10/2013	VL COLLECTIVE IP, LLC
4	RE43,113	1/17/2012	VIDEOLABS, INC.
5			

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
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DECISION/JUDGEMENT

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Copy 2---Upon filing document adding patent(s), mail this copy to Director Copy 4---Case file copy

AO 120 (Rev. 2/99)

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

In Compliance with 35 § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of California on the following X Patents or ☐ Trademarks:

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
CV 13-04134 KAW	09/06/2013	Northern District of California, 1301 Clay Street, RM 400S, Oakland, CA 94612

PLAINTIFF	DEFENDANT
UNWIRED PLANET	APPLE INC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,317,594		See attached Complaint transferred from USDC Nevada
2	6,317,831		
3	6,321,092		
4	6,532,446		
5	6,647,260		

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 6,813,491		See attached Complaint transferred from USDC Nevada
2 7,020,685		
3 7,233,790		
4 RE43,113		
5 7,522,927		

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

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Richard W. Wieking		

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

designed the Accused Products and Services such that they would infringe one or more claims of the Accused Patents if made, used, sold, offered for sale or imported into the United States. The accused technology has no substantial use that does not infringe one or more claims of the Asserted Patents.

30. Apple's acts of direct, contributory and induced infringement have caused damage to Unwired Planet, and Unwired Planet is entitled to recover compensatory damages sustained as a result of Apple's wrongful acts. Unless enjoined by this Court, Apple will continue to infringe the Asserted Patents, continuing to damage Unwired Planet and causing irreparable harm.

31. Apple has known about each of the Asserted Patents. Moreover, Apple lacks justifiable belief that there is no infringement, or that the infringed claims are invalid, and has acted with objective recklessness in its infringing activity. Apple's infringement is therefore willful, and Unwired Planet is entitled to an award of exemplary damages, attorneys' fees, and costs in bringing this action.

DEMAND FOR JURY TRIAL

Unwired Planet hereby demands a jury for all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Unwired Planet respectfully requests that this Court enter judgment in their favor and grant the following relief:

A. Adjudge that Apple infringes the Asserted Patents;

B. Adjudge that Apple's infringement of the Asserted Patents was willful, and that Apple's continued infringement of the Asserted Patents is willful;

C. Award Unwired Planet damages in an amount adequate to compensate Unwired Planet for Apple's infringement of the Asserted Patents, but in no event less than a reasonable royalty under 35 U.S.C. § 284;

D. Award enhanced damages by reason of Apple's willful infringement of the Asserted Patents, pursuant to 35 U.S.C. § 284;

E. Award Unwired Planet pre-judgment and post-judgment interest to the full extent allowed under the law, as well as its costs;

F. Enter an order finding that this is an exceptional case and awarding Unwired Planet its reasonable attorneys' fees pursuant to 35 U.S.C. § 285;

G. Enter an injunction enjoining Apple, and all others in active concert with Apple, from further infringement of the Asserted Patents;

H. Award an accounting for damages;

I. Award a future compulsory royalty in the event full injunctive relief is not awarded as requested; and

J. Award such other relief as the Court may deem appropriate and just under the circumstances.

Dated: May 10, 2013

Respectfully submitted,

/s/ Michael D. Rounds

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ATTORNEYS FOR PLAINTIFF UNWIRED PLANET LLC.

Plaintiff Unwired Planet LLC files this First Amended Complaint for Patent Infringement against Apple Inc. (Apple), and alleges as follows:

JURISDICTION

1. This is an action arising under the patent laws of the United States, 35 U.S.C. § 101 *et seq.* This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

VENUE

2. This Court has personal jurisdiction over the Defendant Apple. Apple has conducted and does conduct business within the State of Nevada. Apple, directly or through subsidiaries or intermediaries (including distributors, retailers, and others), ships, distributes, offers for sale, sells, and advertises (including the provision of an interactive web page) its products and/or services in the United States, the State of Nevada, and the District of Nevada. Apple, directly and through subsidiaries or intermediaries (including distributors, retailers, and others), has purposefully and voluntarily placed one or more of its infringing products and/or services, as described below, into the stream of commerce with the expectation that they will be purchased and/or used by consumers in the District of Nevada. These infringing products and/or services have been and continue to be purchased and/or used by consumers in the District of Nevada. Apple has committed acts of patent infringement within the State and District of Nevada.

3. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b), (c) and (d) and 1400(b). A substantial part of the events giving rise to Unwired Planet's claims occurred in the District of Nevada and Apple is subject to personal jurisdiction in the district.

PARTIES

4. Plaintiff Unwired Planet LLC is a Nevada entity having a principal place of business at 226 California Ave., Reno, NV 89509. "Unwired Planet" refers to Plaintiff and its predecessors in interest referred to herein for the patents-in-suit.

5. Unwired Planet has a long history of innovative technical contributions, as set forth below, including the patents-at-issue in this lawsuit.

6. Defendant Apple is a corporation organized under the laws of California with its principal place of business at 1 Infinite Loop, Cupertino, California 95014-2083.

7. Apple makes, uses, imports into the United States, sells and/or offers for sale in the United States various systems and/or services, servers, and mobile devices, including within this District. Apple can be served with process by serving its registered agent in Nevada, The Corporation Trust Company of Nevada at 311 S. Division St., Carson City, NV 89703.

BACKGROUND

8. Unwired Planet, founded in 1994, is widely regarded as a pioneer of the mobile internet. Unwired Planet invented many of the fundamental technologies that allowed mobile devices to connect to the internet in meaningful ways. For example, Unwired Planet was instrumental in developing the Wireless Application Protocol (WAP), which was the first widely-used standard that allowed mobile devices such as cellular phones to connect to the internet.

9. Unwired Planet was founded with the vision of bringing the "internet-in-your-pocket" to the world. But, at the time of the inventions at issue here, most technology firms were not interested. While Unwired Planet saw the need for applications and environments that could leverage emerging devices and increasing bandwidth, other technology firms were too focused on their old way of doing business. As a result, Unwired Planet was the first to put an internet browser into a phone, signing a deal with AT&T in 1996 through its predecessor company, Libris.

10. In 1997, Unwired Planet began pushing for a worldwide standard for mobile internet access by teaming up with some of the leading global handset manufacturers to found the WAP Forum. The purpose of the WAP Forum was to develop a standard worldwide wireless internet technology so that content providers could use existing content when creating mobile services. The WAP Forum was a resounding success, and by 1999, over 150 wireless companies were integrating the WAP standard into their products, covering approximately 95% of the world market for cellular handsets. By 2001 the WAP Forum had grown to more than 500 members.

11. Unwired Planet issued an initial public stock offering in 1999, changing its name to Phone.com to reflect the company's emphasis on providing internet to wireless devices through

its browser software and developer tools. These products included Up.Mail (which delivered e-mail to wireless telephones), Up.Organizer (a personal information management application), Up.Web (which allowed subscribers to manage and configure the other programs from their PCs), Up.Browser (a wireless phone browser), and Up.Smart (a PDA software application for wireless phones), among others. By August 1999, 31 network operators across the globe had licensed Phone.com's software. Phone.com flourished, providing its access software to companies around the globe. USA Today called Phone.com "the linchpin for the wireless internet" in a July 2000 article, stating that Phone.com's software touched approximately 80 percent of Web-enabled phones at the time. Bloomberg named Alain Rossmann one of the founders of Unwired Planet, among the "Top Entrepreneurs of 1999."

12. In 2000, Phone.com merged with Software.com to form Openwave Systems Inc., the predecessor to the current-day Unwired Planet, in a $6.4 billion merger. Openwave continued to grow and innovate. By mid-2001, about 97 percent of internet-ready mobile phones in the United States and approximately 75 percent overseas used an Openwave browser. By July 2001 Openwave had increased in size to approximately 2,200 employees worldwide, and the company earned revenues of over $465 million for fiscal year 2001.

13. Through its innovation and technological leadership, Openwave was awarded a sizeable portfolio of over 200 patents. Many of these patents disclose and protect the foundational aspects of today's most widely-used mobile technologies, such as mobile internet, location-based services, and e-commerce applications.

14. Unfortunately, merely having patents did not protect Openwave from infringing competition. As Openwave's revenues and market share fell, it was forced to downsize its own employees. With the onslaught of infringing competition having forced Openwave out of the market it created, in April 2012 Openwave sold its product businesses, but retained the patents it had been awarded. After selling off its product businesses, Openwave changed its name back to Unwired Planet, Inc., Unwired Planet Inc. is the parent of, and the predecessor in interest of, Plaintiff Unwired Planet, LLC. Unwired Planet retained its patents, representing almost two decades of investment, allowing the company to focus its efforts on licensing its fundamental

patent portfolio to the companies whose infringement put it out of the software and service businesses.

THE PATENTS

15. United States Letters Patent No. 6,317,594 ("the '594 Patent"), entitled "System and Method for Providing Data to a Wireless Device upon Detection of Activity of the Device on a Wireless Network," was duly and legally issued to inventors William E. Gossman and Peter J. Hartmaier on Nov. 13, 2001. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '594 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '594 Patent is attached hereto as Exhibit A and incorporated herein by reference.

16. United States Letters Patent No. 6,317,831 ("the '831 Patent"), entitled "Method and Apparatus for Establishing a Secure Connection over a One-way Data Path," was duly and legally issued to inventor Peter F. King on Nov. 13, 2001. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '831 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '831 Patent is attached hereto as Exhibit B and incorporated herein by reference.

17. United States Letters Patent No. 6,321,092 ("the '092 Patent"), entitled "Multiple Input Data Management for Wireless Location-based Applications," was duly and legally issued to inventors James Fitch, David L. Hose, and Michael McKnight on Nov. 20, 2001. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '092 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '092 Patent is attached hereto as Exhibit C and incorporated herein by reference.

18. United States Letters Patent No. 6,532,446 ("the '446 Patent"), entitled "Server Based Speech Recognition User Interface for Wireless Devices," was duly and legally issued to inventor Peter F. King on Mar. 11, 2003. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '446 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '446 Patent is attached hereto as Exhibit D and incorporated herein by reference.

19. United States Letters Patent No. 6,647,260 ("the '260 Patent"), entitled "Method and System Facilitating Web Based Provisioning of Two-Way Mobile Communications Devices," was duly and legally issued to inventors Steve Dusse, Peter F. King, Bruce V. Schwartz, and Bruce K. Martin, Jr. on November 11, 2003. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '260 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '260 Patent is attached hereto as Exhibit E and incorporated herein by reference.

20. United States Letters Patent No. 6,813,491 ("the '491 Patent"), entitled "Method and Apparatus for Adapting Settings of Wireless Communication Devices in Accordance with User Proximity," was duly and legally issued to inventor Aldan Martin McKinney on Nov. 2, 2004. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '491 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '491 Patent is attached hereto as Exhibit F and incorporated herein by reference.

21. United States Letters Patent No. 7,020,685 ("the '685 Patent"), entitled "Method and Apparatus for Providing Internet Content to SMS-based Wireless Devices," was duly and legally issued to inventors David A. Chen and Piyush Patel on Mar. 28, 2006. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '685 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '685 Patent is attached hereto as Exhibit G and incorporated herein by reference.

22. United States Letters Patent No. 7,233,790 ("the '790 Patent"), entitled "Device Capability based Discovery, Packaging and Provisioning of Content for Wireless Mobile Devices," was duly and legally issued to inventors Rikard M. Kjellberg, Sheng Liang, Tomas G. Lund, William Chan, Ramakrishna Chinta, and Xinbi Chen on Jun. 19, 2007. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '790 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '790 Patent is attached hereto as Exhibit H and incorporated herein by reference.

23. United States Reissued Patent No. US RE43,113 E ("the '113 Patent"), entitled "Domain-based management of distribution of digital content from multiple suppliers to multiple

wireless services subscribers," was duly and legally issued to inventors Rikard M. Kjellberg, Sheng Liang, Tomas G. Lund, and William Chan. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '113 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '113 Patent is attached hereto as Exhibit I and incorporated herein by reference.

24. United States Letters Patent No. 7,522,927 ("the '927 Patent"), entitled "Interface for Wireless Location Information," was duly and legally issued to inventors James Fitch, David Hose, and Michael McKnight on Apr. 21, 2009. Plaintiff Unwired Planet owns by assignment the entire right, title, and interest in the '927 Patent, and is entitled to sue for past and future infringement. A true and correct copy of the '927 Patent is attached hereto as Exhibit J and incorporated herein by reference.

25. The '594, '831, '092, '446, '260, '491, '685, '790, '113, and '927 Patents (collectively, the Asserted Patents) cover inventions relating to wireless devices, management of wireless devices, management of messages and data for wireless devices, location services, and speech recognition.

CLAIM FOR PATENT INFRINGEMENT

26. Plaintiff Unwired Planet repeats and realleges the allegations in paragraphs 1–25 as though fully set forth herein.

27. Apple directly infringes one or more claims of each of the Asserted Patents under 35 U.S.C. § 271. Apple is making, using, selling, offering for sale, exporting, and/or importing Accused Products and Services which infringe one or more claims of each of the Asserted Patents, as set forth in the table below. Further discovery may reveal additional infringing products and/or models.

Asserted Patent	Accused Products and Services
6,317,594	Mobile App Systems and/or Services (including Apple App Store, Apps, Apple Push Notification Service (APNS), iAds, and Location Services including Safari web browser, Apple Maps, Local Search), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
6,317,831	Mobile App Systems and/or Services (including Apple App Store, Apps, and APNS), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
6,321,092	Mobile App Systems and/or Services (including iAds, and Location Services including Safari web browser, Apple Maps, Local Search), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
6,532,446	Mobile App Systems and/or Services (including Siri), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
6,647,260	Mobile App Systems and/or Services (including iTunes, Apple App Store, and Apps), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
6,813,491	Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
7,020,685	Mobile App Systems and/or Services (including Siri), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
7,233,790	Mobile App Systems and/or Services (including iTunes, Apple App Store, and Apps), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)

Asserted Patent	Accused Products and Services
RE43,113	Mobile App Systems and/or Services (including iTunes, Apple App Store, and Apps), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)
7,522,927	Mobile App Systems and/or Services (including iAds, Location Services including Safari web browser, Apple Maps, Local Search, Find My iPhone, Find My iPad, and Find My Friends), Servers (including servers supporting the aforementioned Systems and/or Services), and Mobile Devices (including mobile phones, tablets, and music players with the iOS operating system including iPhones, iPads, and iPods)

28. Apple indirectly infringes one or more claims of each of the Asserted Patents under 35 U.S.C. § 271(b). Apple has induced and continues to induce its customers and/or users of the Accused Products and services above to infringe one or more claims of the Asserted Patents above. Apple specifically intends for its customers and/or users of the Accused Products and Services above to infringe one or more claims of the Asserted Patents above in the United States because on information and belief, Apple knew of the Asserted Patents and designed the Accused Products and Services such that they would each infringe one or more claims of each of the Asserted Patents if made, used, sold, offered for sale or imported into the United States, and Apple knows that the customers and/or users of the Accused Products and Services will directly infringe one or more claims of the Asserted Patents when those customers and/or users make, use, sell, offer to sell, and/or import into the United States, the Accused Products and Services. In addition, Apple has failed to redesign the Accused Products and Services to cease infringement.

29. Apple indirectly infringes one or more claims of the Asserted Patents by contributory infringement under 35 U.S.C. § 271(c). Apple has contributed to and continues to contribute to the direct infringement of one or more claims of the Asserted Patents by customers and/or users of the Accused Products and Services. Upon information and belief, Apple knew of the Asserted Patents. Apple has sold, offered to sell, and/or imported in and into the United States the Accused Products, which Apple has known to be especially made or adapted for use in infringing the Asserted Patents and which have no substantial non-infringing uses. Apple

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

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:12-cv-505	9/19/2012	District of Nevada

PLAINTIFF	DEFENDANT
UNWIRED PLANET, LLC	APPLE, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,317,594	11/13/2001	SEE COMPLAINT
2	6,317,831	11/13/2001	SEE COMPLAINT
3	6,321,092	11/20/2001	SEE COMPLAINT
4	6,532,446	3/11/2003	SEE COMPLAINT
5	6,647,260	11/11/2003	SEE COMPLAINT

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

DATE INCLUDED	INCLUDED BY			
9/19/2012	☐ Amendment	☐ Answer	☐ Cross Bill	☑ Other Pleading

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,813,491	11/2/2004	SEE COMPLAINT
2	7,020,685	3/28/2006	SEE COMPLAINT
3	7,233,790	6/19/2007	SEE COMPLAINT
4	7,299,033		SEE COMPLAINT
5	7,522,927	4/21/2009	SEE COMPLAINT

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

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Lance S. Wilson	/s/ H. Jordan	9/20/2012

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/600,746	06/19/2003	Rikard M. Kjellberg	022395-018810US

CONFIRMATION NO. 5994

POWER OF ATTORNEY NOTICE

26529
BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
1279 OAKMEAD PARKWAY
SUNNYVALE, CA 94085-4040

OC000000028488876

Date Mailed: 02/28/2008

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/15/2008.

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

/hchristian/

Office of Initial Patent Examination (571) 272-4000 or 1-800-PTO-9199

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
10/600,746	06/19/2003	Rikard M. Kjellberg	022395-018810US

CONFIRMATION NO. 5994

46670
TOWNSEND AND TOWNSEND AND CREW LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

POA ACCEPTANCE LETTER

OC000000028488975

Date Mailed: 02/28/2008

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/15/2008.

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.

/hchristian/

Office of Initial Patent Examination (571) 272-4000 or 1-800-PTO-9199

PTO/SB/80 (01-06)

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: **46670**

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: **46670**

OR

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

Assignee Name and Address:

Openwave Systems Inc.
2100 Seaport Boulevard, Office #311B
Reedwood City, CA 94063
United States of America

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		Date	2/6/08
Name	Jeffrey Kang-Chien Li	Telephone	650-480-5320
Title	Vice President and General Counsel		

61277363 v1

Attorney Docket No. 022395-018810US

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Rikard M. Kjellberg, et al

Application No./Patent No.: 7,233,790 Filed/Issue Date: June 19, 2007

Entitled: DEVICE AND CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Openwave Systems Inc., a Corporation
(Name of Assignee) (Type of Assignee: corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest.
(The extent (by percentage) of its ownership interest is _____%)

in 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 013985, Frame 0220, or a true copy of the original assignment 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.

☐ 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.

/Alan D. Minsk/	February 14, 2008
Signature	Date
Alan D. Minsk, Reg. No. 35,956	(206) 467-9600
Printed or Typed Name	Telephone Number
Attorney of Record	
Title	

Electronic Acknowledgement Receipt

EFS ID:	2870031
Application Number:	10600746
International Application Number:	
Confirmation Number:	5994
Title of Invention:	DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES
First Named Inventor/Applicant Name:	Rikard M. Kjellberg
Customer Number:	26529
Filer:	Alan D. Minsk/Elyse Brownell
Filer Authorized By:	Alan D. Minsk
Attorney Docket Number:	022395-018810US
Receipt Date:	15-FEB-2008
Filing Date:	19-JUN-2003
Time Stamp:	17:33:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	022395_GenPOA.pdf	50806 8473f061ad35736986d3fa075a0b6e85ea99e80f	no	1

Warnings:	
Information:	

2	Assignee showing of ownership per 37 CFR 3.73(b).	373b.pdf	69662 4f3c93893044ab30b7445b260d484953 69e48fe8	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	120468

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

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

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

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,746	06/19/2007	7233790	3399P103	5994

26529 7590 05/30/2007

BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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

The Patent Term Adjustment is 753 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

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

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

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

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

Rikard M. Kjellberg, Santa Cruz, CA;
Sheng Liang, Cupertino, CA;
Tomas G. Lund, Menlo Park, CA;
William Chan, San Mateo, CA;
Ramakrishna Chinta, Sunnyvale, CA;
Xinbi Chen, Palo Alto, CA;

PART B - FEE(S) TRANSMITTAL

MAY 14 2007

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

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

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

26529 7590 03/16/2007

BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025

05/14/2007 HGUTEMA2 00000112 10600746

01 FC:1501 1400.00 OP
02 FC:1504 300.00 OP

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

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

Andreas Radke	(Depositor's name)
Andreas Radke	(Signature)
5-11-07	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,746	06/19/2003	Rikard M. Kjellberg	3399P103	5994

TITLE OF INVENTION: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$0	$1700	06/18/2007

EXAMINER	ART UNIT	CLASS-SUBCLASS
SMITH, CREIGHTON H	2614	455-419000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

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

1 Blakely Sokoloff Taylor & Zafman LLP
2
3

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

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

(A) NAME OF ASSIGNEE: Openwave Systems Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Redwood City, California

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

4a. The following fee(s) are submitted:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)
☒ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 02-2666 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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

Authorized Signature _____ Date May 11, 2007

Typed or printed name Jordan M. Becker Registration No. 39,602

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

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OIPE MP85
MAY 14 2007
PATENT & TRADEMARK OFFICE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	18

Application No.	10/600,746
Filing Date	June 19, 2003
First Named Inventor	Rikard M. Kjellberg
Art Unit	2614
Examiner Name	Smith, Creighton H.
Attorney Docket Number	3399P103

ENCLOSURES ***(check all that apply)***

- [X] Fee Transmittal Form
  - [X] Fee Attached
- [ ] Amendment / Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
  - [ ] PTO/SB/08
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Basic Filing Fee
  - [ ] Declaration/POA
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [X] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s)
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [X] Other Enclosure(s) *(please identify below):*

Payment of Issue Fee and Submission of Formal Drawings
Return Postcard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Jordan M. Becker, Reg. No. 39,602 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	May 11, 2007

CERTIFICATE OF MAILING/TRANSMISSION

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Typed or printed name	**Andreas Radke**		
Signature	Andreas Radke	Date	**May 11, 2007**

OIPE MAY 14 2007 PATENT & TRADEMARK OFFICE

Attorney Docket No.: 3399P103 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg et al.

Serial No.: 10/600,746

Filing Date: June 19, 2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Smith, Creighton H.

Group Art Unit: 2614

Confirmation No.: 5994

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Alexandria, VA 22313-1450

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May 11, 2007
(Date of Deposit)
Andreas Radke
(Printed name)
Andreas Radke 5-11-07
(Signature) (Date)

PAYMENT OF ISSUE FEE & SUBMISSION OF FORMAL DRAWINGS

Dear Sir:

In response to the Notice of Allowance mailed March 16, 2007, enclosed herewith for filing in the above-referenced patent application are fourteen (14) sheets of formal drawings.

Enclosed is a check in the amount of $1,700.00 for payment of the issue and publication fees.

If there is a deficiency in fees, please charge our Deposit Account No. 02-2666.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: May 11, 2007

Jordan M. Becker
Reg. No. 39,602

Customer No. 48102
12400 Wilshire Boulevard
Seventh Floor
Los Angeles, CA 90025-1030
(408) 720-8300

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MAY 14 2007
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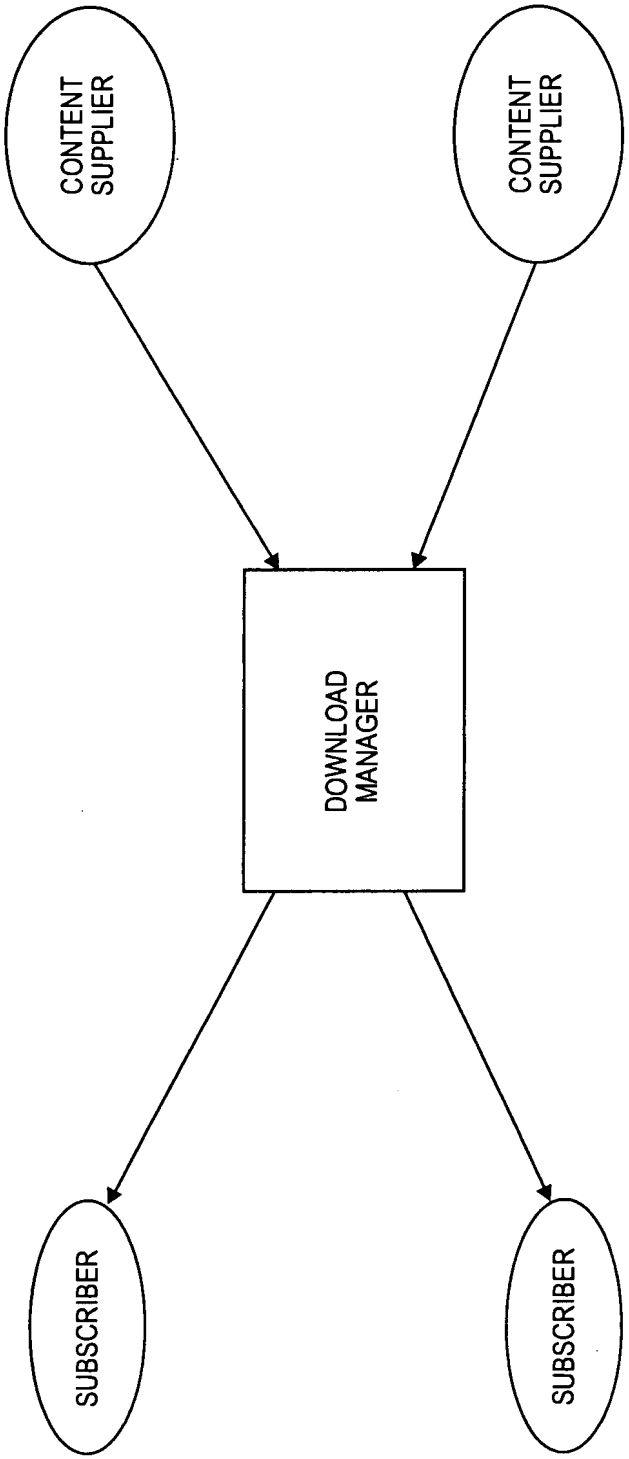


FIG. 1

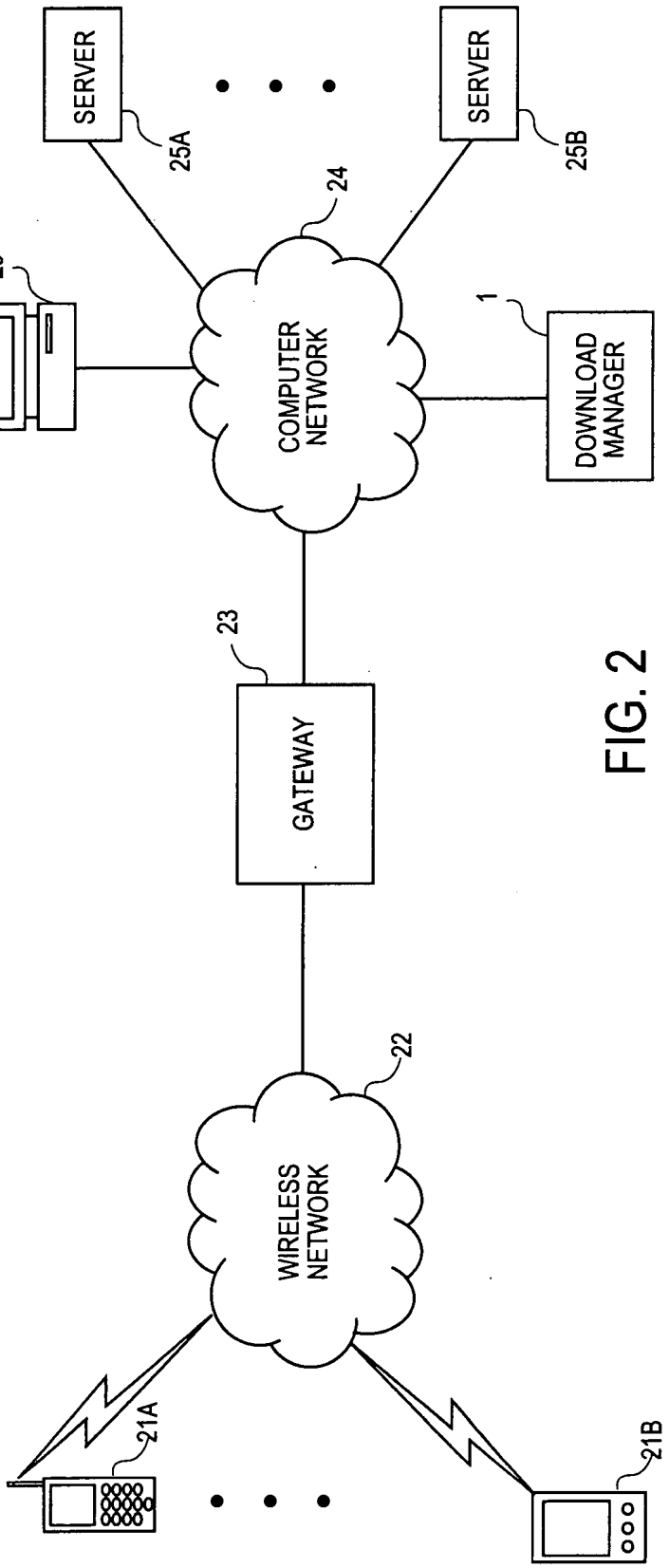

SERVER
25A
SERVER
25B
24
29
COMPUTER NETWORK
1
DOWNLOAD MANAGER
23
GATEWAY
22
WIRELESS NETWORK
21A
21B

FIG. 2

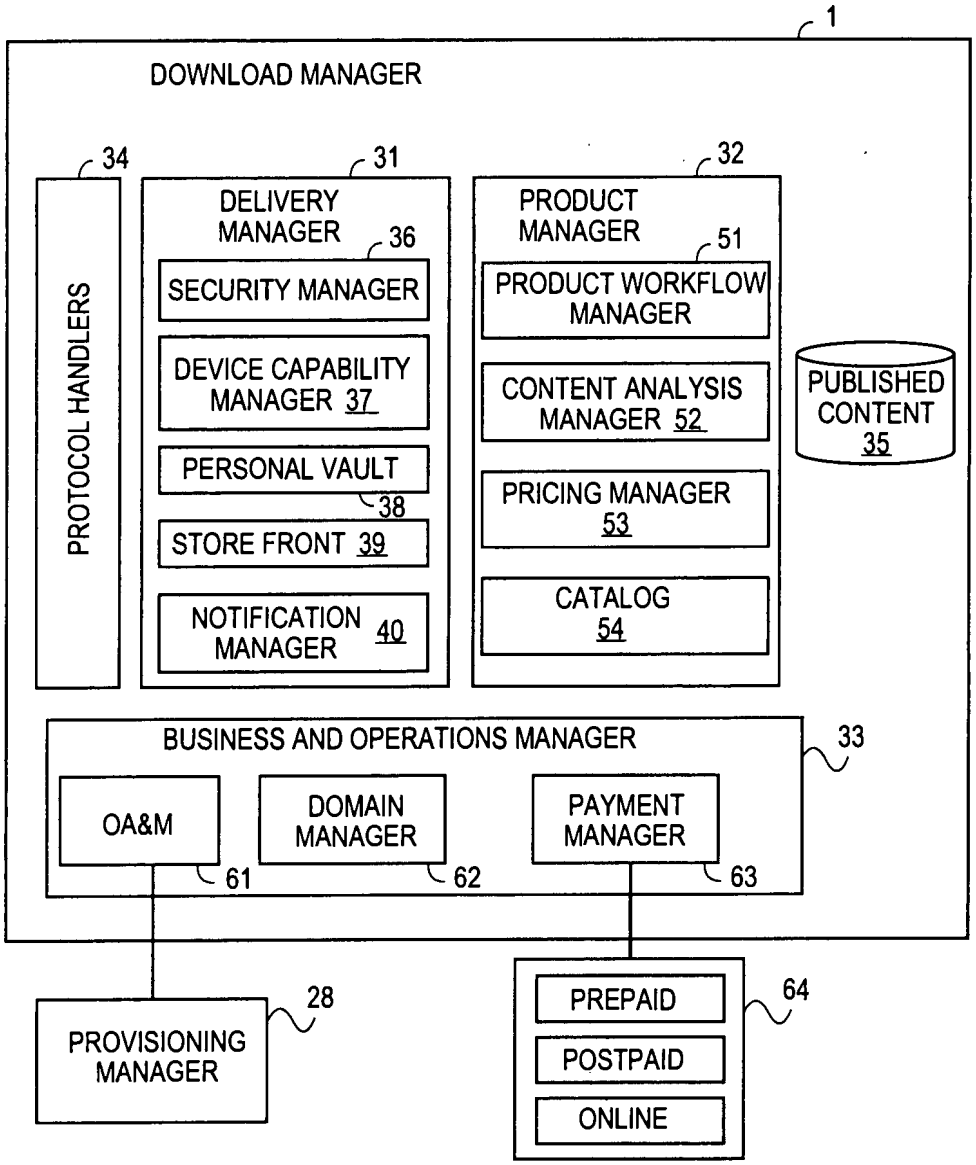

1
DOWNLOAD MANAGER
34
PROTOCOL HANDLERS
31
DELIVERY MANAGER
36
SECURITY MANAGER
DEVICE CAPABILITY MANAGER 37
PERSONAL VAULT
38
STORE FRONT 39
NOTIFICATION MANAGER 40
32
PRODUCT MANAGER
51
PRODUCT WORKFLOW MANAGER
CONTENT ANALYSIS MANAGER 52
PRICING MANAGER 53
CATALOG 54
PUBLISHED CONTENT 35
BUSINESS AND OPERATIONS MANAGER
33
OA&M
61
DOMAIN MANAGER
62
PAYMENT MANAGER
63
PROVISIONING MANAGER
28
PREPAID
POSTPAID
ONLINE
64

FIG. 3

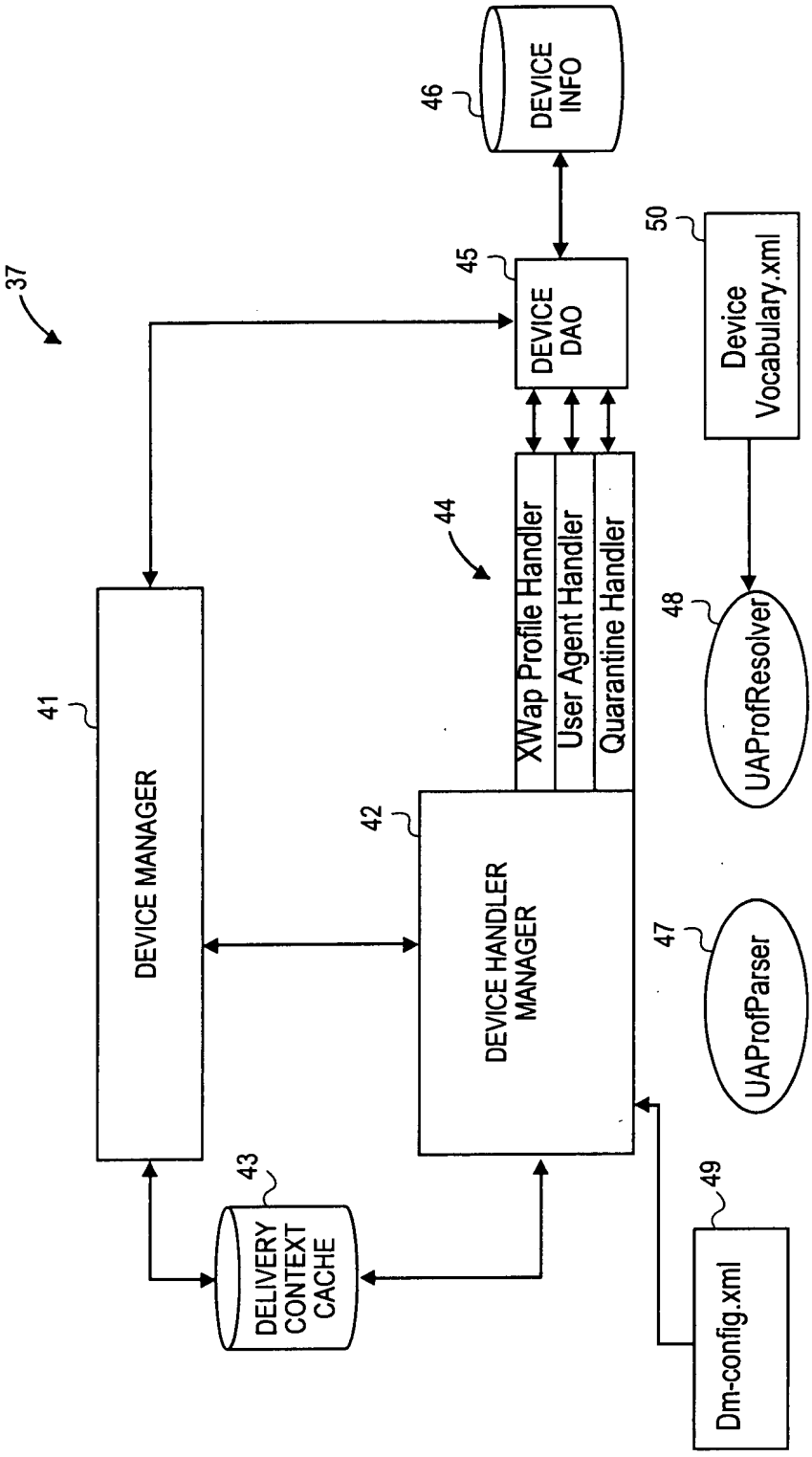

37
41
DEVICE MANAGER
42
DEVICE HANDLER MANAGER
43
DELIVERY CONTEXT CACHE
44
XWap Profile Handler
User Agent Handler
Quarantine Handler
45
DEVICE DAO
46
DEVICE INFO
47
UAProfParser
48
UAProfResolver
49
Dm-config.xml
50
Device Vocabulary.xml

FIG. 4

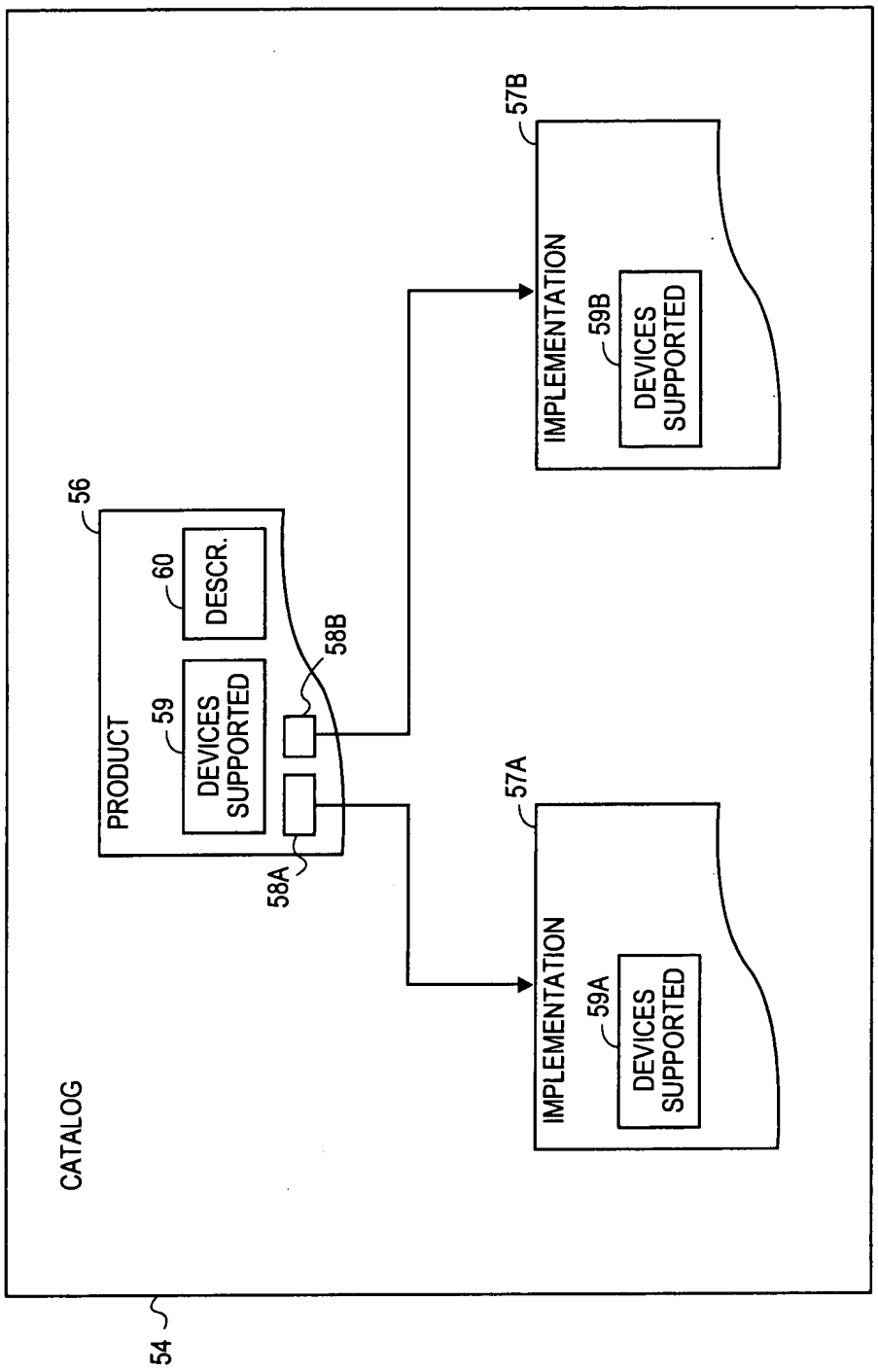

CATALOG
54
PRODUCT
56
DESCR.
60
DEVICES SUPPORTED
59
58A
58B
IMPLEMENTATION
57A
DEVICES SUPPORTED
59A
IMPLEMENTATION
57B
DEVICES SUPPORTED
59B

FIG. 5

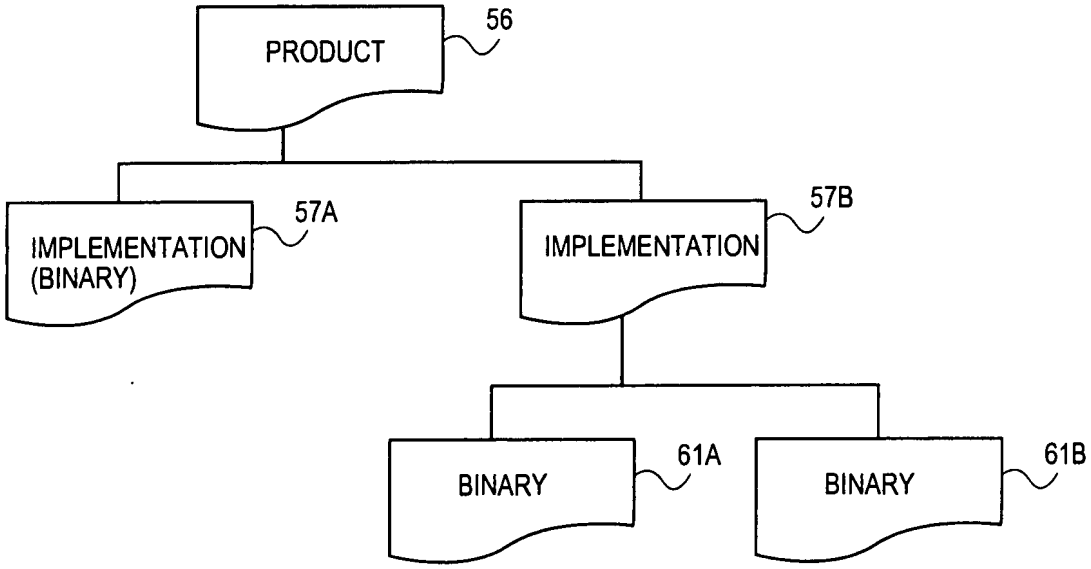

PRODUCT
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IMPLEMENTATION (BINARY)
57A
IMPLEMENTATION
57B
BINARY
61A
BINARY
61B

FIG. 6

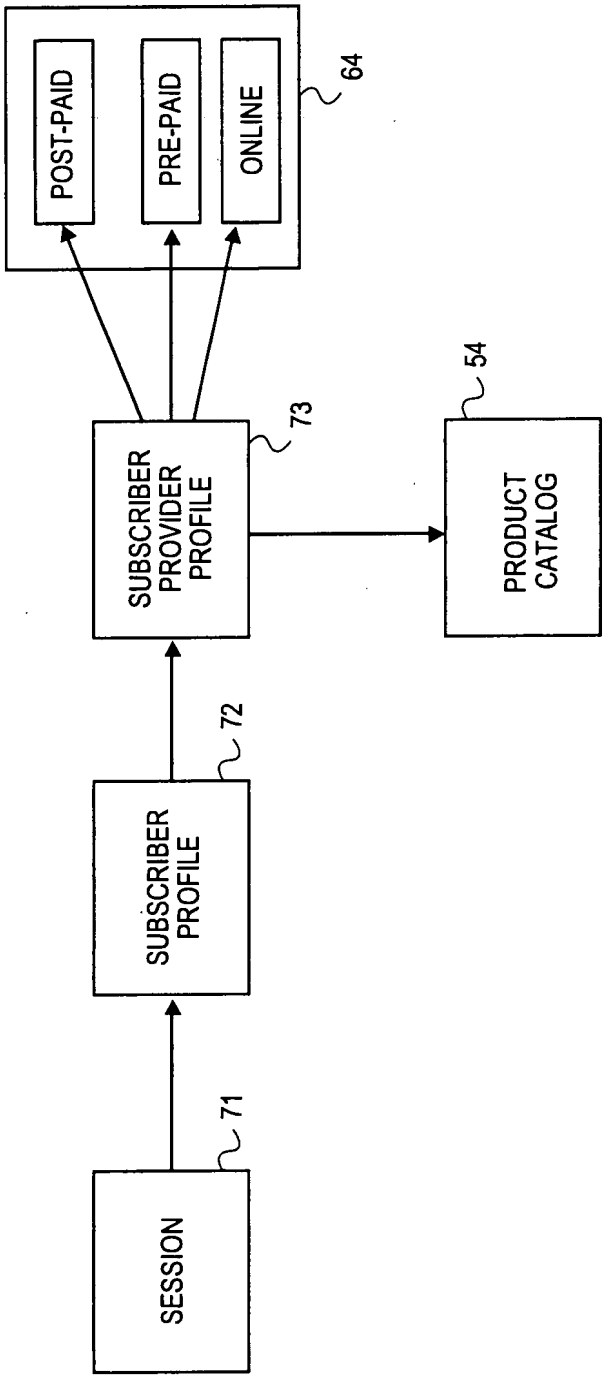

POST-PAID
PRE-PAID
ONLINE
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54
73
SUBSCRIBER PROVIDER PROFILE
PRODUCT CATALOG
72
SUBSCRIBER PROFILE
71
SESSION

FIG. 7

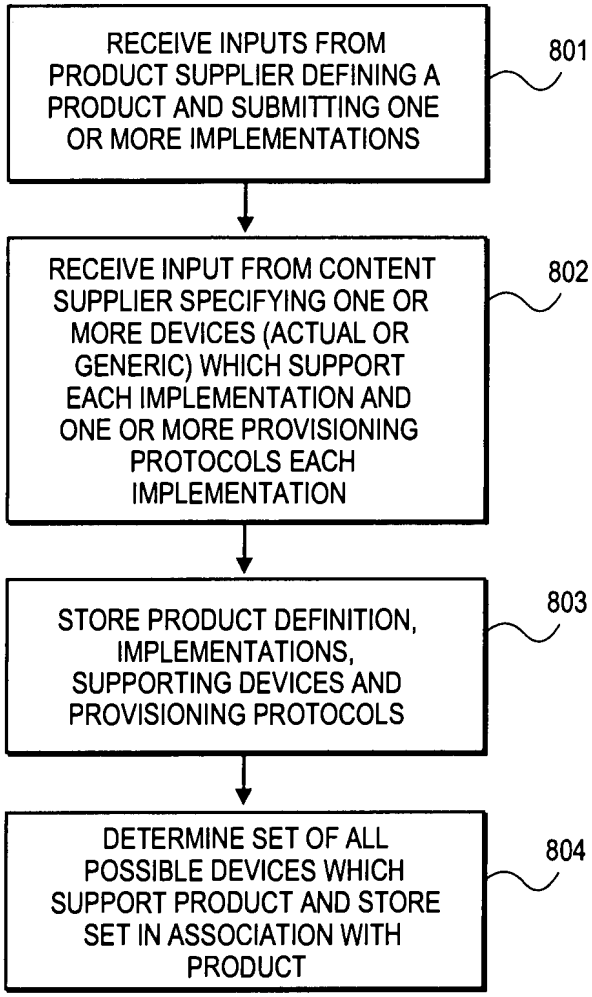

RECEIVE INPUTS FROM PRODUCT SUPPLIER DEFINING A PRODUCT AND SUBMITTING ONE OR MORE IMPLEMENTATIONS
801
RECEIVE INPUT FROM CONTENT SUPPLIER SPECIFYING ONE OR MORE DEVICES (ACTUAL OR GENERIC) WHICH SUPPORT EACH IMPLEMENTATION AND ONE OR MORE PROVISIONING PROTOCOLS EACH IMPLEMENTATION
802
STORE PRODUCT DEFINITION, IMPLEMENTATIONS, SUPPORTING DEVICES AND PROVISIONING PROTOCOLS
803
DETERMINE SET OF ALL POSSIBLE DEVICES WHICH SUPPORT PRODUCT AND STORE SET IN ASSOCIATION WITH PRODUCT
804

FIG. 8

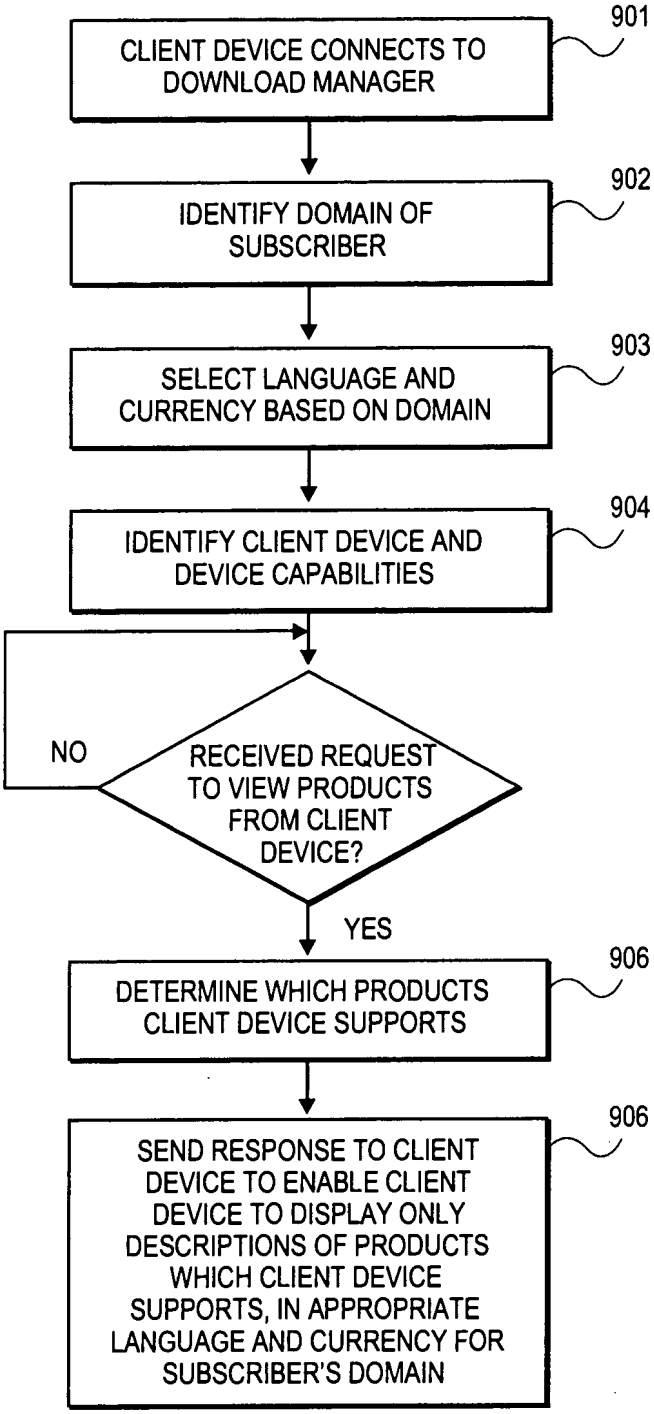

CLIENT DEVICE CONNECTS TO DOWNLOAD MANAGER
901
IDENTIFY DOMAIN OF SUBSCRIBER
902
SELECT LANGUAGE AND CURRENCY BASED ON DOMAIN
903
IDENTIFY CLIENT DEVICE AND DEVICE CAPABILITIES
904
RECEIVED REQUEST TO VIEW PRODUCTS FROM CLIENT DEVICE?
NO
YES
DETERMINE WHICH PRODUCTS CLIENT DEVICE SUPPORTS
906
SEND RESPONSE TO CLIENT DEVICE TO ENABLE CLIENT DEVICE TO DISPLAY ONLY DESCRIPTIONS OF PRODUCTS WHICH CLIENT DEVICE SUPPORTS, IN APPROPRIATE LANGUAGE AND CURRENCY FOR SUBSCRIBER'S DOMAIN
906

FIG. 9

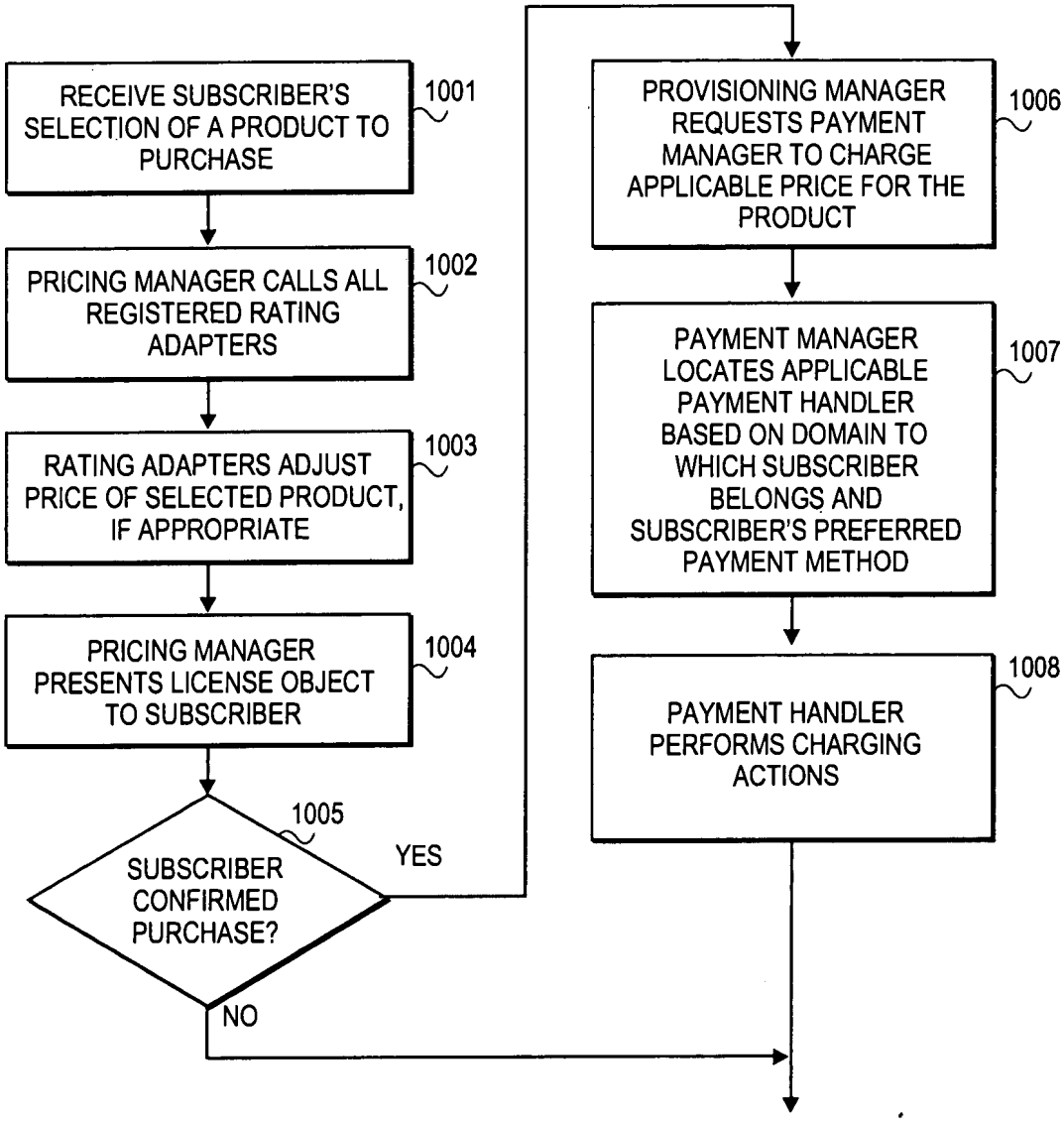

RECEIVE SUBSCRIBER'S SELECTION OF A PRODUCT TO PURCHASE
1001
PRICING MANAGER CALLS ALL REGISTERED RATING ADAPTERS
1002
RATING ADAPTERS ADJUST PRICE OF SELECTED PRODUCT, IF APPROPRIATE
1003
PRICING MANAGER PRESENTS LICENSE OBJECT TO SUBSCRIBER
1004
SUBSCRIBER CONFIRMED PURCHASE?
1005
YES
NO
PROVISIONING MANAGER REQUESTS PAYMENT MANAGER TO CHARGE APPLICABLE PRICE FOR THE PRODUCT
1006
PAYMENT MANAGER LOCATES APPLICABLE PAYMENT HANDLER BASED ON DOMAIN TO WHICH SUBSCRIBER BELONGS AND SUBSCRIBER'S PREFERRED PAYMENT METHOD
1007
PAYMENT HANDLER PERFORMS CHARGING ACTIONS
1008

FIG. 10

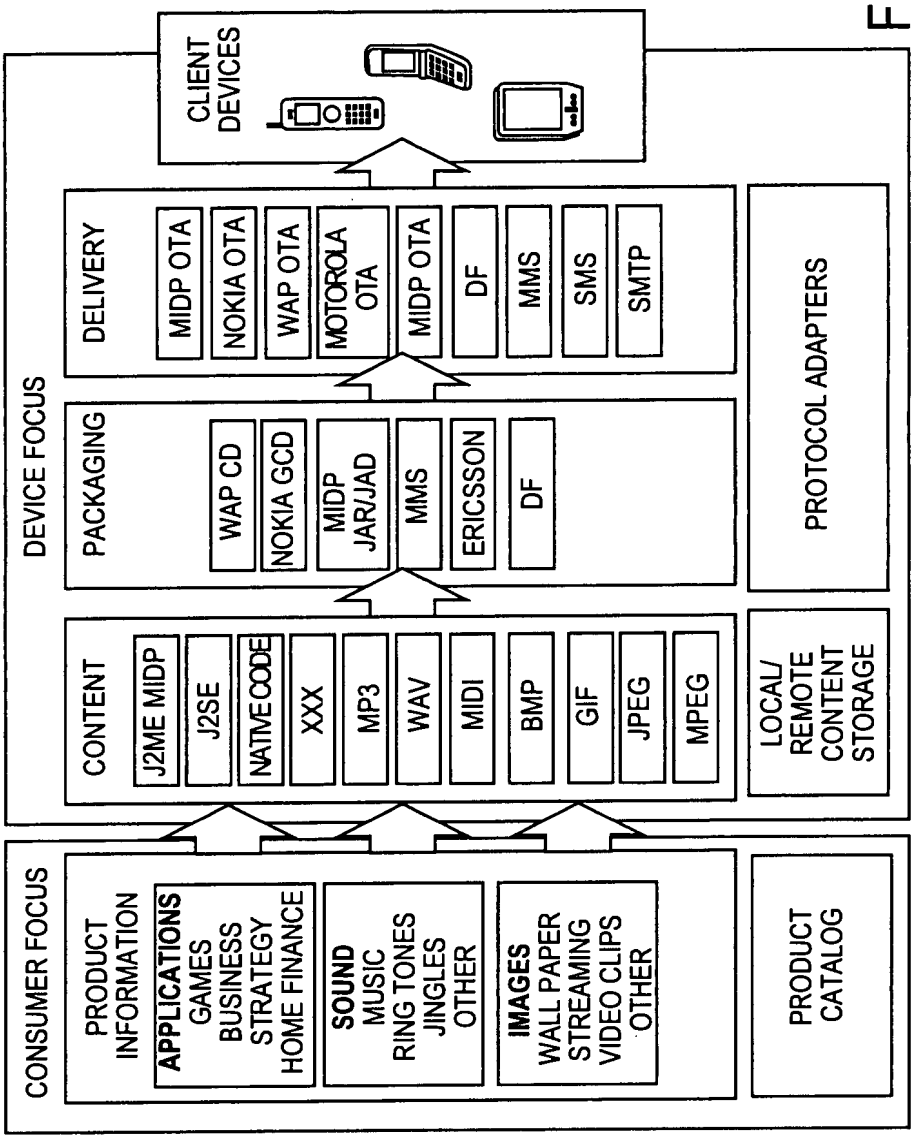

CONSUMER FOCUS
PRODUCT INFORMATION
APPLICATIONS
GAMES
BUSINESS
STRATEGY
HOME FINANCE
SOUND
MUSIC
RING TONES
JINGLES
OTHER
IMAGES
WALL PAPER
STREAMING
VIDEO CLIPS
OTHER
PRODUCT CATALOG
DEVICE FOCUS
CONTENT
J2ME MIDP
J2SE
NATIVECODE
XXX
MP3
WAV
MIDI
BMP
GIF
JPEG
MPEG
LOCAL/ REMOTE CONTENT STORAGE
PACKAGING
WAP CD
NOKIA GCD
MIDP JAR/JAD
MMS
ERICSSON
DF
PROTOCOL ADAPTERS
DELIVERY
MIDP OTA
NOKIA OTA
WAP OTA
MOTOROLA OTA
MIDP OTA
DF
MMS
SMS
SMTP
CLIENT DEVICES

FIG. 11

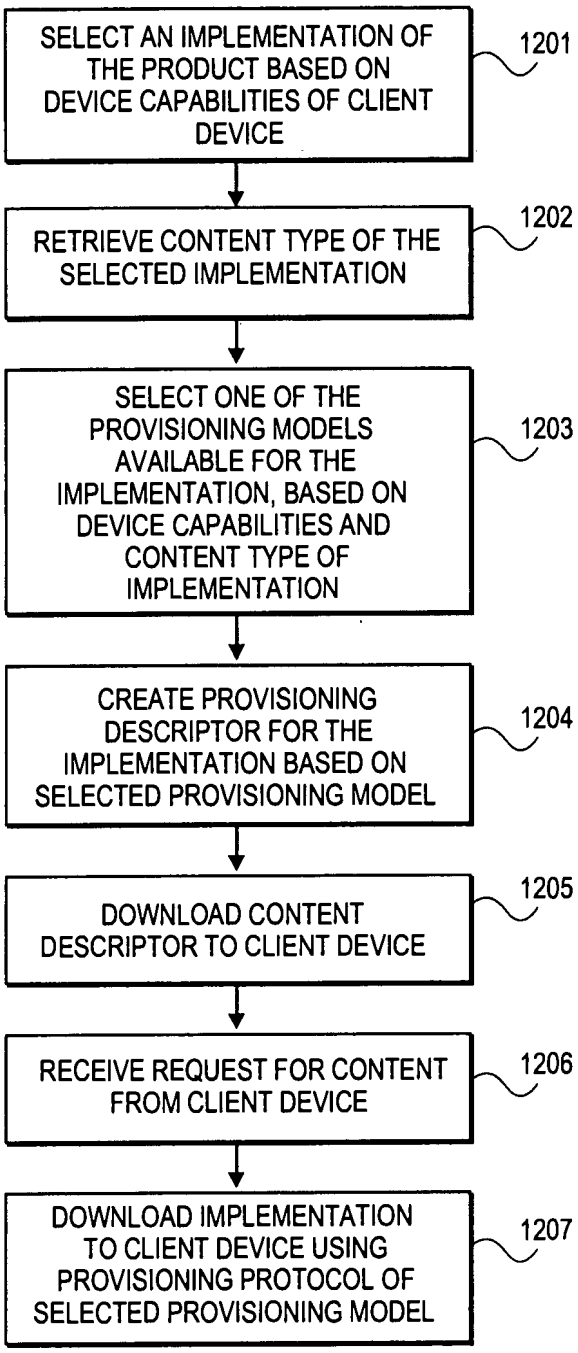

SELECT AN IMPLEMENTATION OF THE PRODUCT BASED ON DEVICE CAPABILITIES OF CLIENT DEVICE
1201
RETRIEVE CONTENT TYPE OF THE SELECTED IMPLEMENTATION
1202
SELECT ONE OF THE PROVISIONING MODELS AVAILABLE FOR THE IMPLEMENTATION, BASED ON DEVICE CAPABILITIES AND CONTENT TYPE OF IMPLEMENTATION
1203
CREATE PROVISIONING DESCRIPTOR FOR THE IMPLEMENTATION BASED ON SELECTED PROVISIONING MODEL
1204
DOWNLOAD CONTENT DESCRIPTOR TO CLIENT DEVICE
1205
RECEIVE REQUEST FOR CONTENT FROM CLIENT DEVICE
1206
DOWNLOAD IMPLEMENTATION TO CLIENT DEVICE USING PROVISIONING PROTOCOL OF SELECTED PROVISIONING MODEL
1207

FIG. 12

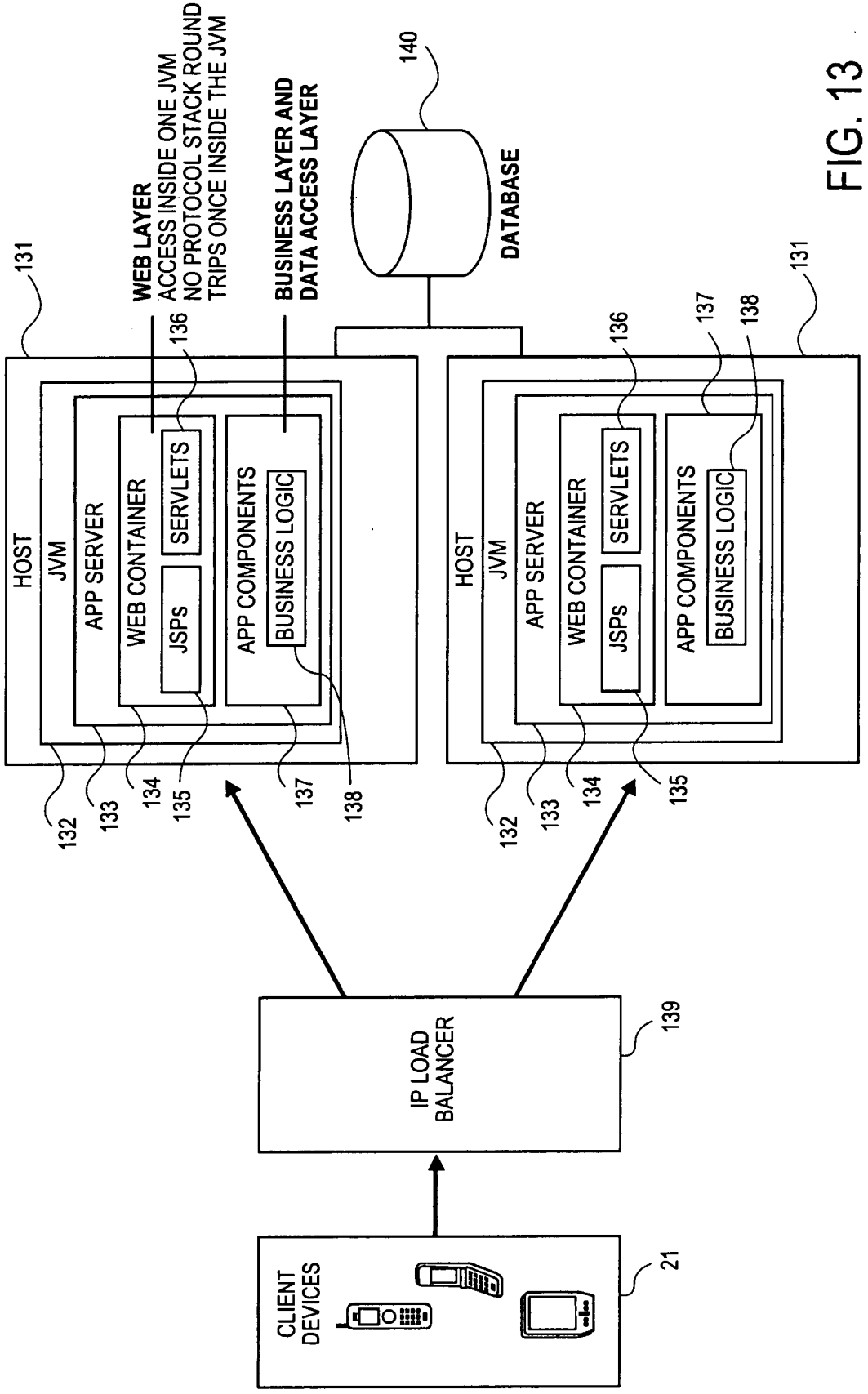

WEB LAYER
ACCESS INSIDE ONE JVM
NO PROTOCOL STACK ROUND
TRIPS ONCE INSIDE THE JVM
BUSINESS LAYER AND
DATA ACCESS LAYER
DATABASE
140
131
HOST
JVM
APP SERVER
WEB CONTAINER
SERVLETS
JSPs
APP COMPONENTS
BUSINESS LOGIC
136
137
138
132
133
134
135
IP LOAD
BALANCER
139
CLIENT
DEVICES
21

FIG. 13

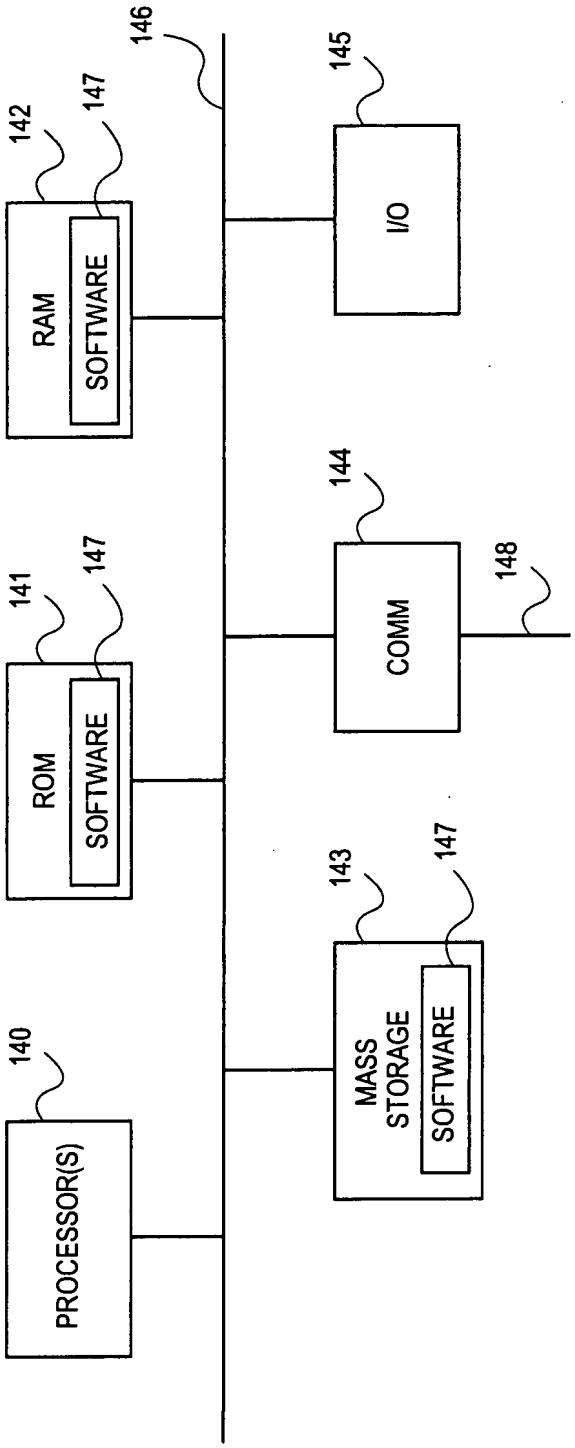

146
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RAM
SOFTWARE
I/O
144
141
147
148
ROM
SOFTWARE
COMM
143
147
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MASS
STORAGE
SOFTWARE
PROCESSOR(S)

FIG. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

26529 7590 03/16/2007

BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025

EXAMINER	
SMITH, CREIGHTON H	
ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 03/16/2007

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,746	06/19/2003	Rikard M. Kjellberg	3399P103	5994

TITLE OF INVENTION: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$0	$1700	06/18/2007

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

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

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

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

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

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

PTOL-85 (Rev. 07/06) Approved for use through 04/30/2007.

PART B - FEE(S) TRANSMITTAL

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

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

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

26529 7590 03/16/2007

BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,746	06/19/2003	Rikard M. Kjellberg	3399P103	5994

TITLE OF INVENTION: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$0	$1700	06/18/2007

EXAMINER	ART UNIT	CLASS-SUBCLASS
SMITH, CREIGHTON H	2614	455-419000

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

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

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

2. For printing on the patent front page, list

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

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

1 _____

2 _____

3 _____

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

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

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

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

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

☐ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

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

☐ A check is enclosed.

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

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

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

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

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

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

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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

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

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
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,746	06/19/2003	Rikard M. Kjellberg	3399P103	5994

26529 7590 03/16/2007

BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025

EXAMINER	
SMITH, CREIGHTON H	
ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 03/16/2007

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

The Patent Term Adjustment to date is 790 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 790 day(s).

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

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

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

PTOL-85 (Rev. 07/06) Approved for use through 04/30/2007.

Notice of Allowability	Application No.	Applicant(s)	
	10/600,746	KJELLBERG ET AL.	
	Examiner	Art Unit	
	Creighton H. Smith	2614	

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

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

1. ☒ This communication is responsive to *Applicant's amendment filed on 17 JAN '07*.

2. ☒ The allowed claim(s) is/are *5-18*.

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

   * Certified copies not received: _____.

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

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

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

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

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Creighton H Smith
Primary Examiner
Art Unit: 2614

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance: The prior art fails to disclose a method and system of accessing content on a wireless communication device, that specifically includes ***receiving and storing a plurality of different implementations of the items of content.*** Neither does the prior art teach maintaining a catalog describing the items of content. No obvious combination of references found would have taught one of ordinary skill in the art to make and use applicant's method and system as claimed.

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

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Creighton H. Smith whose telephone number is 571/272-7546. The examiner can normally be reached on M-F, alternate Fridays off.

Creighton H Smith
Primary Examiner
Art Unit 2614

***

Issue Classification	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/600,746	KJELLBERG ET AL.	
	Examiner	Art Unit	
	Creighton H. Smith	2614	

ISSUE CLASSIFICATION

ORIGINAL		CROSS REFERENCE(S)						
CLASS	SUBCLASS	CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
455	419	455	418	414.1				
INTERNATIONAL CLASSIFICATION								
H04F 3/00								
/								
/								
/								
/								

(Assistant Examiner) (Date)

(Legal Instruments Examiner) 2/20/07 (Date)

Creighton Smith

CREIGHTON SMITH
PRIMARY EXAMINER
(Primary Examiner) (Date)

Total Claims Allowed: 14

O.G. Print Claim(s)	O.G. Print Fig.
1	1

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

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		31		61		91		121		151		181
	2		32		62		92		122		152		182
	3		33		63		93		123		153		183
	4		34		64		94		124		154		184
1	5		35		65		95		125		155		185
2	6		36		66		96		126		156		186
3	7		37		67		97		127		157		187
4	8		38		68		98		128		158		188
5	9		39		69		99		129		159		189
6	10		40		70		100		130		160		190
7	11		41		71		101		131		161		191
8	12		42		72		102		132		162		192
9	13		43		73		103		133		163		193
10	14		44		74		104		134		164		194
11	15		45		75		105		135		165		195
12	16		46		76		106		136		166		196
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	19		49		79		109		139		169		199
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	26		56		86		116		146		176		206
	27		57		87		117		147		177		207
	28		58		88		118		148		178		208
	29		59		89		119		149		179		209
	30		60		90		120		150		180		210

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/600,746	KJELLBERG ET AL.
Examiner	**Art Unit**
Creighton H. Smith	2614

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date
Final	Original	3/07
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Claim		Date
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Claim		Date
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Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
10/600,746	KJELLBERG ET AL.	
Examiner	**Art Unit**	
Creighton H. Smith	2614	

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
Interference Search		02/07	CDT

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR

	Type	L #	Hits	Search Text	DBs	Time Stamp	Comments
1	BRS	L1	3628	content with (wireless or mobile or cell$4).clm.	US-PGPUB	2007/02/15 12:52	
2	BRS	L2	0	implmentation$1 with item$1 with different with (device$1 or teerminal$1) with 1.clm.	US-PGPUB	2007/02/15 12:54	

OIPE IAP17 JAN 22 2007 PATENT & TRADEMARK OFFICE

Attorney Docket No.: 3399P103 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg et al.

Application No.: 10/600,746

Filing Date: 6/19/2003

For: Device Capability Based Discovery, Packaging and Provisioning of Content for Wireless Mobile Devices

Examiner: Creighton H. Smith

Group Art Unit: 2614

Confirmation no.: 5994

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

January 17, 2007
(Date of Deposit)

Andreas Radke
(Printed name)

Andreas Radke 1-17-07
(Signature) (Date)

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO OFFICE ACTION

Dear Sir:

In response to the Office Action mailed on 10/20/2006, please enter the following amendment and consider the remarks below:

01/23/2007 CNEGA1 00000053 10600746
01 FC:1201 200.00 OP

OIPE IAP17 JAN 22 2007 PATENT & TRADEMARK OFFICE

FEE TRANSMITTAL FOR FY 2006

Effective on 10/01/2005. Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

TOTAL AMOUNT OF PAYMENT ($) 200

Complete if Known:

Application No.	10/600,746
Filing Date	June 19, 2003
First Named Inventor	Rikard M. Kjellberg
Examiner Name	Creighton H. Smith
Art Unit	2614
Attorney Docket No.	3399P109

_____ Applicant claims small entity status. See 37 CFR 1.27.

METHOD OF PAYMENT (check all that apply)

__X__ Check _____ Credit Card _____ Money Order ____ None _____ Other (please identify)

_____ Deposit Account

Deposit Account Number : 02-2666

Deposit Account Name: _____

__X__ The Director is Authorized to do the following with respect to the above-identified Deposit Account:

____ Charge fee(s) indicated below.

__X__ Charge any additional fee(s) or underpayment of fee(s) during the pendency of this application.

____ Charge fee(s) indicated below except for the filing fee

__X__ Credit any overpayments.

__X__ Any concurrent or future reply that requires a petition for extension of time should be treated as incorporating an appropriate petition for extension of time and all required fees should be charged.

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.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description		Fees Paid ($)
1011	300	2011	150	Utility application filing fee	1,000/500	_____
1111	500	2111	250	Utility search fee		_____
1311	200	2311	100	Utility examination fee		_____
1012	200	2012	100	Design application filing fee	430/215	_____
1112	100	2112	50	Design search fee		_____
1312	130	2312	65	Design examination fee		_____
1013	200	2013	100	Plant filing fee	660/330	_____
1113	300	2113	150	Plant search fee		_____
1313	160	2313	80	Plant examination fee		_____
1004	300	2004	150	Reissue filing fee	1,400/700	_____
1114	500	2114	250	Reissue search fee		_____
1314	600	2314	300	Reissue examination fee		_____
1005	200	2005	100	Provisional application filing fee		_____

SUBTOTAL (1) $_____

2. EXCESS CLAIM FEES

			Extra Claims		Fee from below		Fees Paid ($)
Total Claims	14	**– 20 or HP =**	0	**X**	50	=	0
HP = highest number of total claims paid for, if greater than 20							
Independent Claims	4	**– 3 or HP =**	1	**X**	200	=	200
HP = highest number of independent claims paid for, if greater than 3							
Multiple Dependent Claims						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Each claim over 20
1201	200	2201	100	Each independent claim over 3
1203	360	2203	180	Multiple dependent claims, if not paid
1204	200	2204	100	Reissue: each claim over 20 and more than in the original patent
1205	50	2205	25	Reissue: each independent claim more than in the original patent

SUBTOTAL (2) $ 200

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 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).

Total Sheets		Extra Sheets		Number of each add'l 50 or fraction thereof		Fee from below		Fees paid ($)
	– 100 =		/ 50 =	(round up to whole number)	X			

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description: **Application size fee for each additional group of 50 sheets beyond initial 100 sheets** (count spec & drawings except sequences & program listings):
1081	250	2081	125	Utility
1082	250	2082	125	Design
1083	250	2083	125	Plant
1084	250	2084	125	Reissue

SUBTOTAL (3) $

FEE CALCULATION (continued)

4. OTHER FEE(S)

Fees Paid ($)

Non-English Specification, $130 fee (no small entity discount) _____

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	
1051	130	2051	65	Surcharge - late filing fee or oath	_____
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	_____
1053	130	1053	130	Non-English specification	_____
1812	2,520	1812	2,520	For filing a request for ex parte reexamination	_____
1813	8,800	1813	8,800	Request for inter parties reexamination	_____
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	_____
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	_____
1251	120	2251	60	Extension for reply within first month	_____
1252	450	2252	225	Extension for reply within second month	_____
1253	1,020	2253	510	Extension for reply within third month	_____
1254	1,590	2254	795	Extension for reply within fourth month	_____
1255	2,160	2255	1,080	Extension for reply within fifth month	_____
1401	500	2401	250	Notice of Appeal	_____
1402	500	2402	250	Filing a brief in support of an appeal	_____
1403	1,000	2403	500	Request for oral hearing	_____
1451	1,510	1451	1,510	Petition to institute a public use proceeding	_____
1452	500	2452	250	Petition to revive – unavoidable	_____
1453	1,500	2453	750	Petition to revive - unintentional	_____
1501	1,400	2501	700	Utility issue fee (or reissue)	_____
1502	800	2502	400	Design issue fee	_____
1503	1100	2503	550	Plant issue fee	_____
1462	400	1462	400	Petitions to the Commissioner (CFR 1.17(f) Group I)	_____
1463	200	1463	200	Petitions to the Commissioner (CFR 1.17(g) Group II)	_____
1464	130	1464	130	Petitions to the Commissioner (CFR 1.17(h) Group III)	_____
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	_____
1806	180	1806	180	Submission of Information Disclosure Stmt	_____
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	_____
1809	790	2809	395	For filing a submission after final rejection (see 37 CFR 1.129(a))	_____
1814	130	2814	65	Statutory Disclaimer	_____
1810	790	2810	395	For each additional invention to be examined (see 37 CFR 1.129(b))	_____
1801	790	2801	395	Request for Continued Examination (RCE)	_____
1802	900	1802	900	Request for expedited examination of a design application	_____
1504	300	1504	300	Publication fee for early, voluntary, or normal pub.	_____
1505	300	1505	300	Publication fee for republication	_____
1803	130	1803	130	Request for voluntary publication or republication	_____
1808	130	1808	130	Processing fee under 37 CFR 1.17(i) (except provisionals)	_____
1454	1,370	1454	1,370	Acceptance of unintentionally delayed claim for priority	_____

Other fee (specify) _____ _____

Other fee (specify) _____ _____

SUBTOTAL (4) $_____

*Reduced by Basic Filing Fee Paid

SUBMITTED BY:

Typed or Printed Name: Jordan M. Becker

Signature: _____ Date: January 17, 2007

Reg. Number: 39,602 Telephone Number: 408-720-8300

Send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Based on Form PTO/SB/17 (01-06) as modified by BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP on 01/26/06

IN THE CLAIMS:

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

1-4. (Canceled)

5. (Original) A method of providing access to content for use on wireless communication devices, the method comprising:

receiving and storing a plurality of items of content to be made available for use in wireless communication devices used by a plurality of wireless services subscribers, including receiving a plurality of different implementations of at least one of the items of content, where each implementation of any given item of content corresponds to a different set of device capabilities; and

maintaining a product catalog containing a description of the items of content, the product catalog including, in association with each item of content, a reference to each implementation of said item of content.

6. (Original) A method of providing access to digital content for use on wireless communication devices, the method comprising:

receiving and storing in a server system a plurality of items of digital content to be made available for use in wireless communication devices used by a plurality of wireless services subscribers, including receiving and storing a plurality of different implementations of at least one of the items of digital content, where each implementation of any given item of digital content corresponds to a different set of device capabilities;

operating the server system to maintain a product catalog containing a description of the items of digital content, wherein the product catalog includes, in association with each item of digital content, a reference to each implementation of said item of digital content;

receiving a request from a wireless device used by one of the subscribers;

in response to the request, selecting a portion of the product catalog to be presented to the subscriber, based on device capabilities of the wireless device used by the subscriber; and

presenting the selected portion of the product catalog to the subscriber via a wireless network, such that the selected portion, as presented to the subscriber, provides only a single description of each item of digital content in said portion, regardless of the number of implementations of each said item.

7. (Original) A method as recited in claim 6, wherein said selecting a portion of the product catalog comprises:

in response to the request, determining the identity of the wireless device used by the subscriber, wherein each implementation of the plurality of items of digital content has been previously associated in the server system with at least one device identity, according to corresponding device capabilities supported by the implementation; and

selecting the portion of the product catalog to be presented to the subscriber based on the identity of the wireless device used by the subscriber.

8. (Original) A method as recited in claim 6, further comprising:

receiving from the subscriber a request for one of the items of digital content in said portion of the product catalog;

selecting an implementation of the requested item of digital content, based on device capabilities of the wireless device used by the subscriber; and

downloading the selected implementation of the item of digital content to the wireless device used by the subscriber.

9. (Currently amended) A method as recited in claim ~~1~~8, further comprising associating each of the items of digital content in the server system with a plurality of different provisioning models, each of the provisioning models corresponding to a different set of device capabilities, each provisioning model including a provisioning protocol and a corresponding set of provisioning attributes and descriptors for provisioning digital content in wireless devices.

10. (Original) A method as recited in claim 9, further comprising:

receiving from the subscriber a request for one of the items of digital content in said portion of the product catalog;

identifying device capabilities of the wireless device used by the subscriber;

selecting one of a plurality of provisioning models associated with the requested item in the server system, based on the device capabilities of the wireless device used by the subscriber;

packaging the requested item according to the selected provisioning model; and

provisioning the requested item in the wireless device used by the subscriber according to the selected provisioning model.

11. (Original) A method as recited in claim 10, wherein:

said packaging the requested item comprises creating a provisioning descriptor for the requested item according to the selected provisioning model, and associating the provisioning descriptor with the requested item; and

said provisioning the requested item in the wireless device comprises sending the packaged requested item to the wireless device used by the subscriber according to a provisioning protocol associated with the selected provisioning model.

12. (New) A system comprising:

a network interface through which to communicate over a communication network; and

a download manager to

receive and store a plurality of items of content to be made available for use in wireless communication devices used by a plurality of wireless telecommunications subscribers, including receiving a plurality of different implementations of at least one of the items of content, where each implementation of any given item of content corresponds to a different set of device capabilities; and

maintain a product catalog containing a description of the items of content, the product catalog including, in association with each item of content, a reference to each implementation of said item of content.

13. (New) A system comprising:

a processor; and

a storage facility accessible to the processor and containing code which, when executed by the processor, causes the processing system to

receive and store a plurality of items of digital content to be made available for use in wireless communication devices used by a plurality of wireless telecommunications subscribers, including receiving and storing a plurality of different implementations of at least one of the items of digital content, where each implementation of any given item of digital content corresponds to a different set of device capabilities;

maintain a product catalog containing a description of the items of digital content, wherein the product catalog includes, in association with each item of digital content, a reference to each implementation of said item of digital content;

receive a request from a wireless device used by one of the subscribers;

in response to the request, select a portion of the product catalog to be presented to the subscriber, based on device capabilities of the wireless device used by the subscriber; and

cause the selected portion of the product catalog to be presented to the subscriber via a wireless telecommunications network, such that the selected portion, as presented to the subscriber, provides only a single description of each item of digital content in said portion, regardless of the number of implementations of each said item.

14. (New) A system as recited in claim 13, wherein selection of said portion of the product catalog comprises:

in response to the request, determining the identity of the wireless device used by the subscriber, wherein each implementation of the plurality of items of digital content has been previously associated in the server system with at least one device identity, according to corresponding device capabilities supported by the implementation; and

selecting the portion of the product catalog to be presented to the subscriber based on the identity of the wireless device used by the subscriber.

15. (New) A system as recited in claim 14, wherein said storage facility further contains code which, when executed by the processor, causes the processing system to:

receive from the subscriber a request for one of the items of digital content in said portion of the product catalog;

select an implementation of the requested item of digital content, based on device capabilities of the wireless device used by the subscriber; and

download the selected implementation of the item of digital content to the wireless device used by the subscriber.

16. (New) A system as recited in claim 15, wherein said storage facility further contains code which, when executed by the processor, causes the processing system to:

associate each of the items of digital content in the server system with a plurality of different provisioning models, each of the provisioning models corresponding to a different set of device capabilities, each of the provisioning models including a provisioning protocol and a corresponding set of provisioning attributes and descriptors for provisioning digital content in wireless devices.

17. (New) A system as recited in claim 16, wherein said storage facility further contains code which, when executed by the processor, causes the processing system to:

receive from the subscriber a request for one of the items of digital content in said portion of the product catalog;

identify device capabilities of the wireless device used by the subscriber;

select one of a plurality of provisioning models associated with the requested item in the server system, based on the device capabilities of the wireless device used by the subscriber;

package the requested item according to the selected provisioning model; and

provision the requested item in the wireless device used by the subscriber according to the selected provisioning model.

18. (New) A system as recited in claim 17, wherein packaging the requested item comprises creating a provisioning descriptor for the requested item according to the

selected provisioning model, and associating the provisioning descriptor with the requested item; and

wherein provisioning the requested item in the wireless device comprises sending the packaged requested item to the wireless device used by the subscriber according to a provisioning protocol associated with the selected provisioning model.

REMARKS

Reconsideration of the present application is respectfully requested. Claims 1-4 have been canceled. Claim 9 has been amended. Claims 12-18 are newly added. No new matter has been added.

Claims 5-8 stand allowed. Claims 10 and 11 were rejected as being dependent on a rejected base claim but were otherwise deemed to recite allowable subject matter. Claims 1-4, and 9 were rejected under 35 U.S.C. § 102(e) based on U.S. Patent no. 6,912,385 of Namba et al. or U.S. Patent Application Publication no. 2003/0060188 of Gidron.

Claims 1-4 have been canceled, thus rendering the rejection of those claims moot. Claim 9 has been amended to correct its dependency to depend on claim 8.

Regarding the new claims, independent claims 12 and 13 include limitations substantially similar to those in claims 5 and 6, respectfully. Therefore, Applicants believe that claims 12 and 13 (and all claims that depend on them) are patentable for at least reasons similar to claims 5 and 6.

Therefore, Applicants believe that all pending claims are in condition for allowance.

Dependent Claims

In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Conclusion

For the foregoing reasons, the present application is believed to be in condition for allowance, and such action is earnestly requested.

If there are any additional charges/credits, please charge/credit our deposit account no. 02-2666.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 1/17/2007

Jordan M. Becker
Reg. No. 39,602

12400 Wilshire Blvd.
Seventh Floor
Los Angeles, CA 90025
(408) 720-8300

OIPE IAP17
JAN 22 2007
PATENT & TRADEMARK OFFICE

AMENDMENT TRANSMITTAL

PATENT

Application No.: 10/600,746
Filing Date: June 19, 2003
First Named Inventor: Rikard M. Kjellberg
Examiner's Name: Creighton H. Smith
Art Unit: 2614
Attorney Docket No.: 3399P103

____ An Amendment After Final Action (37 CFR 1.116) is attached and applicant(s) request expedited action.

__X__ Charge any fee not covered by any check submitted to Deposit Account No. 02-2666.

__X__ Applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 CFR 1.16 and 1.17, for any concurrent or future reply to Deposit Account No. 02-2666.

____ Applicant(s) claim small entity status (37 CFR 1.27).

ATTACHMENTS

____ Preliminary Amendment
__X__ Amendment/Response with respect to Office Action (9 pages)
____ Amendment/Response After Final Action (37 CFR 1.116) (reminder: consider filing a Notice of Appeal)
____ Notice of Appeal
____ RCE (Request for Continued Examination)
____ Supplemental Declaration
____ Terminal Disclaimer (reminder: if executed by an attorney, the attorney must be properly of record)
____ Information Disclosure Statement (IDS)
____ Copies of IDS citations
____ Petition for Extension of Time
__X__ Fee Transmittal Document (that includes a fee calculation based on the type and number of claims; in duplicate)
____ Cross-Reference to Related Application(s)
____ Certified Copy of Priority Document
____ Other: _____
____ Other: _____
__X__ Check(s)
__X__ Postcard (Return Receipt)

SUBMITTED BY:

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP
TYPED OR PRINTED NAME: Jordan M. Becker
SIGNATURE:. _____
REG. NO.: 39,602
DATE: January 17, 2007
ADDRESS: 12400 Wilshire Boulevard, Seventh Floor
Los Angeles, California 90025
TELEPHONE NO.: (408) 720-8300

CERTIFICATE OF MAILING BY FIRST CLASS MAIL (if applicable)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria Virginia 22313-1450
on January 17, 2007
Date of Deposit

Andreas Radke
Name of Person Mailing Correspondence

Andreas Radke — 1-17-07
Signature — Date

Express Mail Label No. (if applicable): _____

(10/14/03)

Send to: COMMISSIONER FOR PATENTS, P.O. Box 1450, Alexandria, Virginia 22313-1450

10/600746

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number
~~3399P103~~

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	11	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	11 minus 20=	* 0
INDEPENDENT CLAIMS	3 minus 3 =	* 0
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
X$ 9=		OR	X$18=	0
X42=		OR	X84=	0
+140=		OR	+280=	0
TOTAL		OR	TOTAL	750

2/17/07

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 14	Minus	** 20	=
Independent	* 4	Minus	*** 3	= 1
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	~~X84=~~ 200	200
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	200

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,746	06/19/2003	Rikard M. Kjellberg	3399P103	5994

26529 7590 10/20/2006

BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025

EXAMINER	
SMITH, CREIGHTON H	

ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 10/20/2006

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

Office Action Summary	Application No.	Applicant(s)	
	10/600,746	KJELLBERG ET AL.	
	Examiner	Art Unit	
	Creighton H. Smith	2614	

-- 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 _____.

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

3)☐ 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

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *5-8* is/are allowed.

6)☒ Claim(s) *1-4 and 9* is/are rejected.

7)☒ Claim(s) *10 and 11* is/are objected to.

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

Application Papers

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

10)☐ 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).

11)☐ 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

12)☐ 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 7.17.06, 9.27.06, 10.14.05, 8.12.05, 11.22.04
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Namba et al '385 or Gidron et al.

Namba et al disclose the downloading of content data to a wireless device, col. 4, lines 1-5; a server system (50), col. 5, lines 54-55, that store various data contents and profiles of such data in its storage. Namba et al disclose that plural content items, i.e., various data such as video, sound, and graphics, col. 10, lines 35-48, are the downloadable data items.

Namba et al disclose in cols. 5-6, lines 66-67 & 1-10, that they use an evaluation function to determine which communication system, A or B, to use that corresponds/ suitable for the contents of the data. Some of the different types of communications systems contemplated by Namba et al are PDC, CDMA, W-CDMA, PHS, LAN, or the like, with the communication system (PDC, CDMA, W-CDMA, PHS, etc.) that corresponds to the contents of the data. In col. 9, lines 21 et seq, Namba et al disclose a request signal for data from the mobile terminal 10 to a provider 400. That request signal includes a mobile profile (various information including moving speed, *communication rate*, terminal environment, user environment, and the like. The provide

400 will then access site 300, in response to a user's request signal to check to check if the site 300 has the contents which are requested by the user. Namba et al next discloses that a profile M1 is divided into 3 profiles: M2a, M2b, M2c. Each one of the profiles M2a-M2c contains various information including the specification of division of the data, specification of the data path (*specification of the communication system)*, data wait time, delivery time and the like.

Therefore, with Namba's disclosure in col. 6 of the different communications systems (PDC, CDMA, W-CDMA, PHS, LAN, etc.), and the disclosure in col. 9 of each of the profiles M2a-M2c specifying a certain communication system, like those systems disclosed in col. 6, it is readily apparent that Namba et al has different provisioning models that correspond to the different terminal's capabilities.

See ¶ 0042 of Gidron et al.

Claims 10 and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 5-8 are allowed.

Any inquiry concerning this communication should be directed to Creighton H. Smith at telephone number 571/272-7546.

16 OCT '06

Creighton H Smith
Primary Examiner
Art Unit 2614

Notice of References Cited	Application/Control No. 10/600,746	Applicant(s)/Patent Under Reexamination KJELLBERG ET AL.	
	Examiner Creighton H. Smith	Art Unit 2614	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,912,385	06-2005	Namba et al.	455/419
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*	C	US-2003/0027581	02-2003	Jokinen et al.	455/456
	D	US-			
	E	US-			
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	I	US-			
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	K	US-			
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*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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PATENT & TRADEMARK OFFICE

Complete if Known	
Application Number	10/600,746
Filing Date	06/19/2003
First Named Inventor:	Rikard M. Kjellberg
Art Unit	2681
Examiner Name	Not Yet Assigned
Attorney Docket Number	3399P103

Sheet	1	of	2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
CHS		US-	6,161,140	12-12-2000	Moriya	
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CHS		WO 02/27543 A2	04-04-2002	Volantis Systems Limited		
CHS		EP 0 992 922 A2	04-12-2000	International Business Machines Corporation		

Examiner Signature		Date Considered	10/06

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	10/600,746
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				First Named Inventor:	Rikard M. Kjellberg
				Art Unit	2681
				Examiner Name	Not Yet Assigned
Sheet	2	of	2	Attorney Docket Number	3399P103

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CHS		AUSTALLER, GERHARD, et al.: "Gulliver Beans: Generating Device Optimized and Individualized Content for WAP Applications", Proc. Workshop Information Design for Mobile Web Services, [Online] May 15, 2000, pages 1-7, XP-002266242.	
CHS		ELLIPSUS SYSTEMS: "Ellipsus' Mobile Application Provisioning System", White Paper, [Online] September 23, 2001, pages 0-10, XP-002266188.	

Examiner Signature		Date Considered	12/07

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Sheet	1	of	2	Attorney Docket Number	3399P103

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U.S. PATENT DOCUMENTS

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CHS		WO 01/97482 A1	12-20-2001	Telefonaktiebolaget LM Ericsson		
		WO 02/23857 A2	03-21-2002	Viafone, Inc.		
		WO 98/35469 A2	08-13-1998	The Sabre Group, Inc.		
CHS		WO 98/35469 A3	08-13-1998	The Sabre Group, Inc.		

Examiner Signature	Smith	Date Considered	10/06

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Sheet	2	of	2

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CHS		Erik Bladh et al., "GPRS – Applicability and Expectations", Växjö University, School of Mathematics and Systems Engineering, Reports from MSI, August 2002, pages 1-64.	

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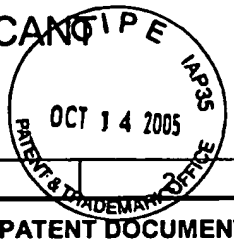
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		Country Code[3] Number[4] Kind Code[5] (if known)				
		WO 00/44147 A1	07-27-2000	Telefonaktiebolaget LM Ericsson		
		WO 00/70826 A2	11-23-2000	Tang, Bob		
		WO 99/08208 A1	02-18-1999	Aoraki Corporation Limited		
		WO 99/26159 A2	05-27-1999	Microsoft Corporation		

Examiner Signature	CSmith	Date Considered	12/06

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CHS		"A Vision for Dynamic Java Services Provisioning, The Java Services Vending Machine Concept", June 2001, Version 1.0, Sun Microsystems, Inc., pages 1-25.	
CHS		Sheila Riley, "Sun-Microsoft Spat Now Carrying Over To Wireless World", Investor's Business Daily, 1 page.	

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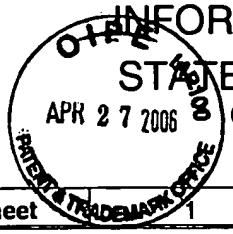
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CHS		US-	6,438,576	08-20-2002	Huang et al.	
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		US-	2002/0065944 A1	05-30-2002	Hickey et al.	
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CHS		US- 6,430,624	08-06-2002	Jamtgaard et al.	
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Examiner Signature		Date Considered	10/06

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Bib Data Sheet

CONFIRMATION NO. 5994

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/600,746	06/19/2003 RULE	455	2614	3399P103

APPLICANTS

Rikard M. Kjellberg, Santa Cruz, CA;
Sheng Liang, Cupertino, CA;
Tomas G. Lund, Menlo Park, CA;
William Chan, San Mateo, CA;
Ramakrishna Chinta, Sunnyvale, CA;
Xinbi Chen, Palo Alto, CA;

Yes CHS

**** CONTINUING DATA ***************************

This appln claims benefit of 60/393,024 06/28/2002 and claims benefit of 60/392,383 06/28/2002
and claims benefit of 60/393,041 06/28/2002
and claims benefit of 60/392,999 06/28/2002

No CHS

**** FOREIGN APPLICATIONS *********************

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 09/12/2003

		STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed	☐ yes ☒ no	CA	14	11	3
35 USC 119 (a-d) conditions met	☐ yes ☒ no ☐ Met after Allowance				
Verified and Acknowledged	Examiner's Signature Initials				

ADDRESS
26529

TITLE

Device capability based discovery, packaging and provisioning of content for wireless mobile devices

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
880	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
10/600,746	KJELLBERG ET AL.	
Examiner	**Art Unit**	
Creighton H. Smith	2614	

SEARCHED			
Class	Subclass	Date	Examiner
455	419	10/06	CHS
"	418		
"	414.1		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST Search See Printout	10/06	CHS

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/600,746	KJELLBERG ET AL.
Examiner	**Art Unit**
Creighton H. Smith	2614

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date
Final	Original	10/06
	1	✓
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	4	✓
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	Type	Hits	Search Text	DBs
1	BRS	12422	"455".clas. and content	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
2	BRS	121	server with (plurality or multiple) near6 content and S1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
3	BRS	475	(different or plural$3 or multiple) with provision$3 with model$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
4	BRS	0	S2 and S3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
5	BRS	7	S1 and S3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
6	BRS	17560	(user or customer or mobile) near3 profile and S6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
7	BRS	2249053	media or content	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
8	BRS	12036	(user or customer or mobile) adj profile and S6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
9	BRS	10841	user adj profile and S6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
10	BRS	3375	user adj profile same S6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
11	BRS	2182	user adj profile with S6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
12	BRS	2	mobile adj profile with S6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
13	BRS	17	mobile adj profile same S6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB
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Deliver to: USPTO
Art Group: 2681
Facsimile No.: (571) 273-8300
Date: July 17, 2006
From: Jordan M. Becker, Reg. No. 39,602
Our Docket No.: 3399P103
Number of pages 4 including this sheet.
Application No.: 10/600,746
Filing Date: 6/19/2003
Docket Due Date(s):

Enclosed are the following documents:

☐ Amendment: (pgs)	☐ Issue Fee Transmittal
☐ Appeal Brief (pgs)	☐ Notice of Appeal
☐ Application:	☐ Petition for:
(pgs) w/cover & abstract)	☐ Request for Continued Examination (RCE)
☐ Assignment & Cover Sheet (pgs)	☐ Reply Brief (pgs)
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☐ Continued Prosecution Application (CPA)	☐ Request to Rescind Previous Nonpublication Request
☐ Declaration & POA (pgs)	☐ Response to Notice of Missing Parts & Formalities Letter
☐ Drawings: sheets, figures	☐ Response to Written Opinion (pgs)
☐ Extension of Time:	☐ Terminal Disclaimer
☐ Fee Transmittal (in duplicate)	☐ Transmittal of Publication Fee Due
☒ IDS & PTO/SB/08 (3 pgs)	☐ Transmittal Letter
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Attorney Docket No.: 3399P103 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg et al.

Serial No.: 10/600,746

Filing Date: 06/19/2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Not Yet Assigned

Group Art Unit: 2681

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Applicants respectfully request that the above-listed item not be printed on the face of any patent which may issue from the present application.

LJV/cak (10/27/04)

PAGE 2/4 * RCVD AT 7/17/2006 5:59:58 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:2738300 * CSID:408 720 9397 * DURATION (mm-ss):02-30

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(408) 720-8300

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Complete if Known	
Application Number	10/600,746
Filing Date	06/19/2003
First Named Inventor:	Rikard M. Kjellberg et al.
Art Unit	2681
Examiner Name	Not Yet Assigned
Attorney Docket Number	3399P103

Sheet	1	of	1

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 6,430,624	08-06-2002	Jamtgaard et al.	
		US- 2003/0054794 A1	03-20-2003	Zhang	
		US- 2004/0248570 A1	12-09-2004	Denenberg et al.	
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Facsimile No.: (571) 273-8300
Date: May 23, 2006
From: Jordan M. Becker, Reg. No. 39,602
Our Docket No.: 3399P103
Number of pages 3 including this sheet.
Application No.: 10/600,746
Filing Date: 6/19/2003
Docket Due Date(s):

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- ☐ Application: (pgs) w/cover & abstract)
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In re Patent Application for:

Rikard M. Kjellberg et al.

Serial No.: 10/600,746

Filing Date: 06/19/2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Not Yet Assigned

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LJV/cak (10/27/04)

PAGE 2/3 * RCVD AT 5/23/2006 6:52:52 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-5/14 * DNIS:2738300 * CSID:14089478280 * DURATION (mm-ss):01-08

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Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: May 23, 2006

Jordan M. Becker
Reg. No. 39,602

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12400 Wilshire Blvd.
Seventh Floor
Los Angeles, CA 90025
(408) 720-8300

LJV/cak (10/27/04)

PAGE 3/3 * RCVD AT 5/23/2006 6:52:52 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-5/14 * DNIS:2738300 * CSID:14089478280 * DURATION (mm-ss):01-08

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Attorney Docket No.: 3399P103 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg et al.

Serial No.: 10/600,746

Filing Date: 06/19/2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Not Yet Assigned

Group Art Unit: 2681

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HBains April 25, 2006
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Applicant would like to bring to the Examiner's attention the following co-pending patent application(s), which is/are assigned to the assignee of the present application, and which may be relevant to the present application:

1) U.S. patent application no. 10/269,133, entitled, "User-Centric Session Management for Client-Server Interaction using Multiple Applications and Devices," filed on October 10, 2002, publication no. 2003/0084165 A1, of Rikard M. Kjellberg et al., which was previously cited in the IDS filed by applicant October 14, 2005.

LJV/cak (10/27/04)

2) U.S. patent application no. 10/282,557, entitled, "Method and Apparatus for Determination of Device Capabilities on a Network," filed on October 28, 2002, publication no. 2004/0024867 A1, of Rikard M. Kjellberg, which was previously cited in the IDS filed by applicant October 14, 2005.

3) U.S. patent application no. 10/601,022, entitled, "Domain-Based Management of Distribution of Digital Content from Multiple Suppliers to Multiple Wireless Services Subscribers," filed on June 19, 2003, publication no. 2004/0054787 A1, of Rikard M. Kjellberg et al., which was previously cited in the IDS filed by applicant October 14, 2005.

4) U.S. patent application no. 10/794,826, entitled, "Federated Download of Digital Content to Wireless Devices," filed on March 4, 2004, publication no. 2005/0071418 A1, of Rikard M. Kjellberg et al., which was previously cited in the IDS filed by applicant October 14, 2005.

Applicants respectfully request that the above-listed items not be printed on the face of any patent which may issue from the present application.

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Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: April 25, 2006

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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APR 27 2006 PATENT & TRADEMARK OFFICE

Complete if Known	
Application Number	10/600,746
Filing Date	06/19/2003
First Named Inventor:	Rikard M. Kjellberg et al.
Art Unit	2681
Examiner Name	Not Yet Assigned
Attorney Docket Number	3399P103

Sheet	1	of	1

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (If known)		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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Attorney Docket No.: 3399P103 Patent

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg, et al.

Serial No.: 10/600,746

Filing Date: 06/19/2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Not Yet Assigned

Group Art Unit: 2681

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Enclosed is a copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 together with copies of the documents cited on that form, except for copies not required to be submitted (e.g., copies of U.S. patents and U.S. published patent applications need not be enclosed). It is respectfully requested that the cited documents be considered and that the enclosed copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

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Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: October 12, 2005

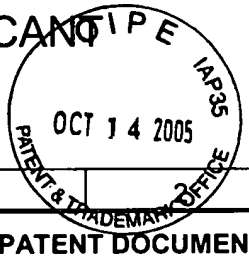
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Sheet	1	of	2

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		US-	5,835,724	11-10-1998	Smith	
		US-	5,895,471	04-20-1999	King et al.	
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		US-	2004/0054787 A1	03-18-2004	Kjellberg et al.	
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		WO 00/44147 A1	07-27-2000	Telefonaktiebolaget LM Ericsson		
		WO 00/70826 A2	11-23-2000	Tang, Bob		
		WO 99/08208 A1	02-18-1999	Aoraki Corporation Limited		
		WO 99/26159 A2	05-27-1999	Microsoft Corporation		

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				Art Unit	2681
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NON PATENT LITERATURE DOCUMENTS

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		"A Vision for Dynamic Java Services Provisioning, The Java Services Vending Machine Concept", June 2001, Version 1.0, Sun Microsystems, Inc., pages 1-25.	
		Sheila Riley, "Sun-Microsoft Spat Now Carrying Over To Wireless World", Investor's Business Daily, 1 page.	

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7: H04L 29/06 — A1

(11) International Publication Number: WO 00/44147

(43) International Publication Date: 27 July 2000 (27.07.00)

(21) International Application Number: PCT/SE99/02501

(22) International Filing Date: 30 December 1999 (30.12.99)

(30) Priority Data:
09/235,030 21 January 1999 (21.01.99) US

(71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).

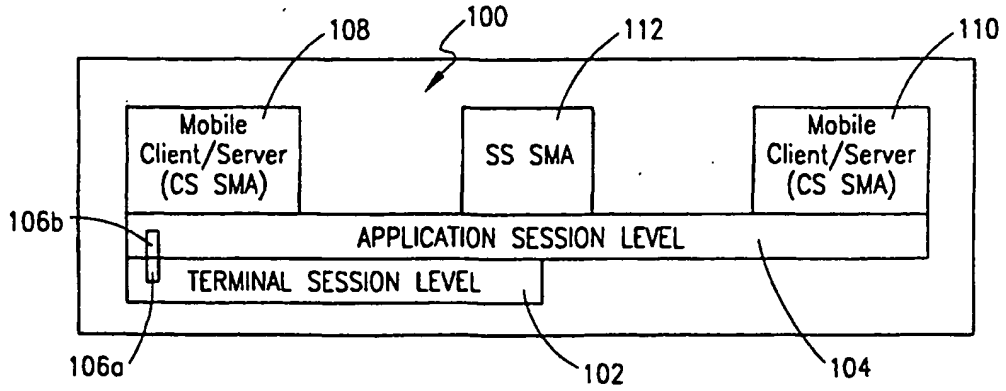
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(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, 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), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: METHOD FOR SUPPORTING COMMUNICATIONS MOBILITY IN A TELECOMMUNICATIONS SYSTEM



(57) Abstract

A multilevel session management protocol (100) is provided to support communications mobility in a telecommunications system. A session is separated into two independent layers – a terminal session layer (102) and an application session layer (104). A session management agent (108, 110) is implemented as a module operating locally in a wireless terminal. A second session management agent (112) is implemented as a module operating remotely in the Internet (206). Any session management agent module can communicate with another session management agent module by use of the session management protocol. The two session management agent modules use a multiplexed TCP connection (22, 24) for conveying TCP data traffic therebetween. As such, the session management protocol can be used with any application that uses an Internet TCP as a transport protocol.

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METHOD FOR SUPPORTING COMMUNICATIONS MOBILITY IN A TELECOMMUNICATIONS SYSTEM

BACKGROUND OF THE INVENTION

Technical Field of the Invention

The present invention relates generally to the telecommunications field and, in particular, to a method and architecture for supporting communications mobility in a telecommunications system.

Description of Related Art

Ever since the beginning of the 1990s, the demand for increased mobility in the computing and communications fields has grown substantially. However, despite the increased mobility that has developed in these fields as a result of the heightened demand, the users of these technologies have all the while insisted on being able to maintain their Internet connectivity because of the massive amount of information that has been made available and the myriad of communications services that can be accommodated on the Internet. As such, mobility in Internet Protocol (IP) networks has become one of the hottest development areas with respect to the ability of providing a continuous flow of data from and to mobile terminals.

With the advent of the next (so-called "third") generation mobile communications systems, two additional requirements are being imposed on mobile terminal designs. The first such requirement is for a mobile terminal to be capable of communicating over a number of different wireless interfaces. The second requirement is for the mobile terminal to be capable of automatically changing a communications interface in order to adapt to the available network, or in accordance with a network's characteristics if multiple networks are involved. The latter (multiple network) capability leads to the need for a terminal that can change its Internet identification (e.g., IP address) when the terminal has changed the type of Internet access network being used or the Internet Service Provider (ISP) offering such access. On the one hand, just having the opportunity to use

multiple network interfaces to access the Internet is a significant advantage. However, on the other hand, it becomes more difficult to provide a continuous data flow for highly mobile terminals which are capable of changing their Internet identifications, while maintaining their ongoing connections to the Internet servers.

Support for such communications mobility can be provided in two different ways which depend on the underlying communication infrastructure. One method for supporting mobility is designed for users with fixed connections or local wireless connections to the Internet via Local Area Networks (LANs). This approach allows a user to maintain its identity (IP address), ongoing connections, etc., while physically changing the points of attachment to another LAN. This form of mobility frequently provides support for "Decoupled Computing," as described in "Adaptation and Mobility in Wireless Information Systems," by Randy H. Katz, IEEE Personal Communications, First Quarter 1994. The term "decoupled computing" is defined as the ability to compute while being detached from the existing computing and communication infrastructure. This capability can be achieved by using file caching techniques on local devices. Subsequently, when a device is again attached to some communication environment, the changed files can be automatically synchronized with copies maintained on a file server. This technique of "decoupled computing" is important because it provides a capability for continuing the computing process locally during movement between communication environments where users spend most of their time (e.g., home, office, corporate or university campus, etc.).

A number of proposals have been made to support this type of mobility. However, the basic assumption made in all of these proposals is that a mobile station has a fixed IP address regardless of its point of attachment. This assumption implies that the IP address must be unique within the public Internet address space in order to allow the mobile station to connect to an arbitrary IP network.

Another type of mobility service exploits certain opportunities offered by wide area wireless networks. This type of service is intended for users who require access to information and other resources while being physically located away from

LAN infrastructures. For example, the basic ideas concerning the provision of continuous network connectivity in a wide area wireless environment are described in "The Design of a Platform for Mobile Data Communication," by Peter Peinl and Christoph Kröll, First IEEE Symposium on Global Data Networking, Cairo, December 12-15, 1993. Essentially, information about this type of service has not been widely published because mobility can be readily supported by wide area wireless networks, as long as the user is located in the coverage area of the same Internet Service Provider (ISP) or does not change the network type. In this case, the existing solutions can provide continuous data flow regardless of a change in the geographical position of the user's terminal.

A significant problem arises if a terminal, for some reason, needs to change its IP identification (i.e., IP address) while maintaining an ongoing communication session with an Internet host. In this case, changing the terminal's IP address makes it impossible for the terminal to resume communication at the point where the communication was interrupted. As such, all active sessions have to be started over from the very beginning. Consequently, the process of starting the communication sessions over can be extremely burdensome especially for the terminals connected to the Internet through low capacity, wide area wireless networks.

The main reason for changing an IP address is related to the strategy used for allocating IP addresses for Internet hosts. First, an IP address can be public or private. A public IP address is the address which is unique among all Internet hosts having direct access to the Internet. A private IP address is the address that can replicate any public IP address but is not "visible" on the global Internet. In other words, this address exists within some LAN or Intranet and is substituted for by some other, public IP address when communicating with the hosts within the global Internet.

Second, an IP address can be dynamic or static. A dynamic IP address is the address that is allocated from the common pool of IP addresses at an ISP. The first available address in the pool is selected. This means that every time a host (e.g., server) wishes to be connected to the Internet, the host will receive an IP

address from the ISP's pool, which means that the IP address can be different from time to time.

A static IP address is the address which is associated with a terminal during the lifetime of a subscription at some ISP. This address is closely related to the communication interface of some particular access network. Additionally, both public and private IP addresses can also be static and dynamic. In summary, the basic problem is that an IP address is not always associated with a particular terminal, and the IP address needs to be changed if the terminal changes an access network type and/or its ISP.

Traditionally, the communications between Internet hosts include certain end-to-end semantics. These functions are provided by the known Transport Control Protocol (TCP). The end-to-end channel between communicating peers is defined by two socket pairs: a local host socket pair and a remote host socket pair. Each socket pair comprises two components - an IP address (local or remote) and TCP port number (local or remote). A change made to any of these components (or to them both) leads to a need to establish a new end-to-end communication channel, although physically the same hosts are involved in the communication. According to the existing semantics for communications between two Internet hosts using the TCP, it is not possible to map a previous TCP connection to a new connection, if one or more components of the socket pair has been changed.

Ultimately, the above-described problem can be summarized as follows. If a fixed or mobile terminal changes its IP address while it is engaged in ongoing communication sessions with Internet hosts, these sessions cannot be resumed at the point of interruption. Instead, these sessions have to be restarted at the very beginning. Consequently, a user has too be connected for a much longer period than usual in order to obtain a desired result, and the resulting communication session becomes much more expensive.

The solutions that exist for gaining IP mobility do not cope with the above-described types of problems for two reasons. First, the existing solutions assume that the mobile host will not change its IP address during a communication session. Second, the existing solutions assume that support for continuous data flow to/from

a mobile terminal can be accomplished by establishing new routes to the terminal on the network layer (i.e., the IP layer residing below the TCP in the communications protocol stack).

In this regard, the session layer protocol is a known protocol that provides at least one solution to the above-described communications mobility problem. For example, the International Standards Organization (ISO) has set forth a number of data communications standards, including the Open Systems Interconnection (OSI) model. The OSI model is used to define the functions of various levels within a protocol stack. Under the OSI model, the session layer (layer 5) resides just over the transport protocol (layer 4) in the communications protocol stack. As such, the primary tasks of the session layer are as follows: establishment and maintenance of sessions; management of dialogs; and session recovery. These features provide for the resumption of communication sessions that have been interrupted for any reason by the underlying protocols. However, although these features result in a notion of session independence for end-to-end semantics in data communications over the Internet, they still depend on the use of the IP addresses of communicating peers. As such, the existing solution assumes that the IP addresses for the dialog at the resumed session are the same as they were for both the client and server before the session was interrupted.

Another existing solution to the communication mobility problem uses the concept of multiplexed TCP connections. This concept was first described in "WebExpress: A System for Optimizing Web Browsing in a Wireless Environment," by Barron C. Housel and David B. Lindquist, ACM/IEEE MobiCom'96 Conference, 1996. The primary goal of this concept is to speed up the operation of Web browsing for users of low capacity wireless links for Internet access. All TCP connections issued by a wireless terminal are multiplexed into one TCP connection, which is established between a Client Side Intercept (CSI) module and a Server Side Intercept (SSI) module. The CSI module resides locally in the wireless terminal and functions as a local "http" proxy for a Web browser. The SSI module resides in the Internet (wired part of the network) and functions as another "http" proxy that directly communicates with the original server. The multiplexed

TCP connection is thus implemented, along with some other enhancements designed to reduce the amount of information that passes between the CSI and SSI modules. Nevertheless, the multiplexed TCP connection solution does not account for the case where a mobile terminal changes its IP address during the period when a session has been interrupted and thus cannot be resumed successfully at the point of interruption. Consequently, a need exists for a protocol and method that will support such communications mobility. As described in detail below, the present invention successfully meets this need and resolves the above-described problems.

SUMMARY OF THE INVENTION

In accordance with a preferred embodiment of the present invention, a multilevel Session Management Protocol (SMP) is provided to support communications mobility in a telecommunications system. A communications session is separated into two independent layers - a terminal session layer and an application session layer. For this exemplary embodiment, a Session Management Agent (SMA) is implemented as a module operating locally in a wireless terminal. A second SMA is implemented as a module operating remotely in the Internet. Any SMA module can communicate with another SMA module by use of the SMP. The two SMA modules use a multiplexed TCP connection for conveying TCP data traffic therebetween. As such, the SMP can be used with any application that uses an Internet TCP as a transport protocol. Of course, it is within the scope of the present invention to use other IP-based protocols, with changes in the SMP in accordance with the properties of these protocols.

An important technical advantage of the present invention is that a mobile client's communications session can be interrupted and resumed successfully and independently of a network's current configuration, access network used, and the client's current IP address.

Another important technical advantage of the present invention is that a change in a network configuration and/or a client's IP address can take place during a transfer of data and subsequently the data missing due to the interruption will be recovered.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the method and apparatus of the present invention may be had by reference to the following detailed description when taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a block diagram of a communications architecture that can be used to implement a preferred embodiment of the present invention;

FIGURE 2 is a block diagram of a multilevel session architecture and protocol that can be used to implement the preferred embodiment of the present invention;

FIGUREs 3A and 3B are related diagrams that illustrate how a Sid can be used to establish, terminate or resume a communication session, in accordance with the preferred embodiment of the present invention;

FIGURE 4 is a diagram of a system that can be used to implement a second exemplary embodiment of the present invention; and

FIGURE 5 is a format for a Sid that can be used for supporting a session handover, in accordance with the second exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

The preferred embodiment of the present invention and its advantages are best understood by referring to FIGUREs 1-5 of the drawings, like numerals being used for like and corresponding parts of the various drawings.

Essentially, in accordance with a preferred embodiment of the present invention, a multilevel SMP is provided to support communications mobility in a telecommunications system. A communications session is separated into two independent layers - a terminal session layer and an application session layer. A session management agent is implemented as an SMA module operating locally in a wireless terminal. A second session management agent is implemented as an SMA module operating remotely in the Internet. Any SMA module can communicate with another SMA module by use of the SMP. The two SMA modules use a multiplexed TCP connection for conveying TCP data traffic therebetween. As such, the SMP can

be used with any application that uses an Internet TCP as a transport protocol, although some legacy applications may require some adjustment for this purpose.

Specifically, FIGURE 1 is a block diagram of a communications architecture 10 that can be used to implement a preferred embodiment of the present invention. A first SMA can be implemented as a module operating locally in a wireless terminal. A second SMA can be implemented as a module operating remotely somewhere in the Internet. For this embodiment, a local SMA is referred to as a Client-Side SMA (CS SMA) (e.g., 12), and all other SMAs in the network are referred to as Server-Side SMAs (SS SMAs) (e.g., 14, 16). Notably, there is no restriction placed on the number of SMAs that can be implemented between the local SMA (e.g., CS SMA 12) and an original server (e.g., client/server 20). For this embodiment, a communications session is to be conducted between two clients' mobile terminals via a respective server 18, 20.

In accordance with the preferred embodiment, any pair of SMA modules can communicate with each other by use of the SMP. Also, any pair of SMA modules can use a multiplexed TCP connection (e.g., 22, 24) to send TCP data traffic to one another. In that regard, any SMA module can accept an arbitrary number of clients (i.e., multiplexed TCP connections) to facilitate communications therebetween.

FIGURE 2 is a block diagram of a multilevel session architecture and protocol 100 that can be used to implement the preferred embodiment of the present invention. The multilevel session architecture and protocol 100 includes a Terminal Session (TS) level 102 and an Application Session (AS) level 104. Both session levels 102 and 104 preferably function independently from one another, except for a Session Identifier (Sid) 106 which can be envisioned to span vertically across the TS and AS levels. The Sid 106 is used for mapping of active sessions, and also for retrieving sessions that have to be resumed, for example, after a TS has been reinitialized. The structure of such an Sid is described in detail below.

In accordance with the preferred embodiment, by separating a communications session into the two levels shown, the AS 104 will be unaware of the network's status, and therefore, the AS 104 will not have to be interrupted even if the network is unreachable. Moreover, the AS 104 can function independently of the IP address of

the terminal involved, because the AS establishes only local (e.g., within the same terminal) communications to a CS SMA (e.g., 108 or 110). The TS 102 handles the network connection using access networks, and depending on the communication scenario employed, the TS can use different IP addresses. Notably, as a consequence of separating the AS and TS levels, a change made to an access network and/or an IP address during a communications session is transparent to the AS.

In accordance with the preferred embodiment, a mapping of a TS between a CS SMA (e.g., 108 or 110) and SS SMA (e.g., 112) is provided. However, because an SS SMA can accept an arbitrary number of clients (i.e., TSs), the mapping is preferably specified by a single parameter. For this purpose, a multiplexed TCP connection can be used between each client and the SS SMA. This approach serves to map each client to one TCP connection at the SS SMA.

For this embodiment, a Client Number (CN) is used to represent each client at the SS SMA 112. Preferably, a CN is a unique integer which is assigned to each client's single TCP connection. The CN forms the portion of the Sid (e.g., 106a) which belongs to the TS level 102. In order to be capable of resuming an AS (which has been interrupted for some reason), the SMP uses a second portion of the Sid (e.g., 106b) which belongs to the AS level 104. As such, the portion of the Sid (106b) that belongs to the AS level preferably comprises three components.

The first component of the AS level-related portion of the Sid is a TCP Connection Number (TCPN). This component is a unique integer value assigned by a CS SMA (108 or 110) to any new TCP connection established between an application and that CS SMA. A requirement imposed for this value is that it must be a unique value within the mobile terminal that is operating that CS SMA. Consequently, an SS SMA can identify any AS by the pair {CN, TCPN}. The second component of the AS level-related portion of the Sid is the Previous IP Address (PIP). This component is stored by a CS SMA any time a mobile terminal changes its IP address. The third component is the Current IP Address (CIP). This component of the AS level-related portion of the Sid is equal to the current IP address used by the mobile terminal involved in the session.

FIGUREs 3A and 3B are related diagrams that illustrate how a Sid can be used

to establish, terminate or resume a communication session, in accordance with the preferred embodiment of the present invention. As such, a fixed or mobile terminal's communication session can be established in response to a user's request via, for example, a graphical user interface or automatically, if a session is to be resumed. Referring to the exemplary Sid format shown in FIGURE 3A, establishing a terminal session means the establishment of the multiplexed TCP connection between the CS SMA and an SS SMA. During the establishment of a session, the CS SMA and SS SMA involved exchange tokens with the SMP, and pass necessary information to each other about session parameters (i.e., the CS SMA and SS SMA create a Sid for the session being established).

When the involved SS SMA receives an announcement about a newly-initiated session with a new client, the SS SMA allocates the unique integer (CN) among all clients attached to it, and returns that CN back to the new client. The new client is required to maintain this number. The client can use this number only to pass the CN to the SS SMA, in order to identify the client if necessary. During a handshake procedure, if the terminal session being established is a new session, the CS SMA sends its CIP to the SS SMA involved. Whenever an application establishes a new local TCP connection to the CS SMA, the CS SMA allocates a unique integer (TCPN) for this connection, which has to be unique only within a mobile terminal.

During an active terminal session, the CS SMA sends the CN and TCPN to the SS SMA (in the SMP header), in order to correctly identify the TCP connections between the SS SMA and Internet server that SS SMA is communicating with. In order to terminate a communication session under normal circumstances (e.g., the CS SMA informs the SS SMA that the session will be terminated), no particular procedure using a Sid is required.

Referring to the exemplary Sid format shown in FIGURE 3B, in the case of the resumption of an abnormally interrupted communication session, the CS SMA first establishes a multiplexed connection in the same manner as described above for the establishment of a session. The CS SMA then obtains a new CN. At this point, the involved SS SMA does not know if a new session is being established or a previously-interrupted session is being resumed. The CS SMA sends a special SMP token

(message) to the SS SMA which specifies that the session is being resumed. Additionally, the SMP token sent by the CS SMA includes the CS SMA's new CN, CIP and PIP, along with the old CN used in the previous terminal session. The old CN is required for the SS SMA in order to map over the corresponding TCP connections to the Internet server(s) according to the new Sid created for the session's resumption. As soon as all of the clients' connection have been updated with the new Sid, the application sessions can continue from the point where they were interrupted. These functions can be achieved by the use of session protocol capabilities, which negotiate the last correctly-received portion of data, and provides both the CS SMA and SS SMA with information necessary to continue sending and receiving data correctly in both directions.

FIGURE 4 is a diagram of a system 200 that can be used to implement a second exemplary embodiment of the present invention. In this embodiment, for the session management system's architecture and the format or structure of the Sid involved, it can be assumed that in order to resume an application session, a mobile terminal has to reestablish an interrupted terminal session with the same SS SMA. Although the system 200 can function properly after reestablishing the terminal session, the system may route unnecessary data traffic through that SS SMA.

For example (assuming the following scenario), a mobile terminal 216 initiates a new terminal session with an SS SMA 204 residing in the access network "A" 202. An ongoing session is interrupted for some reason (e.g., network "A" 202 becomes unavailable). The mobile terminal 216 reconnects to the Internet 206 using, for example, a different access network "B" 210. If the mobile terminal 216 is to use the same SS SMA as before the interruption (e.g., 204), the routing has to include the additional leg from network "B" 210 to network "A" 202.

For this embodiment, it can be assumed that network "B" 210 also offers the session management services that are available to the mobile terminal 216. In this case, the mobile terminal 216 can connect and thus establish the new terminal session with the SS SMA 208 residing in the network "B" 210. As such, the described system (200) does not have the functionality to resume suspended application sessions at the mobile terminal 216, because the system's knowledge about these sessions' states on

the network side is left to the SS SMA 204 residing in the network "A" 202. Consequently, in accordance with this embodiment, in order to avoid additional routing and still be capable of retrieving and resuming suspended application sessions, the exemplary system (200) can be extended with the use of a Session Handover Protocol (SHP) 212. Also, the application part of the Sid can be extended with the use of the Previous SS SMA IP address (PSMAIP), which can be used to retrieve the identity of the SS SMA (e.g., 204) that was serving the mobile terminal 216 before the session's interruption. This extension is necessary, for example, if the mobile terminal 216 establishes the terminal session with a different SSMA (e.g., 208), while having suspended application sessions supported by the previously-served SS SMA (e.g., 204).

FIGURE 5 is a format for a Sid that can be used for supporting a session handover, in accordance with the second exemplary embodiment of the present invention. Essentially, referring to FIGUREs 4 and 5, the CS SMA 214 in system 200 is capable of retrieving and resuming application sessions held between the CS SMA 214 and the SS SMA 204 via the access network "A" 202, even if the subsequent terminal session is established with the SS SMA 208 residing in the network "B" 210. The data for the new application sessions pass directly through the SS SMA@B 208 and then on to the Internet 206 server(s). Only old sessions may require an additional routing path between the SS SMA@B 210 and SS SMA@A 204.

In accordance with the second embodiment, the session handover method can be implemented as follows. First, the CS SMA 214 establishes a terminal session with some SS SMA (e.g., 204). If any application sessions are in a suspended state (i.e., awaiting resumption), the CS SMA 214 compares the PIP of the SS SMA (204) involved and the PSMAIP. If these two IP addresses are the same, the session can be resumed as described above (no handover required). However, if the CS SMA 214 connects to a different SS SMA (e.g., 208), the CS SMA sends a special resume token to that SS SMA with the Sid containing the PSMAIP. In response, the SS SMA (208) establishes contact (using the SHP 212) with the SS SMA (204) pointed to by the PSMAIP. Subsequently, the present SS SMA 208 acts on behalf of the CS SMA 214 with respect to the previous SS SMA 204. As such, the present SS SMA 208

transparently passes SMP data units and data between the CS SMA 214 and the previous SS SMA 204. The previous SS SMA 204 processes data sent to it via the present SS SMA 208, as if the data had come directly from the CS SMA 214.

The Sid sent to the present SS SMA 208 for the handover procedure can have the format shown in FIGURE 5. The present SS SMA 208 removes the PSMAIP field from the Sid and sends the session resumption request to the previous SS SMA 204. The format of such a Sid can be the same as the format shown in FIGURE 3B. As such, the previous SS SMA 204 does not perceive any difference in the session resumption process through another SS SMA or directly from the CS SMA 214.

Although a preferred embodiment of the method and apparatus of the present invention has been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the spirit of the invention as set forth and defined by the following claims.

WHAT IS CLAIMED IS:

1. A system for use in improving communications mobility, comprising:

a first session management agent module, said first session management agent module coupled to a first communications terminal; and

at least a second session management agent module, said first session management agent module coupled to said at least a second session management agent module and communicating therebetween in accordance with a session management protocol.

2. The system of Claim 1, wherein said first session management agent module comprises a client-side session management agent module located in said first communications terminal.

3. The system of Claim 1, wherein said first session management agent module is coupled to said at least a second session management agent module by a multiplexed TCP connection.

4. The system of Claim 1, wherein said at least a second session management agent module comprises a server-side session management agent module located in an Internet.

5. The system of Claim 1, wherein said at least a second session management agent module includes a plurality of server-side session management agent modules.

6. The system of Claim 1, wherein said session management protocol comprises a format for conducting a communications session between two session management agent modules, said communications session further comprising a terminal session part and an application session part.

7. A communications session architecture for use in improving

communications mobility, comprising:

an application session part;

a terminal session part; and

a session identifier, said session identifier coupling said application session part to said terminal session part.

8. The communications session architecture of Claim 7, wherein a combination of said application session part and said terminal session part comprises said communications session.

9. The communications session architecture of Claim 7, wherein said application session part comprises an application session level, said terminal session part comprises a terminal session level, and said communications session architecture comprises a session management protocol.

10. The communications session architecture of Claim 9, wherein said session identifier comprises a first part associated with said terminal session level, and a second part associated with said application session level.

11. The communications session architecture of Claim 10, wherein said first part comprises a client number associated with a TCP connection for a mobile terminal, and said second part comprises at least one of a TCP connection number associated with said mobile terminal, a previous IP address associated with said mobile terminal, a current IP address associated with said mobile terminal, and an old client number associated with said mobile terminal.

12. The communications session architecture of Claim 10, wherein said first part comprises a client number associated with a TCP connection for a mobile terminal, and said second part comprises at least an application session number associated with said mobile terminal.

13. The communications session architecture of Claim 10, wherein said first part comprises a client number associated with a TCP connection for a mobile terminal, and said second part comprises at least one of a previous IP address associated with said mobile terminal, a current IP address associated with said mobile terminal, an old client number associated with said mobile terminal, and a previous server side session management agent IP address.

14. A system for use in improving communications mobility, comprising:

a first session management agent module, said first session management agent module coupled to a first communications terminal; and

at least a second session management agent module, said first session management agent module coupled to said at least a second session management agent module for conducting a communications session therebetween in accordance with a session management protocol, said communications session comprising a terminal session part and an application session part, a session identifier coupling said application session part to said terminal session part.

15. The system of Claim 14, wherein said session identifier comprises a first part associated with a terminal session level, and a second part associated with an application session level.

16. The system of Claim 15, wherein said first part comprises a client number associated with a TCP connection for a terminal, and said second part comprises at least one of a TCP connection number associated with said terminal, a previous IP address associated with said terminal, a current IP address associated with said terminal, and an old client number associated with said terminal.

17. The system of Claim 15, wherein said first part comprises a client number associated with a TCP connection for a terminal, and said second part comprises at least an application session number associated with said terminal.

18. The system of Claim 15, wherein said first part comprises a client number associated with a TCP connection for a terminal, and said second part comprises at least one of a previous IP address associated with said terminal, a current IP address associated with said terminal, an old client number associated with said terminal, and a previous server side session management agent IP address.

19. A method for use in improving communications mobility, comprising the steps of:

conveying session data from a first terminal to a first session management agent module;

conveying said session data from said first session management agent module to a second session management agent module by a multiplexed TCP connection and in accordance with a session management protocol; and

conveying said session data from said second session management agent module to a second terminal.

20. The method of Claim 19, wherein said first terminal comprises a wireless terminal and said second terminal comprises a terminal residing in an Internet.

21. The method of Claim 19, wherein said first session management agent module comprises a client-side session management agent module located in a mobile communications terminal.

22. The method of Claim 21, wherein said second session management agent module comprises a server-side session management agent module located in an Internet.

23. The method of Claim 22, wherein said server-side session management agent module is operable to communicate with at least another server-side session management module over said multiplexed TCP connection and in accordance with said session management protocol.

24. The method of Claim 19, wherein said session management protocol comprises a format for conducting a communications session between two session management agent modules, said communications session further comprising a terminal session part and an application session part.

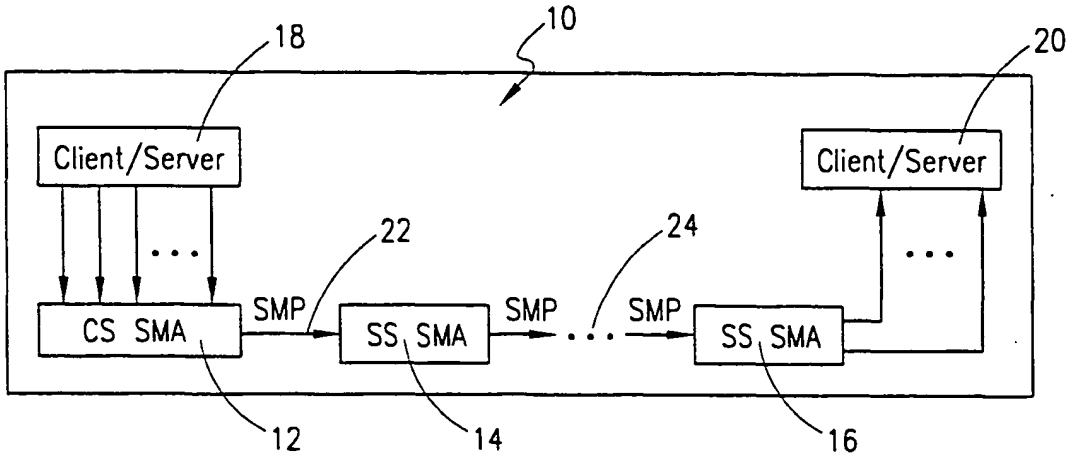


FIG. 1

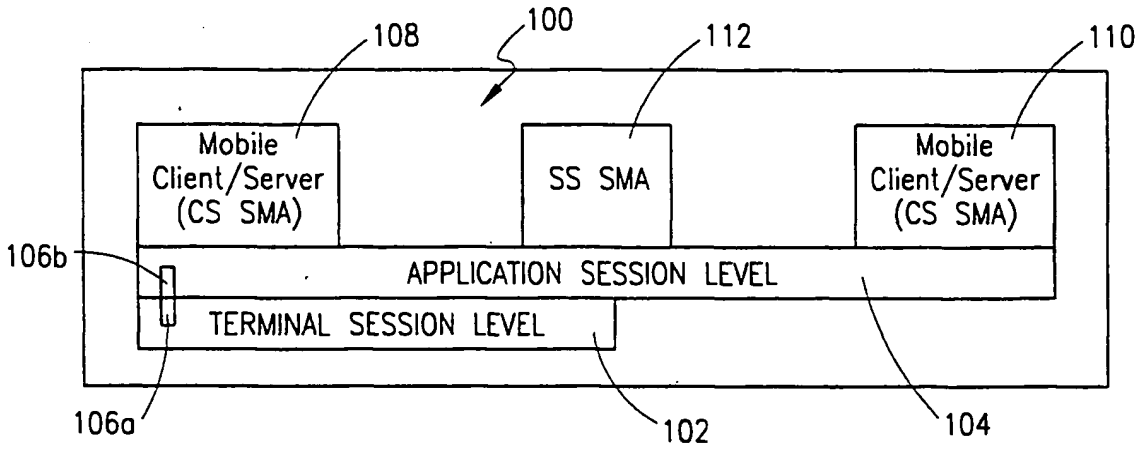


FIG. 2

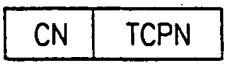


FIG. 3A



FIG. 3B



FIG. 5

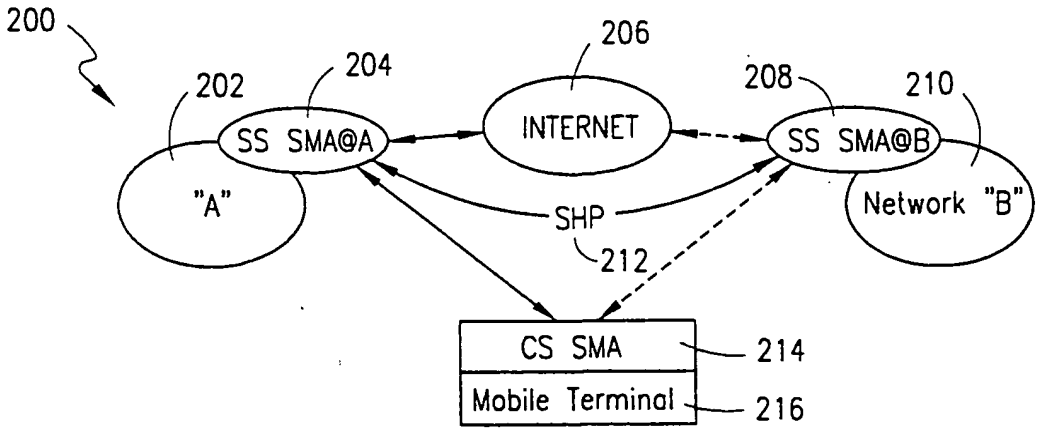

200
202
204
206
208
210
SS SMA@A
INTERNET
SS SMA@B
"A"
Network "B"
SHP
212
CS SMA
214
Mobile Terminal
216

FIG. 4

INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/SE 99/02501

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04Q

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	FUNATO D ET AL: "TCP-R: TCP mobility support for continuous operation" PROCEEDINGS 1997 INTERNATIONAL CONFERENCE ON NETWORK PROTOCOLS, ATLANTA, 28 - 31 October 1997, pages 229-236, XP002113581 USA page 231 -page 233	1,7,14, 19

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25 April 2000	03/05/2000

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H04L 12/00 | A2

(11) International Publication Number: **WO 00/70826**

(43) International Publication Date: 23 November 2000 (23.11.00)

(21) International Application Number: PCT/GB00/01877

(22) International Filing Date: 17 May 2000 (17.05.00)

(30) Priority Data:

9911484.5	18 May 1999 (18.05.99)	GB
9913748.1	15 June 1999 (15.06.99)	GB

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, 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, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, 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), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(71)(72) Applicant and Inventor: TANG, Bob [MY/GB]; 132 Sylvan Avenue, Wood Green, London N22 5JB (GB).

(54) Title: METHODS FOR FAST DIAL–ON–DEMAND INTERNET ACCESS WITH ANALOG MODEMS AT USER SIDES, VIA PUBLIC SWITCHED TELEPHONE NETWORKS, ENABLING APPARENT USER'S FULL SESSION–CONTINUITIES

(57) Abstract

The methods bypass present lengthy modem renegotiations (typically 20–30 seconds) to effect fast re–establishment of ISO Application–Oriented Layer communication link between user Application Programs/Browsers and Internet Service Provider, and enables complete session continuity without user being aware of noticeable difference due to frequent connections/disconnections of PSTN line. The methods at its most basic essence requires that the reconnecting incoming calls be routed to the same Port #/Modem unit/Data channel.

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BNSDOCID: <WO___0070826A2_I_>

METHODS FOR FAST DIAL-ON-DEMAND INTERNET ACCESS WITH ANALOG MODEMS AT USER SIDES, VIA PUBLIC SWITCHED TELEPHONE NETWORKS, ENABLING APPARENT USER'S FULL SESSION-CONTINUITIES

Fast Dial-on-Demand establishes the physical line connections only upon request from user's application programs (such as web browser) and disconnects when not in use for data transmissions, eliminating requirement for the PSTN connection to be maintained throughout the user session thus achieving substantial cost savings.

The methods presented here bypass present lengthy modem renogotiations (typically 20-30 seconds) to effect fast re-establishment of ISO Application - Oriented Layer communication link between user Application Programs/Browsers and Internet Sevice Provider, and enables complete session continuity without user being aware of noticable difference due to frequent connections/disconnections of PSTN line.

METHOD 1

Internet Service Provider implements a PBX module which monitors incoming calls extracting DTMF Caller-ID (ie caller's phone number) and checks against existing maintained table of modem unit # (or Port #, Data channel)/ Caller-ID to switch the incoming call to the corresponding modem unit (or Port #/Data channel))if found on the table. If not already on the table, it will be treated as a first time dial-up connection, whereupon the usual modem negotiations, authentications and Dynamic IP address assignment will take place and therafter a new modem unit #(or Port #, data channel)/ Caller-ID entry for this session connection will be created on the Table.

The ISP could set the Idle Period before terminating session to say 15 minutes; if there has been no transmission line activities during this period the user's Dial-on-Demand session will be terminated, the modem unit and Dynamically assigned IP address returned to resource pool, and the corresponding modem unit # (or Port #,data channel) / caller-ID entry removed from Table. This prevents tying up of modem(or Port, datachannel), IP address resources by inactive Dial-on-demand sessions.

The ISP modem setting for elapsed time period before terminating line connection upon NO CARRIER DETECT (ie caused by user Dial-on-demand software package hanging up telephone line when there are no data transmissions) could be set to the same 15 minutes above, to allow for subsequent instantaneous modem reconnections to new incoming calls by the

same user session if within the 15 minutes period after user Dial-on-Demand software package last hanging up on the PSTN line connection.

The user Dial-on-demand software package could be set by user to hang up on the PSTN line connection to ISP after a period of say 45 seconds transmissions inactivity to save on phone costs. Most browsers have webpage access connection time-out of around 30 seconds, ie browsers will abort attempt to download webpage if access to the URL site clicked on was not established by then. Within the next 15 minutes after hanging up whenever the Dial-on-demand software package detects via user's Operating System (eg Telecommunication Application Programming Interface environment of Microsoft Windows Operating systems) user program's request for Internet access, the software package redials the ISP number; whereupon the ISP module checks the incoming Caller-ID against Table of modem unit # (or Port#, Data channel) / Caller-ID to route the incoming call to be connected to the corresponding modem unit (or Port #, data channel) it was previously connected to. The Dial-on-Demand Software Package insulates the user's Application Programs/Browsers from the PSTN line connection/disconnection events : the Application Programs/Browsers could assume the PSTN line is connected all the time.

The user Dial-on-Demand software package could further saves on phone connection costs by immediately hanging up PSTN line when webpages/files download from Internet site is completed, or when browser is not expecting any further incoming response to outgoing transmissions sent. The status/ events are detected by software package from the informations contained in

Operating System (eg Telephony Applications Programming Interface environment of Windows).

The user Dial-on-demand software package could also monitors incoming call's DTMF Caller-ID from ISP during the next 15 minutes above after software package hanging up the PSTN line connection (which signifies that there's incoming data transmission while the PSTN line is hung up after inactivity period of 45 seconds above, were ISP server software incorporated Dialling to user to notify of incoming transmissions for the Session); upon such detection to redial to ISP, whereupon the ISP PBX module effects fast re-establishment of communication link.

The method enables apparent user's full session-continuity , ie HTTP/FTP/TELNET/ONLINE GAMING/AUDIOVISUAL STREAMING continuities.

The method at its most basic essence requires that the reconnecting incoming calls be routed to the same Port #/Modem unit/Data channel (eg to the same DS0 of the ISP's PRI). As a very basic workable example (only one of several!) of PBX Module implementation for ISPs with Lucent Technology PortMaster4 and PRI lines (note that there is no modem banks deployed here), all that is required is for the ISP's Telecommunication Service Provider to customise the Exchange Switching Software to suppress the disconnection event and reserve the same DSO of the PRI for Dial-in subscriber to reconnect (identified by Caller-ID) within the said 15 minutes after disconnection. Where subscriber does not reconnect within the said 15

minutes, the Exchange Switching terminates and releases the DSO in the usual manner. The DSO link is treated by ISP as 'live' (thus enabling Dial-in subscriber to reconnect the PSTN line and be immediately Online again to continue the same Session from where was left off retaining the same Session IP address) for 15 minutes after Dial-in subscriber's disconnection, although no datacommunication is possible until Dial-in subscriber reconnects the PSTN line (routed by Exchange Switching Software to the same DSO) within the said 15 minutes.

METHOD 2

By having a pre-arranged common modem settings, eg specific common connection rate (eg 56KBS), hardware flow control, parity, compression; and installing modified modem drivers to connect at above pre-arranged common settings at both ISP & user modems, lengthy modem negotiation is bypassed for every Dial-ins achieving fast establishment (eg 1 second-4 seconds) of ISO Application-Oriented Layer communication link.

The ISP access authentication server system only needs to maintain/check a table of current Session dynamic IP address assigned / Caller-ID to ensure that the reconnecting user gets assigned the same IP address at every subsequent reconnections if reconnecting within a period of say 1 hour since last PSTN line disconnection (else the corresponding IP address / Caller-ID entry is removed from Table and the IP is returned to the resource pool). If the Caller-ID is not on the Table on user dial-in, the server will dynamically assign a new IP address for the session, and create a correponding current Session dynamic IP address assigned/Caller-ID entry on the Table.

On its own, or together with user Dial-on-demand software package described in Method 1, this Method enables apparent user's full session-continuity, ie HTTP/FTP/TELNET/ONLINE GAMING/AUDIOVISUAL STREAMING continuities.

METHOD 3

The ISP maintains a 'State Information' of all users by their Caller-ID. The 'State Information' contains permanent details of user's modem connection settings (eg user specific connection speed/protocol, flow control method, parity, compression method) and details of user's current Dynamically assigned IP address for the Session. The user modem driver is modified to connect at above user specific settings, & an appropriate ISP modem driver is selected corresponding to the incoming Caller-ID & assigned to the ISP modem unit, before the incoming line is picked up by the modem unit, hence doing away with lengthy modem negotiations.

Upon detection of DTMF Caller-ID for the Dial-in to a modem, the ISP server will select an appropriate modem driver & set the modem unit to the user specific modem setting details contained in the Caller-ID's 'State Information' before the modem unit picks up the incoming line thus bypassing lengthy modem negotiations, authenticates user and assigns user with the same IP address entry in the 'State Information' if present. If IP address is absent the ISP access authentication server will dynamically assign a new IP address to user for the Session, and record it in user's current Dynamically assigned Session IP address field of user's 'State Information'. After a pre-set Idle Period of say 1 hour the entry in Session IP address from the field in 'State Information' is removed & the IP address is returned to resource pool (to prevent excessive tying up of IP resource by inactive

sessions) , and any subsequent Dial-in will then be assigned a new new Session IP address.

On its own, or together with user Dial-on-Demand software package described in Method 1, this method enables fast establishments (eg 1second-4 seconds) of ISO Application-Oriented Layer
communication link, together with apparent user's full session-continuity, ie HTTP/FTP/TELNET/ONLINE GAMING/AUDIOVISUAL STREAMING continuities.

2. A method as claimed in Claim 1, said method having the PBX module implemented by the ISP's Telecommunication Service Provider in the Exchange Switching Software, customising for the ISP access # so that reconnecting calls within a preset time period, based on their Caller-IDs are routed to the same Port # / Datachannel before, the Port # / Datachannel being reserved for the Caller-ID for a preset time period since user last Disconnects; the ISP's Modem Unit(or Port/Datachannel) is kept 'live' for a preset time period since last PSTN disconnection enabling Dial-on-Demand users to reconnect the PSTN line within the preset time period and be immediately Online again to continue the same Session from where was left off retaining the same assigned Session IP Address; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physcial PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnect the physical PSTN line.

3. Method for Dial-on-Demand Internet access with analog modems at user sides, via Public Switched Telephone Networks, enabling session continuity without user being aware of noticable difference due to frequent connections/disconnections of physical PSTN line, said method having a pre-arranged common modem connection settings for users to connect to ISP ; the ISP checks a a Table of current Session dynamic IP assigned / Caller-ID to ensure the reconnecting user gets assigned the same IP Address at every subsequent reconnections if reconnecting within a preset time period since last physical PSTN line disconnection; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physcial PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnects the physical PSTN line.

NOTES

1. Modem units referred to may be virtual/software modems, eg Lucent Technology PM4 's Modem DSP with PRI lines : the connecting of incoming DSO from PRI to specific Modem DSP could also be effected by assigning incoming DSO to the the same TDM bus time slot of the Modem DSP.

2. The Dial-on-Demand software package is here described for predominantly Internet usage, but is also applicable for use in connection between any two user application programs on two computers connected by analog modems via PSTN line.

3. Method 1 described above may also be appled for users with digital Terminal Adapters instead of analog Modems.

CLAIMS

1. Method for Dial-on-Demand Internet access with analog modems at user sides, via Public Switched Telephone Networks, enabling session continuity without user being aware of noticable difference due to frequent connections/disconnections of physical PSTN line, said method having the Internet Service Provider implements a PBX module which monitors incoming calls extracting DTMF Caller-ID and checks against existing maintained Table of Modem Unit #(or Port #/Datachannel) / Caller-ID to switch the reconnecting PSTN line to the same Modem Unit #(or Port#/Datachannel) before, the ISP's Modem Unit(or Port/Datachannel) is kept 'live' for a preset time period since last PSTN disconnection enabling Dial-on-Demand users to reconnect the PSTN line within the preset time period and be immediately Online again to continue the same Session from where was left off retaining the same assigned Session IP Address; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physcial PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnect the physical PSTN line.

4. Method for Dial-on-Demand Internet access with analog modems at user sides, via Public Switched Telephone Networks, enabling session continuity without user being aware of noticable difference due to frequent connections/disconnections of physical PSTN line, said method having the ISP maintains a 'State Information' of all users by their Caller-ID containing permanent details of user's specific modem connection settings and details of user's current Dynamically assigned IP Address for the Session, to select/initialise an appropriate ISP Modem Driver corresponding to the incoming Caller-ID before the incoming line is picked up by the modem unit; the ISP assigns reconnecting user with the same Session IP Address as before if reconnecting within a preset time period; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physcial PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnect the physical PSTN line.

5. A method as claimed in any of the preceding Claims, in which the method is applied between any two user Application Programs on two computers connected by PSTN line.

6. A method as claimed in any one of Claims 1-3, in which the method is applied to users with digital Terminal Adapters instead of analog Modems.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 November 2000 (23.11.2000)

PCT

(10) International Publication Number
WO 00/70826 A3

(51) International Patent Classification⁷: H04L 12/28, 29/00

(21) International Application Number: PCT/GB00/01877

(22) International Filing Date: 17 May 2000 (17.05.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9911484.5 18 May 1999 (18.05.1999) GB
9913748.1 15 June 1999 (15.06.1999) GB

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(81) Designated States *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, 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, NO, NZ, PL, PT, RO, RU, SD, SE, 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, 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), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*
— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

(88) Date of publication of the international search report:
1 February 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 00/70826 A3

(54) Title: METHODS FOR FAST DIAL-ON-DEMAND INTERNET ACCESS WITH ANALOG MODEMS BYPASSING LENGTHY MODEM NEGOTIATIONS

(57) Abstract: The methods bypass present lengthy modem renegotiations (typically 20-30 seconds) to effect fast re-establishment of ISO Application-Oriented Layer communication link between user Application Programs/Browsers and Internet Service Provider, and enables complete session continuity without user being aware of noticeable difference due to frequent connections/disconnections of PSTN line. The methods at its most basic essence requires that the reconnecting incoming calls be routed to the same Port #/Modem unit/Data channel.

BNSDOCID: <WO__0070826A3_I_>

INTERNATIONAL SEARCH REPORT

Inte. onal Application No
PCT/GB 00/01877

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/28 H04L29/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99 12380 A (TELEFONAKTIEBOLAGET LM PUBL) 11 March 1999 (1999-03-11) page 4, line 6 - line 10 page 14, line 13 - line 29 page 19, line 15 - line 20	1-6
A	WO 97 37458 A (NETSPEED INC) 9 October 1997 (1997-10-09) page 2, line 30 -page 3, line 10 page 10, line 17 - line 23 page 15, line 22 -page 16, line 29 page 19, line 11 - line 30	1-6
A	US 4 817 114 A (BOER JAN ET AL) 28 March 1989 (1989-03-28) abstract	1

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Date of the actual completion of the international search	Date of mailing of the international search report
17 November 2000	24/11/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Mikkelsen, C

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BNSDOCID: <WO__0070826A3_I_>

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte onal Application No
PCT/GB 00/01877

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BNSDOCID: <WO___0070828A3_I_>

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6: G06F 17/30 — A1

(11) International Publication Number: **WO 99/08208**

(43) International Publication Date: 18 February 1999 (18.02.99)

(21) International Application Number: PCT/NZ98/00121

(22) International Filing Date: 12 August 1998 (12.08.98)

(30) Priority Data:
328538 12 August 1997 (12.08.97) NZ

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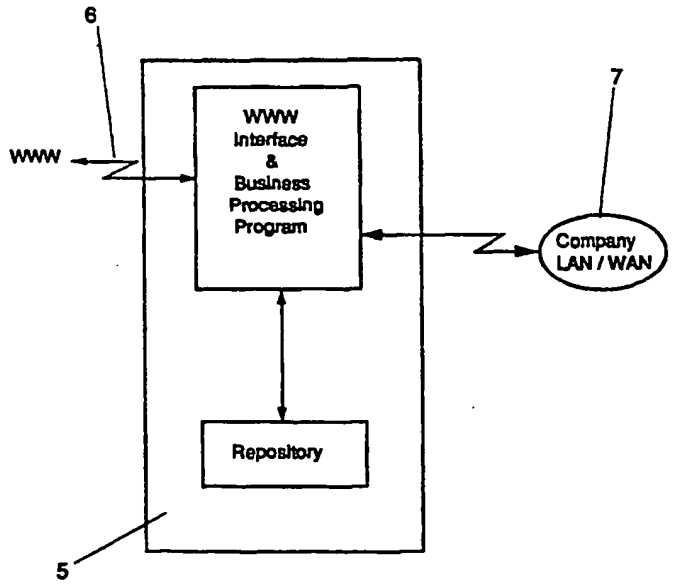
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(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: INTERNET TRANSACTION PROCESSING INTERFACE



(57) Abstract

An Internet transaction process interface for software applications residing in an object oriented client server environment which dynamically generates HTML code. Internet user requests are passed from a web server to the object oriented environment. User session management, manages and maintains web connected users via use of use TCP/IP address lists, unique session IDs and their corresponding session objects. Each session object calls upon pre-stored application forms which includes menus, controls and implicitly assigned data from the user requests. The controls are executed via a method and the output returned to the form, this is then converted to corresponding HTML strings and passed back to the web browser.

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"INTERNET TRANSACTION PROCESSING INTERFACE"

TECHNICAL FIELD

This invention relates to an internet transaction processing interface.

BACKGROUND ART

Figure 1 represents the conventional manner in which a software application is "web enabled". By 'web enabled' is meant the provision of access via the world wide web to an application and associated database instead of via a private local area or wide area network.

The web interface or "adapter" program 1 is usually developed as a totally separate computer program from the computer program which implements the in-house business transactions. Numerous products/tools are available that allow for the development of both static and dynamic web pages. In this diagram the database is identified as 2 and the business processing program is identified as 3. The business processing program is connected to the enterprise LAN/WAN 4. In such prior art systems the web transactions are treated separately and differently from the standard business transactions. The web transactions are processed by a different program which will be written in a different language using a different tool. Any significant change in the database structure would result in changes having to be made in both the web interface program and the business processing application. Additionally any significant change in the handling of any specific transaction would also need both the interface program and the business application program to be modified.

In many cases the traditional or typical environment available today is a mixture of a number of tools of different vendors. In the example illustrated in Figure 1 it would be likely that the web interface program, the database and the business program are all generated from totally different products potentially sourced from different vendors. For example the database might be Microsoft SQL Server, the business program might be written in Visual Basic and the wen interface written in Perl.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide an internet transaction processing interface which overcomes the above identified disadvantages of the prior.

Accordingly in one aspect the invention consists in an Internet transaction processing interface for software applications residing in an object oriented client server environment comprising

(a) means for passing Internet user requests from a web sever to said object oriented environment,

(b) means which manage web connected user sessions including maintaining a list of connected web user TCP/IP addresses together with unique system generated session IDs, checking requests for session IDs contained in said list and retrieving a corresponding session object if found, while if not found creating a new session object,

(c) means which accept requests from each session object to call an appropriate pre-stored application form including menus and controls and assigns data implicit in said requests to said controls,

(d) means which cause a method associated with said controls to be executed and to return output data to said form,

(e) means which accept said form, controls and menus and generates an HTML string by substituting html commands for corresponding form, controls and menus said HTML string capable of displaying on a web browser a page which corresponds to said form, said request passing means receiving said HTML string and passing it to the web server.

In a second aspect the invention consists in a method of providing Internet access to software applications residing in an object oriented client server environment comprising

receiving Internet user requests at a web server, passing Internet user requests from said web server to said object oriented environment,

producing for each new session a unique system generated session ID,

maintaining a list of connected web user TCP/IP addresses, together with said unique system generated session IDs, checking requests for session IDs contained in said list and retrieving a corresponding session object if found, while if not found creating a new session object,

accepting requests from each session object to call an appropriate pre-stored application form including menus and controls,

assigning data implicit in said requests to said controls,

executing a method associated with said controls, said method returning output data to said form,

generating an HTML string by substituting corresponding html commands for said form, controls and menus, said HTML string capable of displaying on a web browser a page which corresponds to said form, and passing said HTML string to the web server.

In the present invention the web interface, the business processing and the database are all integrated and operating in real time and are sourced from the same development environment. The essential processing steps performed by the interface are shown in figure 4, where the IIS (Internet Information Server) is standard web server software, such as Microsoft Internet Information Server.

The advantages of the preferred form of the present invention include increased reliability as only a single development tool is involved, reduced costs of operation as only a single entity needs to be maintained, consistency of view and that all data is potentially available to all users, consistency of processing as the code processing a web initiated transaction can be the same code used for processing a LAN/WAN transaction.

Strictly speaking, all web pages are dynamically create although the facility to include static pages as a part of dynamic generate is possible. A developer can create an application in one complete graphical environment and deploy this application on the web.

BRIEF DESCRIPTION OF THE DRAWINGS

in which

Figure 1 represents the existing typical internet transaction processing interface;

Figure 2 is the transactional processing interface according to the present invention broadly represented;

Figure 3 is a more detailed representation of the transactional processing interface according to the present invention;

Figure 4 is a flow diagram representing the sequence of processing events carried out in the present invention, and

Figure 5 is a diagram showing how the present invention serves as an interface to more than one software application.

BEST MODES FOR CARRYING OUT THE INVENTION

The present invention in one aspect is diagrammatically and simply represented in Figure 2. A single application established by the development environment 5 can receive input from and deliver output to both the web 6 and the standard LAN/WAN environment 7 of a business enterprise. Any change to the database (repository) or the program is instantly available to all potential users as the development environment 5 ensures consistency.

In this way the web interface, the business processing application and database are all integrated and sourced from the same development environment, leading to the advantages as specified above.

The essential features of the web interface of the present invention will now be described

1. Automatic Generation of Web Interfaces

The same forms developed for an application deployed on a LAN/WAN are

made available for deployment on the web thereby allowing the application to be run from the web. HTML code is automatically generated for each form accessed by a web user.

Typically, the HTML code generated will conform to the HTML 3.2 standard. This allows a developer to generate a single user interface that is compatible with multiple browsers.

2. Session Management

A session is created for each user that accesses an application through the web. A session will store information such as the session ID, time created, form name and client address. When the application is first accessed a unique random session ID will be assigned to the user. This ID will be included on every form while remaining invisible to the user.

4. Application Clients

Application clients running on the LAN can also be running the same application as is being run from the web. The user interface forms for the LAN client can be the same as the ones defined for the web or they can be different. This allows the application developer to have one application with the same or different views of that application data as between LAN and web users.

In the preferred embodiment of the invention Microsoft Internet Information Server (IIS) is used as the web server. ISAPI is used to communicate with the IIS.

Security is implemented using Windows NT Security and IIS security for data access and secure sockets layer for data transmission. All these facilities are

provided by Windows NT and the Internet Information Server and is not specific to the JADE environment.

Figure 3 shows a more detailed view of the internet transaction processing interface according to the present invention. A web server PC 8 is shown web running an application 9 with a Repository 10 and a web interface 11 according to the present invention A remote Internet connected PC 13, having a world wide web browser 14 displaying an HTML page 15 is connected to the server 8. At the same time the application 9 is connected through the LAN/WAN 16 to a client PC 17 operating a client node 18 and application windows (forms) 19. The web client PC may be running an NT, Win.95, W3.11, Mac or Unix operating system and any HTML 3.2 compatible browser.

It should be appreciated that the present web interface allows access to more than one business application running on the server. This is illustrated in figure 5 where three applications 9a, 9b and 9c are shown by way of example. A web user can access any one of these applications provided the application name is included in the URL entered in the web browser. In addition many web users may concurrently access the same business application.

The Internet transaction processing interface of the present invention is preferably incorporated in an integrated object oriented development and run-time environment such as JADE™ (produced by Aoraki Corporation Ltd and described in the JADE Technical Overview (4.0), published in August 1997). A more detailed description of the invention will now be given with reference to JADE.

Automatic Generation of the Web Interface

Within the JADE development environment the JADE forms painter offers a

web page as an additional form style on the "create new form" dialogue. When this is selected as the form style the painter switches to a mode that supports HTML style windows. The form creation grid will automatically be set up to support character-mode style painting.

A web insert control allows the contents of a file containing HTML code to be inserted as part of the HTML generation. The file contents are copied as is. The web HTML control allows text to be directly inserted into the generated HTML.

A WEBHTML control allows for the direct insertion of HTML code. This code is then included as a part of the dynamically generate HTML.
There is also a hot spot control that allows hot spots to be placed on an image.

The HTML generation process starts when the "show" method (code segment) of the form is called. The generation is as follows: the form load method is invoked. This method must set up all the required information in the controls e.g. a combo box must be populated in this method. Once the load process has completed then the HTML generation is started by calling the output HTML method for the form, the menu items and the controls. This generation creates a string, containing HTML text. The string is then returned to the web browser which then displays the information. A range of controls that have an equivalent HTML 3.2 syntax are provided. Image generation is allowed for, as part of the HTML generation. When an image is encountered, the image file will be created and stored in the jpeg format.

Examples of JADE painter - HTML syntax correspondence are:

Jade Form Class	HTML Equivalent
Form	<Form>

Jade Control Class	HTML Equivalent
Button	< INPUT TYPE = SUBMITS>

Jade Menu Class	HTML Equivalent
Menu Item	Generated as static text

2. Session Management

Whenever a new JADE schema is created a sub class of WebSchema is created for it. This allows the application developer to keep information relating to a web session. The schema dialogue allows the default web session sub class name to be changed. A new system property currentSession is available for use in the JADE logic. This property is used to get the session object for the current web session. The property will be null if there is no current web session.

A transient instance of WebSession is created when the application is started and stored in the application property in the WebSessionManager. When an internet request is received by the JADE application, the web sessions dictionary in the web session manager instance is accessed to determine whether the session is for an existing session. This is done by searching the dictionary using the TCP/IP address and the encrypted content of the hidden field "Session ID". If there is no such dictionary entry a new instance of the web session sub class is created. The TCP/IP address for the new user is set in the object (Client IP address). A new session ID is generated and set and the object is added to the web session dictionary.

The encrypted version of the Session ID is converted to a hexadecimal string and placed in the encrypted session ID property. This field is used as a key to the dictionary, rather than a session ID to save the overhead of encrypting the returned hidden field which would end up with the session ID.

If multiple copies of the application are initiated then they will use the same copy of the web session manager instance.

The encrypted session ID is embedded as a hidden text field in every web page that is sent to the user. Creation time stamp of the web page is also stored as a hidden text field on the page. The last access time stamp is used to determine disconnect status. If there is no activity for a session for the user specified time then the session is ended.

3. Web Applications

JADE applications can be web enabled by setting the web enabled check box. If an application is web enabled then the following will apply.

The startup form defined for the application is the first web page that the user sees when they invoke the application from the web browser. The startup form that is displayed when the user runs the application is a form that is provided with JADE. This form will allow monitoring and control the web requests. A web enabled application will also invoke it own initialize method (webInitialise) and this cannot be overridden. Application features such as MDI and 3D controls are also ignored for web enabled application.

4. Web Forms

Except for the previously mentioned Painter facility JADE does not distinguish between web forms and non-web forms. However, depending on whether the application is web enabled or not the process involved in displaying the form will be different.

5. Event Handling

Click methods on controls will be executed as at present. If a click method is present the generated HTML has the URL set up and a click on this control will cause a request to be sent back to the JADE application. No other event method will be processed (unless it is explicitly called from the click method). When a request is sent to the JADE application the web browser waits for a reply. If the JADE code that is processed does not initiate the creation of another web page then the form that was previously displayed is redisplayed. If there were no previous forms then the start up form is displayed. This is so the web browser does not end up waiting forever for a response.

6. Unhandled Exceptions

The web application is armed with a global exception handler. When an unhandled exception occurs the error is recorded to the web user and logged on the JADE client computer. The JADE client is also informed of this error, the operation aborted and the web user is returned to the previous page.

7. Message Box Handling

The MSG box method in the application class is reimplemented in the root schema application class. This creates a HTML page and returns to the web user. As there is no modal capabilities with web applications any code following an application message box will continue to be executed.

8. Web Browser

The HTML code that is generated by JADE conforms to the HTML 3.2 specification. Specific Netscape or Explorer extensions are not used. The

user can still add these specifics by inserting raw HTML into the web page as previously described.

9. The JADE Web Connectivity

The processing of requests form a Microsoft Internet Information Server, (IIS) is handled by the following components (see also figure 4):

A The web interface software, jadehttp.dll, which is directly called by IIS for each internet request made. This dll will connect to a JADE system application via a named pipe (see B below). The jadehttp.dll sends the received user request over the channel to the JADE application, which processes the request and returns an HTML page for transmission to the internet user.

B A JADE class *InternetPipe* provides the ability for a JADE system to establish a communications channel with another program. To communicate with the jadehttp.dll, the application creates an instance of this class and then offers the named pipe for opening. Once the dll opens the other end of the channel, the JADE system waits for input from the dll. When input arrives, the JADE system processes that input and sends the reply back to the dll. The JADE system waits for more input.

Because the jadehttp.dll communicates directly with a standard JADE application, there are no limitations placed on the JADE facilities that can be used.

The JADE system asynchronously waits for input from the named pipe. This means that the JADE client is able to perform other tasks when idle such as monitoring and display of the system processing status.

The jadehttp.dll has been generalised so that communication can be initiated with any JADE system.

10. Initiation Flow

Each schema in the JADE database can be made web capable by defining a web-enabled application instance. This JADE application then communicates with the jadehttp.dll when it is initiated. This application opens an InternetPipe class instance with the name of the application as its name and waits for the jadehttp.dll to connect to the other end of the pipe. Once the pipe is connected, it waits for Internet requests to be sent over the pipe.

When the first request for the JADE application is received, the IIS initiates the jadehttp.dll and calls the GetExtensionVersion entry point in the dll to obtain the ISAPI version being used. The dll initialises itself as part of this call and attempts to open a pipe using the application name that must be passed as part of the initiation. It does not matter at this stage whether the open was successful or not. The dll assumes that the pipe is to be opened on the same device unless it finds a .ini file named jadehttp.ini with a JadeHost entry in a section with the application name.

To process multiple Internet requests simultaneously, additional copies of the JADE application can be run. Each copy opens its own instance of the named pipe and the jadehttp.dll will utilise those additional pipe channels as required.

11. Process Flow

The process flow for the handling of the JADE application will be as follows (see also figure 5):

I. The Internet Client will connect to the JADE application by invoking the jadehttp.dll passing the application name in the script directive.

II. This directive causes the IIS server to pass requests to this dll.

III. When there is such a script directive, the IIS call HttpExtensionProc entry point in the jadehttp.dll, passing the information describing the client request.

IV. The HttpExtensionProc routine will obtain and lock an available named pipe connection and send the request to the attached JADE application process. It then waits for the reply from the JADE system, which when received is sent to the internet client and the name pipe connection is unlocked. If there are other queued internet requests waiting (in a 'first in first out' queue), the first queued entry is removed from the queue and its associated thread awakened (see VII below). The thread finally exits back to the IIS caller.

V. If no named pipe channels are open, the open is attempted. If still no channel is available, the internet user will be sent the contents of the file 'jadehttp.htm' which informs them that the service is not available. If that file is not available, a simple 'service not available' message will be sent. If a channel was opened, the process restarts at IV above.

VI. If there are named pipe channels open but all are in use, every tenth time this occurs, an attempt will be made to open another pipe connection. For this to succeed, another copy of the JADE application must have been started. If the open succeeds, the processing continues as at IV.

VII. If there are still no available connections, the request will be added to a first in first out queue and the thread halts waiting for its turn at the available pipe channels. These entries will be processed when another thread completes its processing as at step IV.

VIII. If a pipe channel is broken by the connected JADE application terminating, the dll will remove that pipe from the list of available channels. When the JADE application is restarted, because of the above scheme, the dll will re-establish the channel transparently without any intervention required.

The HttpExtensionProc entry point can be called simultaneously by multiple IIS threads, and so the dll is 'thread safe". This means each thread is able to execute simultaneously without affecting other thread copies.

Certain sections of the logic must be singled threaded to ensure integrity. For instance, locking an available pipe instance. This is achieved by using the Window's standard Critical Section facility. The single threaded sections of logic are kept to an absolute minimum.

12. Jade Processing

When the JADE system receives an internet request, the processing is as follows (see also figure 4):

I. From the input data, the TCP address and the contents of a hidden field containing the encrypted session id are obtained.

II. These fields are used to search the session dictionary for an existing session object for this client. If the entry is not found in the dictionary, a new client session object is created (See Client Session Control below).

III. A method 'processRequest' of the session object is then called, passing the requested data to the system. This method must process the request and ultimately send a formatted HTML page back via the

named pipe instance on which the input data was received. The jadehttp.dll sends this page to the user and the IIS server is informed that the request processing is complete.

13. Termination Flow

If the web service of the IIS is stopped, it calls the TerminateExtension entry point of the jadehttp.dll. This function closes the named pipe connections to the JADE application.

The JADE application threads treat the pipe closures as an instruction to terminate.

14. Client Session Control

Client Internet sessions are managed as follows:

I. A list (dictionary) of active client internet sessions is maintained in the JADE database. This list is accessed using the client's TCP/IP address and a hidden encrypted session ID transmitted and returned with each HTML page for that client. The TCP/IP address is not necessarily unique across users, but the session ID is. The use of the TCP/IP address provides an additional level of security protection. Encrypting the session ID minimises the possibility of another user forging access, as both the TCP/IP address and the encrypted session key must be valid while the other user is logged on.

II. The encryption is achieved using the standard Microsoft RSA encryption APIs. Each time the JADE application is initiated, a new 40 bit encryption key will be generated for the encryption process. The 4 byte session ID will be encrypted into a 64 bit key using the

standard block encryption method available.

III. When a user request is received, the request data is scanned for the hidden session ID information. If not present, or the TCP/IP and decrypted session ID combination is not located in the session list, a new session is commenced. This consists of creating a new unique session ID and a client session object in the JADE database and adding an entry to the session list for the TCP/IP address and session ID.

IV. If the TCP/IP and decrypted session ID combination is found in the session list, then the existing associated session object (information) is retrieved.

V. Each request received from that client session will be passed to that same session object. This is achieved by calling the 'processRequest' method of that session object.

VI. The JADE system will detect a new client session by the absence of a session object for that user.

VII. In this case, a new session object will created for that client.

VIII. These session objects will be "timed out" after an application defined time. If no requests are received within that time limit, then the session will be deemed to have "timed out". Should the user transmit a request after that "timed out" period, they will be provided with a "timed out" message.

XI. Session objects which have "timed out" will be deleted after a defined time. This will have the same effect as in (VIII) above except that no "timed out" explanation will be given.

X. Should the JADE application be taken down or crash, no session will be deemed to remain open. Users will be forced to reconnect and logon again.

15. JADE Named Pipe Class

The JADE application uses a subclass of NamedPipe to define the requirements for handling the pipe channel to the jadehttp.dll.

When the application is initiated, it creates an instance of the InternetNamedPipe which is stored in the WebSessionManager property internetPipe. An asynchronous open is then requested on that pipe.

When the jadehttp.dll opens the other end of the pipe, the openPipeCallback method is called. This method initiates an asynchronous read on the opened pipe.

When there is data available on the pipe, the readPipeCallback method is called. This method performs the session evaluation processing as described previously. The processRequest method is called for the internet session object created or found.

When the processing of the request is completed, the formatted HTML page will be sent back to the jadehttp.dll by calling the reply method of the session object. This method sends the reply to the jadehttp.dll, deletes the session object if required and initiates another read on the named pipe.

16. Logging

Should a problem occur with any processing in the jadehttp.dll, an entry will be posted to a file named 'jadehttp.log' located in the same directory as the

dll. Any failures that occur will be as a result of the JADE system's unavailability.

The IIS server will log all Internet requests received into its own log file. IIS logging should be enabled and it is recommended that the option for a new file to be automatically started each day be set.

The jadehttp.dll will also post routine messages into the log when initiated, closed and when connections to the JADE Named Pipes channels are made and broken.

17. Ini File

When the jadehttp.dll is initiated, it will search for a .ini file named 'jadehttp.ini' file located in the same directory as the jadehttp.dll:

If the file is not found, or there is no section with the application name or there is no JadeHost parameter, then it is assumed that the JADE System is located on the same device as the IIS and '.' is assumed.

18. Web Server

Microsoft Internet Information Server 2.0 is supported. The IIS has to be set up with virtual directories and the appropriate paths defined. As this is an IIS function, it will not be described here.

19. Security

Security can be defined at several levels.

I. Windows NT Security

Windows NT security will protect the computer and its resources by requiring assigned user accounts and passwords. It can control access to computer resources by limiting the user rights of these accounts. It can use the Windows NT File System (NTFS) to assign permissions to folders and files on the computer. You can control access to folders and files by preventing users from copying files to or from a folder, or by preventing users from executing files in certain folders.

II. Internet Information Server Security

In addition to Windows NT security, IIS provides additional security by restricting IP addresses, or checking user names and passwords (basic or Windows NT Challenge/Response). In addition, it also provides a security protocol, called Secure Sockets Layer (SSL). This protocol is layered between its service protocols (HTTP) and TCP/IP. The SSL provides data encryption, server authentication and message integrity for a TCP/IP connection.

III. Application Security

The user application can define its own security scheme via the facilities available within JADE.

20. User Preferences

The JADE application developer can set the following preferences:

I. showModal forms.

Display an error or treat the showModal command as a show. Default behaviour is to display an error.

II. Session timeout.

Specifies the timeout period that determines when the session is to end. Default is 60 minutes. A value of 0 means no timeout.

Support for JAVA Applet

A JADE developer can "paint" a JAVA applet into the JADE painter to be included as part of the HTML generation. These JAVA applets are created outside of JADE.

CLAIMS:

1. An Internet transaction processing interface for software applications residing in an object oriented client server environment comprising

a. means for passing Internet user requests from a web sever to said object oriented environment,

b. means which manage web connected user sessions including maintaining a list of connected web user TCP/IP addresses together with unique system generated session IDs, checking requests for session IDs contained in said list and retrieving a corresponding session object if found, while if not found creating a new session object,

c. means which accept requests from each session object to call an appropriate pre-stored application form including menus and controls and assigns data implicit in said requests to said controls,

d. means which cause a method associated with said controls to be executed and to return output data to said form,

e. means which accept said form, controls and menus and generates an HTML string by substituting html commands for corresponding form, controls and menus said HTML string capable of displaying on a web browser a page which corresponds to said form, said request passing means receiving said HTML string and passing it to the web server.

2. An Internet transaction processing interface according to claim 1 further including means which establish communication channels between said request passing means and any one of a plurality of applications residing in said client server environment, each channel corresponding to a different web user request.

3. A method of providing Internet access to software applications residing in an object oriented client server environment comprising

receiving Internet user requests at a web server, passing Internet user requests from said web server to said object oriented environment,

producing for each new session a unique system generated session ID, maintaining a list of connected web user TCP/IP addresses, together with said unique system generated session IDs, checking requests for session IDs contained in said list and retrieving a corresponding session object if found, while if not found creating a new session object,
accepting requests from each session object to call an appropriate pre-stored application form including menus and controls,
assigning data implicit in said requests to said controls,
executing a method associated with said controls, said method returning output data to said form,
generating an HTML string by substituting corresponding html commands for said form, controls and menus, said HTML string capable of displaying on a web browser a page which corresponds to said form, and passing said HTML string to the web server.

4. A method according to claim 3 including the step establishing from the Internet request the selected application from a plurality of applications residing in said client server environment, and ensuring that for the duration of the session all requests forming part of that session communicate with said selected application.

FIG. 1

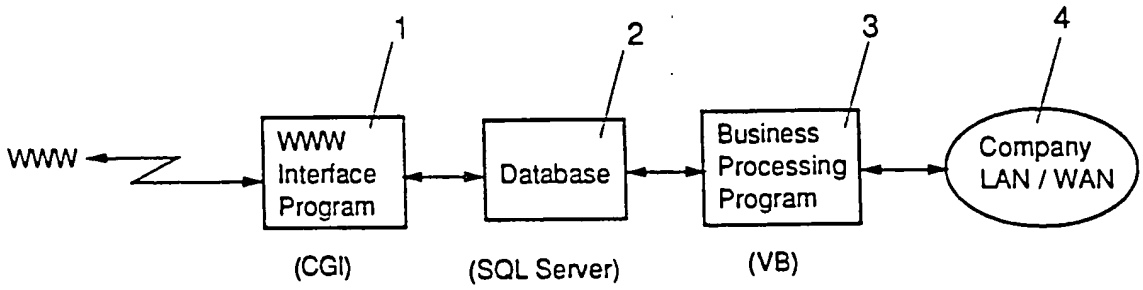
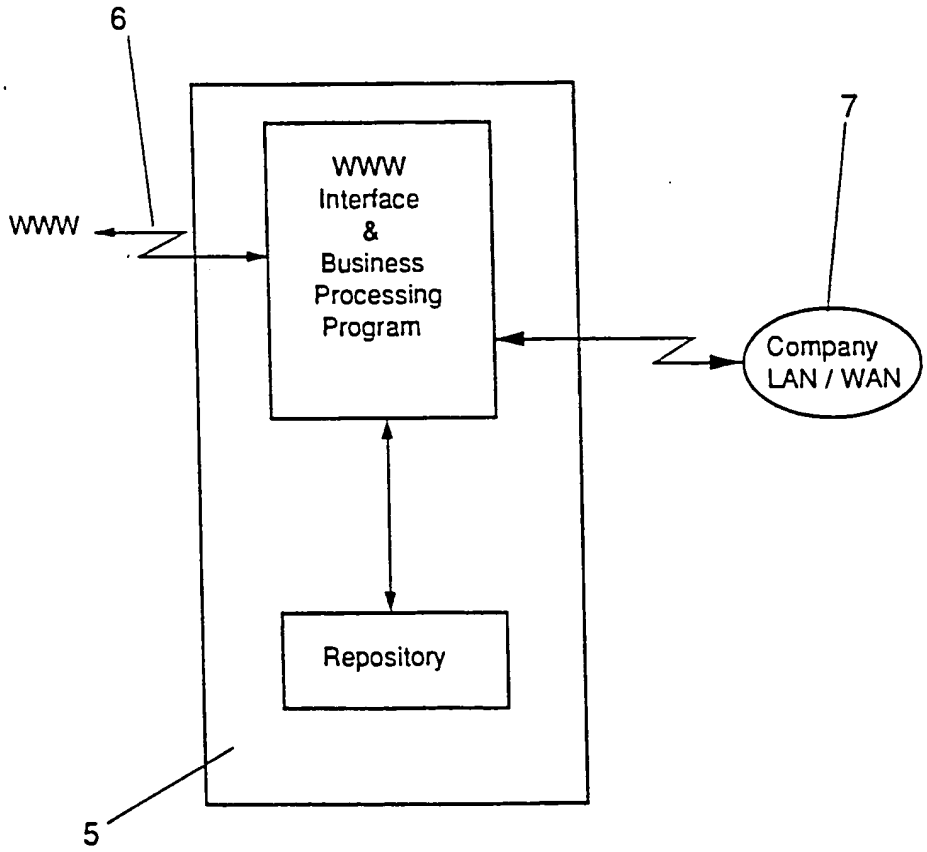


FIG. 2



BNSDOCID: <WO___9908208A1_I_>

FIG. 3

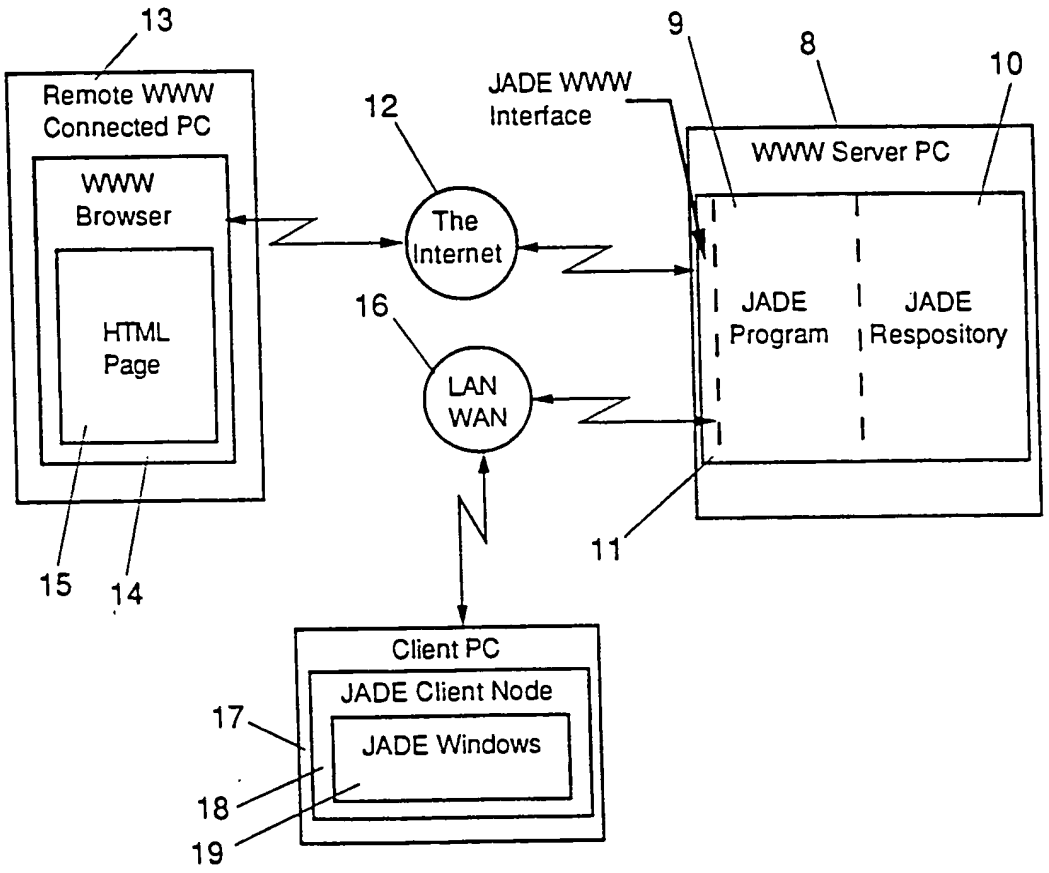

13
Remote WWW Connected PC
WWW Browser
HTML Page
15
14
12
The Internet
JADE WWW Interface
9
8
10
WWW Server PC
JADE Program
JADE Respository
11
16
LAN WAN
Client PC
JADE Client Node
JADE Windows
17
18
19

FIG. 5

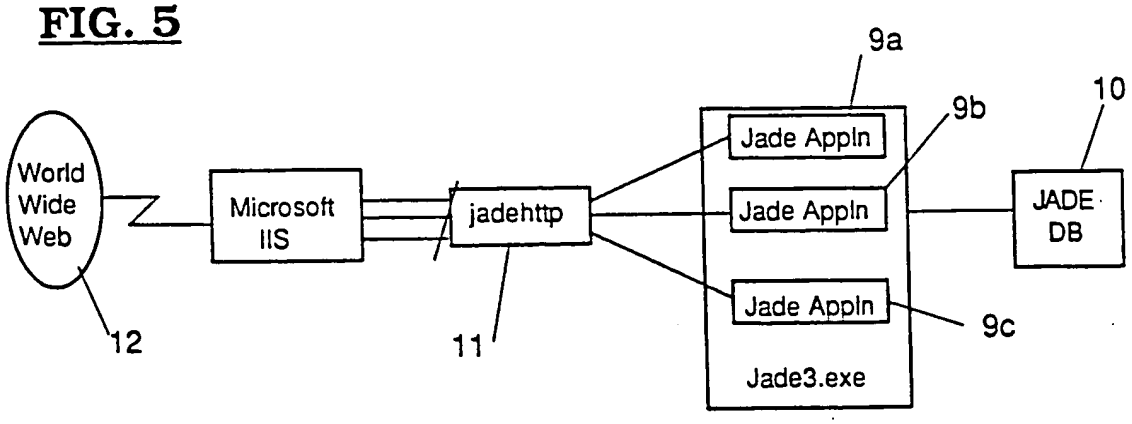
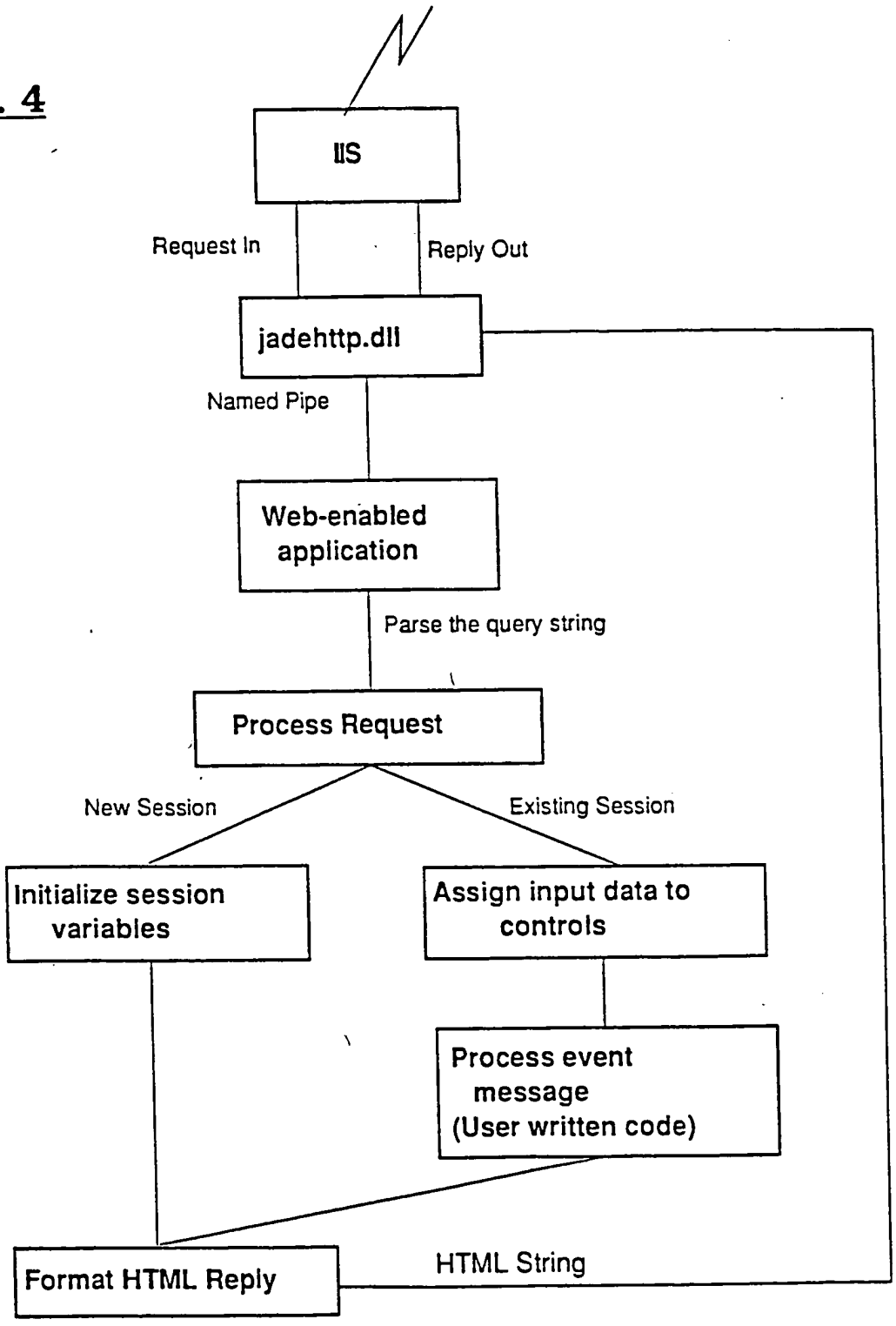

World Wide Web
12
Microsoft IIS
jadehttp
11
9a
Jade Appln
Jade Appln
Jade Appln
Jade3.exe
9b
9c
10
JADE DB

FIG. 4



BNSDOCID: <WO___9908208A1_I_>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 98/00121

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: G06F 17/30

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)
G06F 17/30

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT, BYTE, INTERNET, WEBTECHNIQUES.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, A	US 5754772 A (LEAF) 19 May 1998 Whole document Figure 2 Column 4 lines 50/67	1-4
P, A	US 5742762 A (SCHOLL et al) 21 April 1998 Whole document Column 6 line 37 to column 7 line4	1-4

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited-to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 November 1998	10 NOV 1998
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer **R STOPFORD** Telephone No.: (02) 6283 2177

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ 98/00121

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, A	US 5737592 A (NGUYEN et al) 7 April 1998 Whole document Column 4 lines 54/62	1-4
A	EP 747845 A1 (INTERNATIONAL BUSINESS MACHINES CORPORATION) 11 December 1996 Whole document	1-4
A	BYTE MAGAZINE-September 1996. "The Web Is Changing the Way Companies Automate Forms Processing". Peter Jerram. HTTP://WWW.BYTE.COM/ART/9609/SEC11/ART2.HTM. Whole document	1-4
A	WEB TECHNIQUES MAGAZINE-July 1997. "A Design Retrospect From One Of Web Objects' top developers". Bob Kachms. HTTP://WWW.WEBTECHNIQUES.COM/FEATURES/1997/07/KAEHMS/KAEHMS.HTML Whole document	1-4

BNSDOCID: <WO___9908208A1_I_>

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/NZ 98/00121

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
EP	747845	CA	2177917	CN	1138177	JP	9026972
		US	5721908				

END OF ANNEX

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G06F 15/00 — A2

(11) International Publication Number: **WO 99/26159**

(43) International Publication Date: 27 May 1999 (27.05.99)

(21) International Application Number: PCT/US98/23347

(22) International Filing Date: 2 November 1998 (02.11.98)

(30) Priority Data:
60/065,991 14 November 1997 (14.11.97) US
09/093,969 8 June 1998 (08.06.98) US

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(81) Designated States: JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: SERVER OPERATING SYSTEM FOR SUPPORTING MULTIPLE CLIENT-SERVER SESSIONS AND DYNAMIC RECONNECTION OF USERS TO PREVIOUS SESSIONS

(57) Abstract

A server operating system supports multiple client-server sessions and enables a user to begin a session and later dynamically reconnect to that session even if the user uses two different client computers. The operating system has a multi-user session manager to enable multiple client-server sessions on the server and a multi-user stack protocol manager to manage one or more protocol stacks used in communicating with the clients. When a user connects to the server via a first client, the stack protocol manager assigns a first protocol stack to this first client-server connection and the session manager creates a first session for the user. When the user subsequently reconnects to the server using a second client that is different from the first client, the stack manager assigns a second protocol stack to a second client-server connection and the session begins creating a second session for the user. During this latter process, however, the session manager recognizes that the user is affiliated with the first session. The session manager adapts the first session to conform to the system configuration of the second client. The session manager then reassociates the second protocol stack with the reconfigured first session so that the user is returned to his/her original session, even though they logged on from a different client.

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BNSDOCID: <WO 9928159A3_I_>

SERVER OPERATING SYSTEM FOR SUPPORTING MULTIPLE CLIENT-SERVER SESSIONS AND DYNAMIC RECONNECTION OF USERS TO PREVIOUS SESSIONS

TECHNICAL FIELD

This invention relates to client-server computer systems. More particularly, this invention relates to server operating systems executing on servers in the client-server computer systems.

BACKGROUND OF THE INVENTION

Most people are generally familiar with computer operating systems. An operating system is the code or computer program that provides an environment in which other computer programs can run. The operating system manages the system resources, such as processing resources, memory allocation, and I/O devices, to enable other programs to easily take advantage of these resources. Some operating systems are multitasking, meaning they support concurrent operation of more than one task. A multitasking operating system divides the resources among various processes, giving each process access to memory, processing resources, and at least one execution thread.

In the client-server environment, the server operating system is also called upon to handle communication interaction with client-based applications. The client operating system locates a server and requests a connection with the server and the server allocates resources to handle requests from the client.

One well-known server operating system is the Windows NT server operating system from Microsoft Corporation. The Windows NT server operating system is a multitasking, extensible, scalable operating system that can be implemented on standard personal computers. The Windows NT server operating system is well documented. For background information, the reader is directed to the book entitled *Inside Windows NT*,

which is written by Helen Custer and is published by Microsoft Press (copyright 1993). This book is incorporated by reference.

In many client-server systems, the client computer is itself a full-functioning general-purpose computer, having its own operating system, processing resources, memory resources, and so forth. Examples of such clients include workstations, desktop computers, laptops, and the like. In some client-server systems, however, the client computer is a simple machine that is implemented with less functionality than a general-purpose computer. For instance, the client might be implemented as a terminal, which typically provides just enough functionality to enable access to the server computer over a network. The terminal has no operating system: rather, the operating system and applications reside at the server, and the processing takes place at the server.

More recently, low cost computers known as "network computers" or "NCs" have been introduced as a means for providing access to a network. Network computers have a display, a keyboard, a network port, and limited processing capabilities. Network computers can provide some limited local processing, but are primarily reliant on the server for most processing. Presently available network computers are primarily configured to run applications written in Java, a language introduced by Sun Microsystems. A close cousin to the NCs is another type of low cost computer, known as "Net PCs", which can run both Windows-based and Java-based applications.

A technology marketed under the name "WinFrame" from Citrix Systems Inc. extends the Windows NT server operating system to support multiple client-server windowing sessions for connected clients, where each session provides a windowing environment for the connected client. The WinFrame technology essentially replicates low kernel-level support routines, such as USER, CONSOLE, and GDI drivers, to provide multiple windowing sessions on the same server. Each session is tailorable to support a system configuration (i.e., display, mouse, keyboard) of a particular connected client.

With the WinFrame technology, a client can connect to the Windows NT server and begin a windowing session. To the user, it appears as if the client is a standalone Window-enabled computer that is running its own Windows-brand operating system. However, the session is actually taking place on the server computer, remote from the client, and the client is merely running a local graphical user interface to provide entry to the session. In this regard, the WinFrame technology is particularly well suited for low intelligent client computers, such as terminals and network-centric computers, because the client need not be capable of running its own operating system. However, the WinFrame technology is equally well suited for fully enabled clients.

One problem with the Citrix WinFrame technology is a lack of usability from the user perspective. Each session is bound to a particular client machine and does not consider the requirements of a user, who may in fact log on to the server from different physical machines.

To exemplify the problem, consider a common scenario. A user logs onto the Windows NT server from a client computer at the user's workplace. The workplace client is a desktop PC with a large 20" VGA display with 1024 x 768 resolution. At quitting time, the user decides to temporarily halt the session and disconnects from the server. Later that evening, the user reconnects to the server from a home computer, which is a laptop computer with an 11" color display of 640 x 480 resolution. When the laptop connects to the server, the Citrix WinFrame technology creates a new session for this new client machine. Since the user is employing different clients, the user is not permitted to reconnect to the old session. As a result, the user's previous session started on his/her work computer is not ported to the laptop computer because the server understands them as two distinct sessions started on two distinct machines.

Accordingly, there is a need to improve the server operating system to overcome this problem and to better focus on the needs of the user.

SUMMARY OF THE INVENTION

This invention concerns a server operating system that supports multiple client-server sessions and enables a user to begin a session and later dynamically reconnect to that session even if the user employs two different clients.

According to one implementation, the operating system has a multi-user session manager to enable multiple client-server sessions on the server. The operating system further has a multi-user stack protocol manager to manage one or more protocol stacks, wherein each protocol stack facilitates communication with a corresponding client during a client-server session.

When a user connects to the server via a first client, the stack protocol manager assigns a first protocol stack to this first client-server connection. The session manager then creates a first session for the user. In the described implementation, the session is a windowing session that supports a windowing graphical user interface environment on the remote client. The session consists of various software modules to support a windowing environment, and includes various hardware drivers, such as keyboard drivers, display drivers, and protocol drivers. The drivers employed in the first session are selected to conform to the system configuration of the first client.

Sometime later, the user leaves the first session and disconnects the first client from the server. The server maintains the user's session at the server so that the user may return to it at a later time. The session can be ended, however, if the user expressly terminates the session prior to disconnecting the first computer from the server.

At a later time, the user reconnects to the server using a second client. The second client has a system configuration that is different than that of the first client. As an example scenario, the user might first log onto the server via a desktop computer at the user's workplace and then later via a laptop computer at the user's home. The second client connects to the server via a second client-server connection and the stack manager

assigns a second protocol stack the second client-server connection. The session manager then begins creating a new, second session for the user.

During this process, however, the session manager recognizes that the user is affiliated with the first session. The session manager adapts the first session to conform to the system configuration of the second client. That is, the first session is reconfigured with a new set of one or more configuration parameters (e.g., a new display driver or protocol driver) to support the different system configuration of the second client.

The session manager then reassociates the second protocol stack with the reconfigured first session so that the user is returned to his/her original session, even though they logged on from a different client. The adaptation occurs solely at the server, and hence, it is invisible to the user. As a result, the user merely sees the same session. In the case of a changed display driver, for example, the user would see the same session, yet reformatted for the display of the second client.

Another aspect of this invention concerns using dynamic reassociation to accommodate multiple users who connect to the server from a single client computer. As an example of this situation, it is common for two bank tellers to concurrently use a single computer. In this case, the server detects when different users log onto the server via the same client. Upon detection, the server reassociates the protocol stack handling the client-server connection with the session affiliated with the present user. In this manner, the server can support multiple users, all of whom use the same computer.

BRIEF DESCRIPTION OF THE DRAWINGS

The same reference numbers are used throughout the drawings to reference like components and features.

Fig. 1 is an illustration of a client-server computer system.

Fig. 2 is a block diagram of a server computer in the client-server computer system.

Fig. 3 is a block diagram of a portion of the server operating system, showing a single client-server windowing session.

Fig. 4 is a block diagram similar to Fig. 3, but further showing multiple client-server windowing sessions.

Figs. 5-6 are block diagrams similar to Fig. 3, but further showing a dynamic reassociation process in which a user is reassociated with a previous windowing session, even though the user logs onto the server using different clients.

Fig. 7 is a flow diagram showing steps in the reassociation process.

Fig. 8 is a block diagram of part of the server operating system, illustrating how the operating system supports multiple sessions for multiple users, all of whom access the server from the same client.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 shows a client-server computer system 20 comprising a server computer 22 connected to multiple clients 24(1)-24(5) via a network 26. The client-server computer system 20 is representative of many different architectures, including direct dialup via modem, enterprise LANs (local area networks), WANs (wide area networks), and the Internet. The network 26 can be implemented in a number of ways to support such networking contexts, including both wire-based technologies and wireless technologies. Aspects of this invention are not limited to one specific network architecture or network technology.

The server 22 is preferably implemented as a Windows NT server, which supports a windowing user interface environment. The server 22 is described in this context for discussion purposes. A more detailed description of the server 22 is given below with respect to Fig. 2. It is noted, however, that the server 22 may be implemented using an operating system other than Windows NT.

The clients 24(1)-24(5) represent various kinds of computers that may connect to the server 22 over the network 26. Client 24(1) is a conventional desktop personal computer (PC), which possesses a local operating system, processing unit, and storage system. As one example, the desktop client 24(1) is a general-purpose PC implemented with a Windows-brand operating system from Microsoft Corporation, such as Windows 95 or Windows 98. The desktop client 24(1) is a standalone computer that primarily interfaces with the server to access files or other information that is not locally stored.

Client 24(2) is illustrated as a portable laptop computer, which can be connected to the network 26 via a conventional network card or a dial-up modem connection. The laptop computer 24(2) is also a fully equipped, standalone computer that can be configured with its own operating system, processing unit, and storage system. The laptop client 24(2) may likewise be configured to run a Windows-brand operating system, such as Windows 95 or Windows 98.

Client 24(3) is a handheld PC, which generally possesses less functionality than a general-purpose computer. However, the handheld PC 24(3) is preferably equipped with a Windows-brand operating system, such as Windows CE from Microsoft Corporation.

Client 24(4) is a terminal computer, which is a low cost machine with minimal local processing and little local memory. The terminal computer includes a display, a keyboard, a mouse (optional), and enough intelligence to connect to a server. All applications run at the server and the terminal merely provides a connection point to the server-based processing.

Client 24(5) represents a network-centric computer, such as a Network Computer (or NC) or a Net PC. The network-centric computer client 24(5) primarily facilitates execution of server-based applications, but has some limited local processing capabilities for running Windows-based or Java-based applications.

Server Computer

Fig. 2 shows an example implementation of the server computer 22, which is implemented as a general-purpose computer configured with the Windows NT operating system. The server 22 includes a processing unit 32, a system memory 34, and a system bus 36 that interconnects various system components, including the system memory 34 to the processing unit 32. The system bus 36 may be implemented as any one of several bus structures and using any of a variety of bus architectures, including a memory bus or memory controller, a peripheral bus, and a local bus.

The system memory 34 includes read only memory (ROM) 38 and random access memory (RAM) 40. A basic input/output system 42 (BIOS) is stored in ROM 38.

The server 22 has one or more of the following drives: a hard disk drive 44 for reading from and writing to a hard disk or hard disk array, a magnetic disk drive 46 for reading from or writing to a removable magnetic disk 48, and an optical disk drive 50 for reading from or writing to a removable optical disk 52 such as a CD ROM or other optical media. The hard disk drive 44, magnetic disk drive 46, and optical disk drive 50 are connected to the system bus 36 by a hard disk drive interface 54, a magnetic disk drive interface 56, and an optical drive interface 58, respectively. The drives and their associated computer-readable media provide nonvolatile storage of computer readable instructions, data structures, program modules and other data for the server 22.

Although a hard disk, a removable magnetic disk 48, and a removable optical disk 52 are described, other types of computer readable media can be used to store data. Other such media include magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, random access memories (RAMs), read only memories (ROM), and the like. Additionally, the server 22 may be configured to serve data stored on an independent storage system, such as a RAID (redundant array of independent disks) storage system.

A number of program modules may be stored on the hard disk, magnetic disk 48, optical disk 52, ROM 38, or RAM 40. These programs include a server operating system

60, one or more application programs 62, other program modules 64, and program data 66.

A user may enter commands and information into the server 22 through input devices such as a keyboard 68 and a mouse 70. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are connected to the processing unit 32 through a serial port interface 72 that is coupled to the system bus 36, but may alternatively be connected by other interfaces, such as a parallel port, game port, or a universal serial bus (USB).

A monitor 74 or other type of display device is also connected to the system bus 36 via an interface, such as a video adapter 76. The server computer 22 has a network interface or adapter 78, a modem 79 or other means for establishing communications over the network 26, such as a T1 or T3 Internet connection. The modem 79 facilitates dialup connection from a client.

General Software Architecture

The computer system 20 implements a software architecture that enables the clients 24(1)-24(5) to run a Windows-brand operating system and applications on the server 22. The software architecture includes a server-based multi-client core, a client-based module, and a remote protocol that enables communications between the server and client.

The server-based multi-client core enables the server to host multiple, simultaneous client sessions. The multi-client core is resident as part of the operating system 60 and executes on processor 32. The multi-client core supports both windowing-enabled clients (i.e., clients that are capable of running a local windowing operating system, such as the desktop client 24(1), the laptop client 24(2), and the handheld PC client 24(3)) and non-windowing clients (i.e., clients that are incapable of running a local

windowing operating system, such as terminal client 24(4) and network-centric client 24(5)).

The multi-client server core enables any of the clients to log into the server and run a windowing session at the server. In one embodiment, the multi-client server core implements the Citrix WinFrame technology that extends the Windows NT server operating system to support multiple windowing environments for multiple clients. The WinFrame technology provides the means for replicating client-server windowing sessions, as is described below in more detail with reference to Figs. 3 and 4. The multi-client server core goes beyond the basic WinFrame technology, however, to offer a means for maintaining windowing sessions at the server and dynamically reconnecting users to their sessions even if the users reconnect using different clients.

The client-based module resides in memory at the client and executes on the client's processing unit. The client-based module contains code to run a graphical windowing user interface (UI). The code is capable of running on a broad range of hardware, including terminals, network-centric computers, Windows-enabled computers, UNIX-based computers, and DOS-based computer. To the user, the client appears to be running a local version of a windowing operating system, even though all of the operating system functionality is occurring at the server.

The protocol component of the software architecture allows the client to connect to the network and present the windowing UI to the user. One suitable protocol that may be used in system 20 is MS Remote Desktop Protocol, which is a highly scalable derivative of the T.128/T.120 protocol, an international, standard multichannel conferencing protocol. T.128/T.120 is a well-known protocol and will not be described in detail. For more information on T.128/T.120, the reader is directed to the T.120/T.128 standards from the International Telecommunications Union (ITU) which are hereby incorporated by reference.

In contrast to prior art client-server systems, the computer system 20 is tailored to view the server network as servicing the needs of a user, rather than supporting specific client computers. This ideology shift implies that the computer system 20 supports the user, regardless of which client 24 the user employs to access the server 22. Prior art client-server systems typically emphasize a machine-centric perspective, treating each connection in terms of the needs of a particular client configuration.

As an example of this dichotomy, a scenario presented in the Background section describes a user who logs onto the server from a workplace client computer, begins a session, stops the session without terminating it, and subsequently logs on from a home computer. In the prior art architecture, the server creates a new session for each client because they originated from two different clients with different system configurations. When the user logs on from the first client, the server creates a session that utilizes display drivers, keyboard drivers, and the like that are specific to support the particular client computer. The server might also use one type of protocol that is suitable for communicating with the client computer.

When the user logs on from the second client, the server creates another session that loads different display drivers, keyboard drivers, and the like that are specific to support the second client computer. The server might also employ a different type of communication protocol. Hence, the server creates machine-dependent sessions, even though the same user would like to continue the same session regardless of the machine from which he/she uses to connect to the server. The prior art represents a machine-centric architecture.

The computer system 20, on the other hand, is user centric. In the above scenario, the computer system 20 enables the user to connect to the server from one client, start and stop a session without termination, and later return to that same session from a different client. The server does not create a new session for the new client, but instead adapts the

original session with the appropriate drivers, protocols, and configuration parameters to support the second client.

For example, suppose the user first logs on from a workplace computer with a large 20" VGA display with resolution of 1024 x 768. The server establishes a windowing session with the appropriate display driver to service a 20" VGA display with 1024 x 768 resolution. When the user subsequently logs on from his/her laptop computer with an 11" display of 640 x 480 resolution, the server begins to establish a new session. However, during the session initiation process, the server recognizes that the user is affiliated with a previous session. The server then modifies the previous session to employ a new display driver appropriate for an 11" display with 640 x 480 resolution. The server then automatically reassociates the user with the previous session. The work in progress is dynamically resized to the new 11" display and the user may continue from where he/she left off when working on the workplace computer.

The server operating system 60 advantageously enables a dynamic reassociation of users to their respective sessions, even if the users log on from different machines with different operating characteristics. The reassociation process occurs entirely at the server, with the server automatically adapting to the client. The process is invisible to the user and client computer.

One preferred way of implementing server operating system is described below with reference to Figs. 3-6. Following this discussion, another aspect of this invention is described, which involves switching among multiple windowing sessions running at the server from a single client machine.

Server-Based Dynamic Reassociation

An aspect of this invention concerns reassociating users with their respective windowing sessions and automatically adjusting the windowing sessions to accommodate

any new client system configurations. This dynamic reassociation takes place entirely at the server.

Fig. 3 shows a portion of the server operating system 60, including the multi-client core that enables replication of the windowing modules to form multiple windowing sessions. The operating system 60 includes code that runs in a privileged processor mode, which is often referred to as the "kernel mode", and applications or other service routines that run in a non-privileged processor mode, commonly referred to as "user mode".

The operating system 60 includes a multi-user session manager 90 implemented in the user mode. The multi-user session manager 90 enables creation of multiple client-server windowing sessions that reside on the server for use by the client. The operating system 60 further includes a protocol stack manager 92 implemented in the kernel mode and closely interfaced with the session manager 90. Under the direction of the multi-user session manager, the protocol stack manager 92 creates and manages one or more protocol stacks, as represented in Fig. 3 by protocol stack 94, to facilitate communication with corresponding external clients during the client-server windowing sessions. The protocol stacks are implemented according to certain types of communications protocols, such as RDP over a TCP/IP transport, RDP over IPX, RDP on top of an asynchronous serial connection (modem), and the like.

One exemplary implementation of the session manager 90 and the protocol stack manager 92 is using the Intelligent Console Architecture (ICA) from Citrix Systems, Inc. The Citrix ICA extends the Windows NT server operating system to provide multiple windowing sessions for connected clients.

For discussion purposes, suppose a client 24(1) desires to run a server-based windowing session. The client 24(1) is illustrated as a Windows-enabled desktop computer. However, other types of clients may be used, including terminal clients and network-centric clients. The client 24(1) sends a connection request to a well-known

connection port. The server operating system 60 accepts the connection request and creates a communication port, as represented by object 96. The communication port 96 provides the client with a handle to send messages or callbacks to the server.

The multi-user session manager 90 creates and launches a new transfer thread to service the new client request. The server operating system 60, and namely the protocol stack manager 92, assigns a protocol stack 94 to the communication port 96. The protocol stack then enters a connection query mode where client and server capabilities are subsequently exchanged such as keyboard layout/locale, desired video resolution, etc.

The protocol stack 94 is initially a container with a communications endpoint. During activation, the stack container is loaded with at least two drivers: a WinStation Driver (WD) and a transport driver (TD). The transport driver is a lower level driver that facilitates transfer of data over the communications transport used to make the connection thus providing transport independence. Additionally, a protocol driver (PD) may be layered between the WD and TD to provide additional features such as compression, reliable data flow, encryption and framing. As an example the WinStation, protocol, and transport drivers might be implemented to handle an RDP data stream over a compressed TCP/IP transport. The WinStation Driver provides remote access to the windowing session being created on the server. The WinStation Driver is implemented as a kernel mode driver (SYS) with entry points that provide for access to a remote mouse, keyboard, character mode display commands, and a set of virtual channels.

After connection with the client is established and the client request for a windowing session is received, the operating system 60 creates a windowing session, which is indicated in Fig. 3 as session 1. In the Citrix WinFrame technology, this windowing session involves running a client-server routine CSRSS.EXE, which is referenced generally as CSRSS module 98. In Windows NT 3.x versions of the operating system, the CSRSS module 98 contains all of the Microsoft-written code for USER, CONSOLE, GDI, and other support routines. In addition, the module 98 contains a

collection of hardware device drivers for the hardware display, the GDI interface to the hardware display (GDI driver), the mouse driver, and keyboard driver.

In new versions of the Windows NT server operating system such as Windows NT 4.0 or 5.0, the USER and GDI portions of the CSRSS module 98 are moved to the kernel mode, to a module referred to as WIN32K.SYS 100. The CSRSS module 98 and Win32K module 100 are closely integrated across the user-kernel line. Fig. 3 shows the software modules implemented in the newer versions of Windows NT.

When a client requests a windowing session, the server operating system creates the CSRSS module 98 and Win32K module 100 to open the hardware devices and load the proper GDI display driver 102 and protocol driver 104 that are compatible with the remote client's system configuration. In this example, the client 24(1) is a desktop computer that has a VGA monitor with a resolution of 1024 x 768 and uses a RDP protocol. After these drivers are loaded, the protocol stack 94 is bound to the windowing session 1. Communications with the client are passed to the windowing session 1, as illustrated by the arrow from the protocol stack 94 to the protocol driver 104.

As part of the session startup, the user at the remote client 24(1) is prompted via a Windows logon (WL) module 106 to enter a user identification (ID). The operating system associates the user ID with the windowing session 1. This is represented by the box labeled "User 1" in the user mode for the windowing session 1.

The server operating system then provides the windowing environment on the client computer 24(1). The client-based code runs a windowing graphical user interface that enables the user to start applications on the server, and perform other functions that are common to Windows-based systems.

With the first protocol stack 94 bound to session 1, the server operating system 60 prepares to accommodate another client by creating a container for a second protocol stack. When a second client connects to the server to run a windowing session, the stack manager 92 assigns the protocol stack to the new client.

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Fig. 4 shows a second protocol stack 94(2) connected to a communication port 96(2) for a second client 24(4). The multi-user session manager 90 creates a new client-server windowing session, labeled as session 2, to accommodate the second client 24(4). The second session 2 is a replica of the first session 1, and includes a copy of the CSRSS module 98(2) and the Win32K module 100(2). As described with respect to Fig. 3, the second user 2 logs on and the server operating system loads the appropriate drivers to service the client 24(1). In this case, the client is a terminal computer that has a lower resolution 800 x 600 display and also employs an RDP display protocol over a TCP/IP transport. The windowing session 2 is bound to the protocol stack servicing the second client machine 24(4).

Each session maintains a container for it's associated protocol stack. In this example, session 1 has an associated protocol stack 94(1) and session 2 has an associated protocol stack 94(2).

As more clients connect to the server, the server operating system 60 continues to replicate more windowing sessions. The ability to replicate the modules to produce multiple client-server windowing sessions is implemented using the WinFrame technology from Citrix Systems Inc. as described in the Background.

Unfortunately, a problem with the Citrix WinFrame technology is a lack of usability from the user perspective. Using WinFrame, each windowing session is bound to a particular client machine and the system configuration of the machine. Assuming a system shown in Fig. 4, the conventional WinFrame technology ties the first windowing session 1 to the system configuration of desktop computer 24(1), including the 1024 x 768 monitor and a RDP protocol, and ties the second windowing session 2 to the system configuration of the terminal computer 24(4), which has an 800 x 600 monitor and a RDP protocol.

The Citrix WinFrame technology does not address the needs of the user, who may in fact log on to the server from different physical machines. Thus, when a user stops a

windowing session from one client computer and logs onto the server using another client computer. the WinFrame technology will create a new windowing session in the case where the two client computers do not share common video resolutions. The user is not permitted to reconnect to the old session.

In the client-server system of this invention, however, the server operating system is designed to accommodate the user's needs and to support windowing sessions that a user can reconnect to from different machines. Recall from the above example that user 1 is connected to the server using the desktop client 24(1) with a 1024 x 768 VGA monitor and a RDP protocol.

To continue this example, suppose that user 1 disconnects from the server 60, without terminating the windowing session 1. The user leaves the workplace and goes home. While at home, the user decides to continue the session that he/she began earlier in the day. The user connects to the server from a second client computer located at home.

Fig. 5 shows the situation in which user 1 first connected to the server using a first client 24(1) to create a first client-server windowing session 1, as described above with respect to Fig. 3. and subsequently connects to the server using a second client 24(2). Upon disconnection of the first session, the container previously loaded with RDP and TCP/IP-stack-drivers is emptied and its associated communications endpoint is destroyed. This is represented by the empty protocol stack 94(1).

When the user subsequently logs on using the second client 24(2), the multi-user session manager 90 initially creates a second session 2, as if the person logging on is a new user. In this example, the client 24(2) is a laptop computer with a flat panel, 11" color display with a resolution of 640 x 480. The client 24(2) uses a RDP protocol. Accordingly, the second client 24(2) has a different system configuration than the first client 24(1) used in Fig. 3.

The connection process is identical to that explained with respect to Fig. 3. The multi-user session manager 90 creates and launches a new transfer thread to service the new client request. The protocol stack manager 92 assigns a second protocol stack 94(2) to a communication port 96(2) to which the client 24(2) connects. The second protocol stack 94(2) comprises an empty container with a communications endpoint. The stack manager loads the default drivers into the stack container 94(2) and client communication is passed to the session 2 (as shown by the dashed arrow). During these initializations, the operating system is not yet aware of who the user is.

When the user ID of user 1 is received as part of the log on process, the Windows logon module 106 recognizes that user 1 is affiliated with a previous session, namely session 1. Rather than continuing to create a whole new session, however, the WL module 106 reassociates the user 1 with his/her previous session 1 (as represented by the solid arrow).

The reassociation involves adapting the server operating system to the system configuration parameters of the user's new client computer 24(2). The reassociation process is not visible to the user or client. From the user perspective, the user is returned to the same point in the session at which he/she had left off previously.

According to an aspect of this invention, the server operating system 60 modifies the Win32K module 100(1) in the original session 1 to use different drivers and devices that conform to the client computer 24(2). In this example, the Win32K module 100(1) is adapted to accommodate the smaller 11" display with the lower resolution of 640 x 480. The server operating system 60 changes the GDI display driver 102(1) from a driver for a 1024 x 768 VGA monitor to a driver for a 640 x 480 flat panel color display. Since the client 24(2) employs the same RDP protocol, the Win32K module 100(1) keeps the original protocol driver 104(1).

In addition, another aspect of this invention is reassociating the previous stack contents of the protocol stack used in the original client-server connection to the previous

session 1. In the preferred implementation, the stack contents (the WinStation Driver (WD), protocol driver (PD), and transport driver (TD)) from the second stack and the live connection endpoint are moved back over to the first protocol stack 94(1) for the previous session 1.

Fig. 6 shows the results of modifying the Win32K module 100(1) to support the new client computer. The display driver 102(1) is now a driver for the 640 x 480 flat panel color display. Additionally, the stack contents are loaded back into the protocol stack 94(1) for session 1. As a result, the server dynamically adjusts to the client computer that the user is now employing as an access point. Session 2 and its associated protocol stack 94(2) will be destroyed once the re-association is complete.

In this example, the display data is dynamically resized to fit the user's new client computer 24(1). The session appears the same to the user, only it is reformatted for the user's smaller, lower resolution screen. The previous WinFrame technology did not permit this reassociation process, and hence the original session could not be served to the new client computer 24(1).

The above example highlights adapting the server session to conform to a different display size and resolution. This is merely one example. Other possible client configuration parameters that may be accounted for at the server include types of keyboards, keyboard layouts (QWRTY v. Dvorak), protocol types (e.g., RDP over TCP/IP, versus RDP over asynchronous modem), language (e.g., English v. Spanish), memory drives, and peripherals.

Fig. 7 shows the steps in the dynamic reassociation process. These steps are implemented in code within the server operating system, preferably as part of the multi-user session manager with user authentication software in the Windows logon module. At step 120, a user connects to the server via a client. The server commences the connection process to form a client-server connection (step 122) and begins creating a new client-server windowing session (step 124).

During the initialization process, the server operating system analyzes whether the user is affiliated with any previous active session that has not yet been terminated (step 126). If not (i.e., the "no" branch from step 126), the server operating system finishes creating a new session for the user (step 128).

On the other hand, if the user is affiliated with a previous active session, (i.e., the "yes" branch from step 126), the server operating system reassociates the user with the previous active session (sub-process 130). This involves re-associating (i.e. transferring) the presently connected user's protocol stack and connection endpoint to the original session (step 132) as well as adapting the previous active session to accommodate any system configuration changes suitable for the current client (step 134).

Kiosk Environment

Another aspect of this invention concerns using dynamic reassociation to accommodate multiple users who connect to the server from a single client computer. As an example of this situation, it is common for two or more bank tellers to utilize the same computer or for two or more salespersons to employ one computer register. This environment in which multiple users rely on the same computer is commonly referred to as the "kiosk" environment.

Fig. 8 shows a client 24(4) connected to the server operating system 60 through a protocol stack 94. Multiple users 1-N use the same client 24(4). The multi-user session manager 90 creates a client-server windowing session for each of the users 1-N. Each windowing session contains a CSRSS module and a Windows logon module, represented as the "user" blocks in the user mode, and the Win32K module in the kernel mode. Each session also has an associated protocol stack 94.

When a first user logs on to the server, the session manager 90 creates a first session 1 for the first user 1. The Win32K module provides the appropriate drivers and devices to implement a windowing session on the terminal 24(4). Internally, the

operating system associates the protocol stack 94(1) with session 1 as represented by the solid arrow 140.

When user 1 completes a task, the user freezes the session without logging off or otherwise terminating the session. Another user is then free to use the terminal 24(4). Suppose user 2 logs onto the server. The session manager 90 creates a second session 2 for the second user 2. The Win32K module in session 2 also provides the appropriate drivers and devices to implement a windowing session on the terminal 24(4). The operating system associates the second protocol stack 94(2) with session 2 as represented by the dashed arrow 142. This process can continue for the N users.

Now, when the terminal is again free to use, user 1 may wish to return to session 1. The user retypes his/her ID. The operating system initially begins to create a new session and associated protocol stack. However, when the operating system realizes that the user has a pre-existing disconnected session, the operating system reassociates the user with the existing session 1. The stack contents and live communications endpoint are transferred back to the protocol stack container 94(1) for association with the session 1. In this manner, the server operating system accommodates multiple user sessions from the same client computer.

Although the invention has been described in language specific to structural features and/or methodological steps, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or steps described. Rather, the specific features and steps are disclosed as preferred forms of implementing the claimed invention.

CLAIMS

1. In a client-server computer system. a computer-implemcnted method implemented at a server comprising the following steps:

maintaining a first session at the server for a user who connects to thc server via a first client. the first session conforming to a system configuration of the first client;

subsequently establishing a client-server connection for the user who connects to the server via a second client, the second client having a system configuration that is different than the first client;

recognizing the user as being associated with the first session;

adapting the first session to conform to thc system configuration of the second client; and

reassociating the client-server connection with the first session.

2. A computer-implemented method as recited in claim 1, wherein the first and second clients have different display types, and the adapting step comprises the step of reconfiguring the first session to conform to the display type on the second client.

3. A computer-implemented method as recited in claim 1, wherein:

the system configuration of the first and second clients include parameters selected from a group of parameters comprising display type, keyboard type, network protocol type, peripheral types, human language, and memory drives; and

the adapting step comprises the step of changing the first session to conform to at least one of the parameters on the second client.

4. An operating system embodied on a computer-readable medium having computer-executable instructions for performing the computer-implemented method as recited in claim 1.

5. A server computer programmed to perform the computer-implemented method as recited in claim 1.

6. In a client-server computer system, a computer-implemented method implemented at a server comprising the following steps:

creating a connection with a first client, which is being operated by a user;

assigning a first protocol stack to the first client;

logging on the user;

establishing a first session for the first client;

configuring the first session to conform to configuration parameters of the first client;

associating the first session with the first user;

ending the connection with the first client;

subsequently creating a connection to a second client, which is being operated by the same user;

assigning a second protocol stack to the second client;

logging on the user;

detecting the user as being associated with the first session;

reconfiguring the first session to configuration parameters for the second client; and

reassociating the first session with the user by transferring contents of the second protocol stack to the first protocol stack associated with the first session so that the user may continue with the first session while using the second client.

7. A computer-implemented method as recited in claim 6, wherein the first and second clients have different display types, and the reconfiguring step comprises the step of modifying the first session to conform to the display type on the second client.

8. An operating system embodied on a computer-readable medium having computer-executable instructions for performing the computer-implemented method as recited in claim 6.

9. A server computer programmed to perform the computer-implemented method as recited in claim 6.

10. In a client-server computer system, a computer-implemented method implemented at a server comprising the following steps:

maintaining a first session at the server for a user who connects to the server via a first client, the first session formatting video data for a first display type corresponding to the first client;

subsequently establishing a client-server connection for the user who connects to the server via a second client, the second client having a second display type that is different than the first client;

recognizing the user as being associated with the first session;

reconfiguring the first session to format the video data for the second display type corresponding to the second client; and

reassociating the client-server connection with the first session.

11. An operating system embodied on a computer-readable medium having computer-executable instructions for performing the computer-implemented method as recited in claim 10.

12. A server computer programmed to perform the computer-implemented method as recited in claim 10.

13. In a client-server computer system in which a client is connected to communicate with the server via a client-server connection, a computer-implemented method implemented at a server comprising the following steps:

creating a first session for a first user who accesses to the server from the client;

associating the client-server connection with the first session;

temporarily freezing the first session;

creating a second session for a second user who connects to the server from the client;

associating the client-server connection with the second session;

temporarily freezing the second session; and

subsequently reassociating the client-server connection with the first session.

14. An operating system embodied on a computer-readable medium having computer-executable instructions for performing the computer-implemented method as recited in claim 13.

15. A server computer programmed to perform the computer-implemented method as recited in claim 13.

16. An operating system for a server computer, wherein the operating system is embodied on a computer-readable medium, comprising:

a multi-user session manager to enable multiple client-server sessions on the server;

a first session created by the session manager when a user connects to the server from a first client, the first session being configured to accommodate a system configuration of the first client;

a second session created by the session manager when the user subsequently reconnects to the server from a second client different from the first client; and

wherein the session manager recognizes that the user is affiliated with the first session and adapts the first session to conform to a system configuration of the second client, the session manager reassociating the user with the reconfigured first session so that the second client communicates with the first session rather than the second session.

17. An operating system as recited in claim 16, wherein the first session includes one or more software modules to support a graphical user interface windowing environment for the first client.

18. An operating system as recited in claim 16, wherein the first session includes at least one of the following software modules: a display driver, a protocol driver, a keyboard driver, and a mouse driver.

19. An operating system as recited in claim 16, wherein the first and second clients have different display types, and the first session is reconfigured from conforming to a first display type on the first client to conforming to a second display type on the second client.

20. An operating system as recited in claim 16, wherein the system configuration of the first and second clients include parameters selected from a group of parameters comprising display type, keyboard type, network protocol type, peripheral types, human language, and memory drives.

21. An operating system for a server computer, wherein the operating system is embodied on a computer-readable medium, comprising:

a multi-user session manager to enable multiple client-server sessions on the server;

a multi-user stack protocol manager to manage one or more protocol stacks, the protocol stacks facilitating communication with corresponding clients during the client-server sessions;

in an event that a user connects to the server from a first client, the stack protocol manager assigns a first protocol stack to a first client-server connection and the session manager creates a first session for the user, the first session being configured to accommodate a system configuration of the first client;

in an event that the user exits the current session and subsequently reconnects to the server from a second client different from the first client, the stack manager assigns a second protocol stack to a second client-server connection;

wherein the session manager recognizes the user as being affiliated with the first session and adapts the first session to conform to a system configuration of the second client, the session manager transferring contents of the second protocol stack to the first protocol stack associated with the first session

22. An operating system as recited in claim 16, wherein the first and second clients have different display types, and the session manager adapts the first session from a first display type on the first client to a second display type on the second client.

23. An operating system as recited in claim 16, wherein the system configuration of the first and second clients include parameters selected from a group of parameters comprising display type, keyboard type, network protocol type, peripheral types, human language, and memory drives.

24. In a server operating system that provides multiple graphical user interface windowing sessions for multiple clients, the server operating system embodied on a computer-readable medium comprising:

computer readable instructions to direct a server to recognize when a user, who is connecting to the server via a remote client, is associated with a previous windowing session that the user started previously; and

computer readable instructions to direct the server to reassociate the user with the previous windowing session and to reconfigure the previous windowing session to conform to any different system configurations of the remote client in the event that the remote client is different than a client from which the user originally connected to the server to start the previous windowing session.

25. In a windows-based server operating system embodied on a computer-readable medium at a server, wherein the server operating system is capable of providing multiple client-server graphical user interface windowing sessions for multiple clients, an improvement to the server operating system comprising:

code means for maintaining sessions at the server after clients disconnect from the server;

25. In a windows-based server operating system embodied on a computer-readable medium at a server, wherein the server operating system is capable of providing multiple client-server graphical user interface windowing sessions for multiple clients, an improvement to the server operating system comprising:

code means for maintaining sessions at the server after clients disconnect from the server;

code means for detecting whether a user, who reconnects to the server through a new client, is already affiliated with a previous session;

code means for adapting the previous session to conform to a system configuration of the new client in an event that the system configuration is different from that of a previous client through which the user was previously connected to the server; and

code means for reassociating the user with the previous session.

26. In a windows-based server operating system embodied on a computer-readable medium at a server, wherein the server operating system is capable of facilitating multiple client-server sessions in which the server provides a windowing environment for a client, an improvement to the server operating system comprising:

computer readable instructions to direct a server to recognize when a user, who is connecting to the server via a remote client, is associated with a previous windowing session that the user started previously;

computer readable instructions to direct the server to adapt the previous windowing session to support a new display type in the event that the new display type is different than an original display type on a client from which the user originally connected to the server to start the previous windowing session; and

computer readable instructions to direct the server to reassociate the user with the previous windowing session and to reformat data served from the previous windowing session for depiction on the new display type.

27. In a windows-based server operating system embodied on a computer-readable medium at a server, wherein the server operating system is capable of facilitating multiple client-server sessions in which the server provides a windowing environment for a client, an improvement to the server operating system comprising:

first computer readable instructions to direct a server to recognize when a first user, who is connecting to the server via a remote client, is associated with a previous windowing session that the first user started previously;

second computer readable instructions to direct the server to reassociate the first user with the previous windowing session;

the first computer readable instructions further directing a server to recognize when a second user, who is connecting to the server via the same remote client, is associated with a previous windowing session that the second user started previously; and

the second computer readable instructions further directing the server to reassociate the second user with the previous windowing session.

28. In a client-server computer system, a system comprising:

a server-based operating system embodied on a computer-readable medium and executed at a server, the server-based operating system enabling multiple graphical user interface windowing sessions for multiple clients;

a client-based code embodied on a computer-readable medium and executed at a client, the client-based code enabling the client to initiate a connection with the server and to run a local graphical user interface (UI) window to facilitate access to the server-based windowing session; and

the server-based operating system being implemented to recognize when a user, who is connecting to the server via the client, is associated with a previous windowing session that the user started previously and to reassociate the user with the previous

windowing session, the server-based operating system adapting the previous windowing session to conform to any different system configurations of the client in the event that the client is different than a client from which the user originally connected to the server to start the previous windowing session.

29. A system as recited in claim 28, wherein the client-based code is configured to run on a client that is implemented with an operating system that is capable of connecting to the server.

30. In a client-server computer system, a system comprising:

a server-based operating system embodied on a computer-readable medium and executed at a server, the server-based operating system enabling multiple graphical user interface windowing sessions for multiple clients;

a client-based code embodied on a computer-readable medium and executed at a client, the client-based code enabling the client to initiate a connection with the server and to run a local graphical window user interface (UI) to the server-based windowing sessions; and

the server-based operating system being configured to associate communication to and from the client-based code with various ones of the windowing sessions so that multiple users can employ the client to operate their own corresponding windowing sessions.

31. A system as recited in claim 30, wherein the client-based code is configured to run on a client that is implemented with an operating system that is capable of connecting to the server.

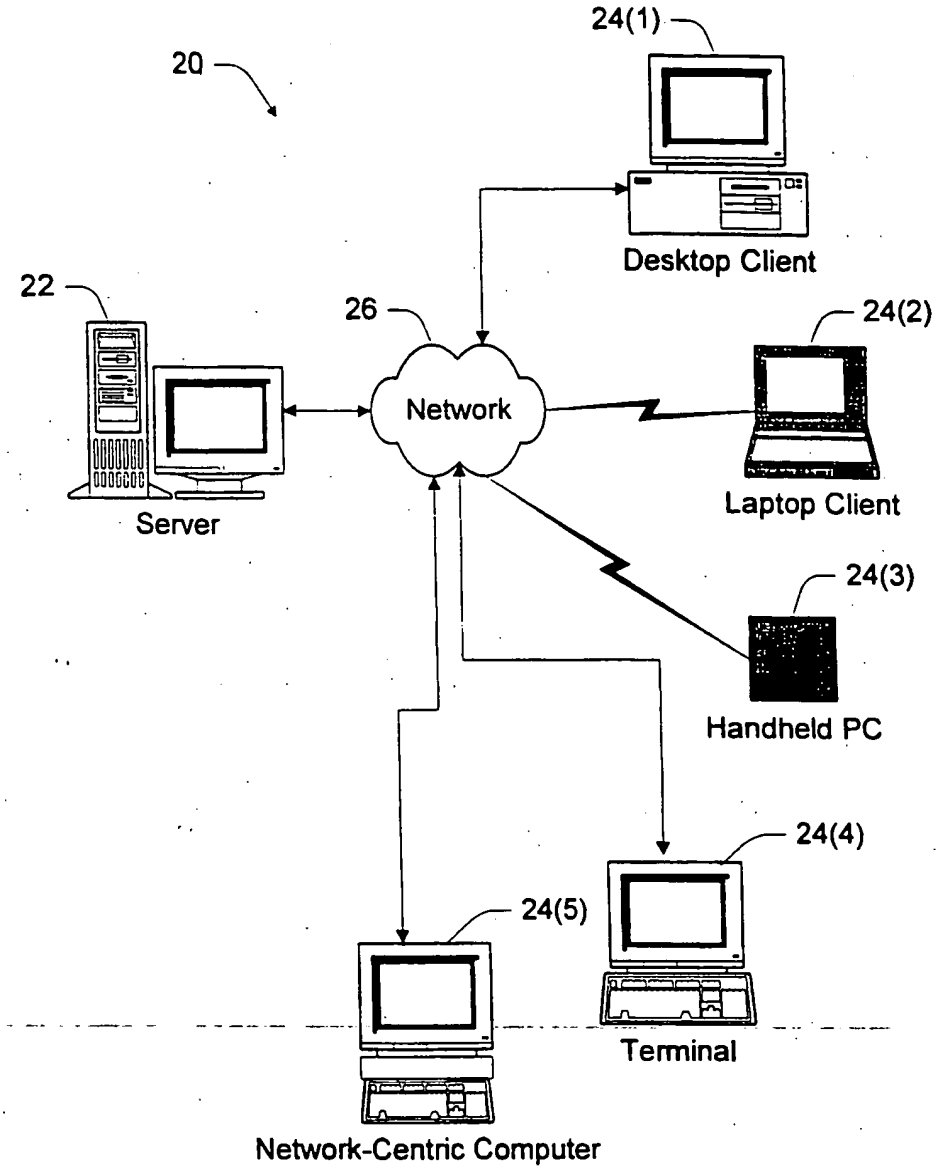
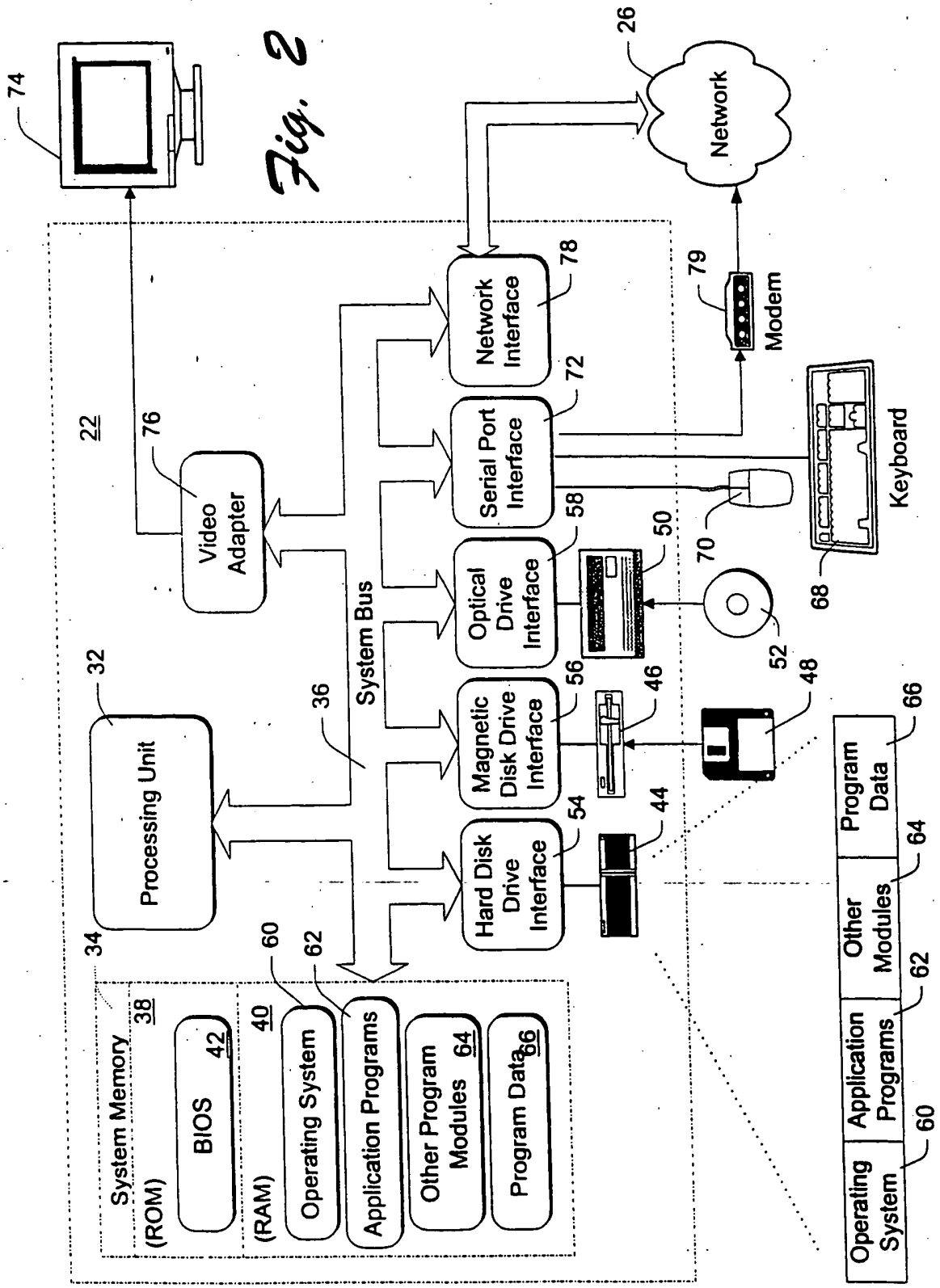

20
24(1)
Desktop Client
22
26
24(2)
Network
Laptop Client
Server
24(3)
Handheld PC
24(4)
24(5)
Terminal
Network-Centric Computer

Fig. 1


74
26
Network
Fig. 2
22
76
Video Adapter
Network Interface
78
79
Modem
Serial Port Interface
72
Keyboard
58
50
70
Optical Drive Interface
68
52
32
36
System Bus
Processing Unit
Magnetic Disk Drive Interface
56
46
48
54
44
Hard Disk Drive Interface
66
Program Data
64
Other Modules
62
Application Programs
60
Operating System
34
60
62
System Memory
38
(ROM)
BIOS
42
40
(RAM)
Operating System
Application Programs
Other Program Modules
64
Program Data
66

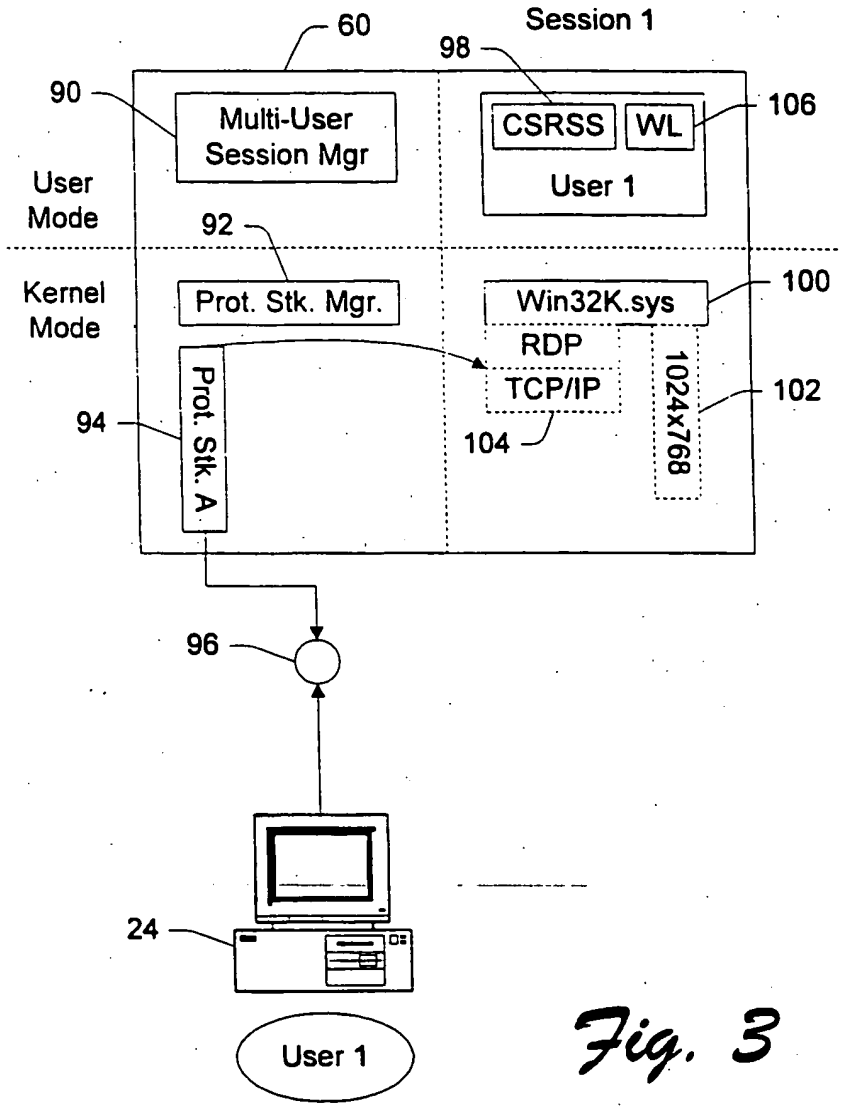

60
Session 1
98
90
Multi-User Session Mgr
CSRSS
WL
106
User 1
User Mode
92
Kernel Mode
Prot. Stk. Mgr.
Win32K.sys
100
RDP
TCP/IP
1024x768
102
104
94
Prot. Stk. A
96
24
User 1

Fig. 3

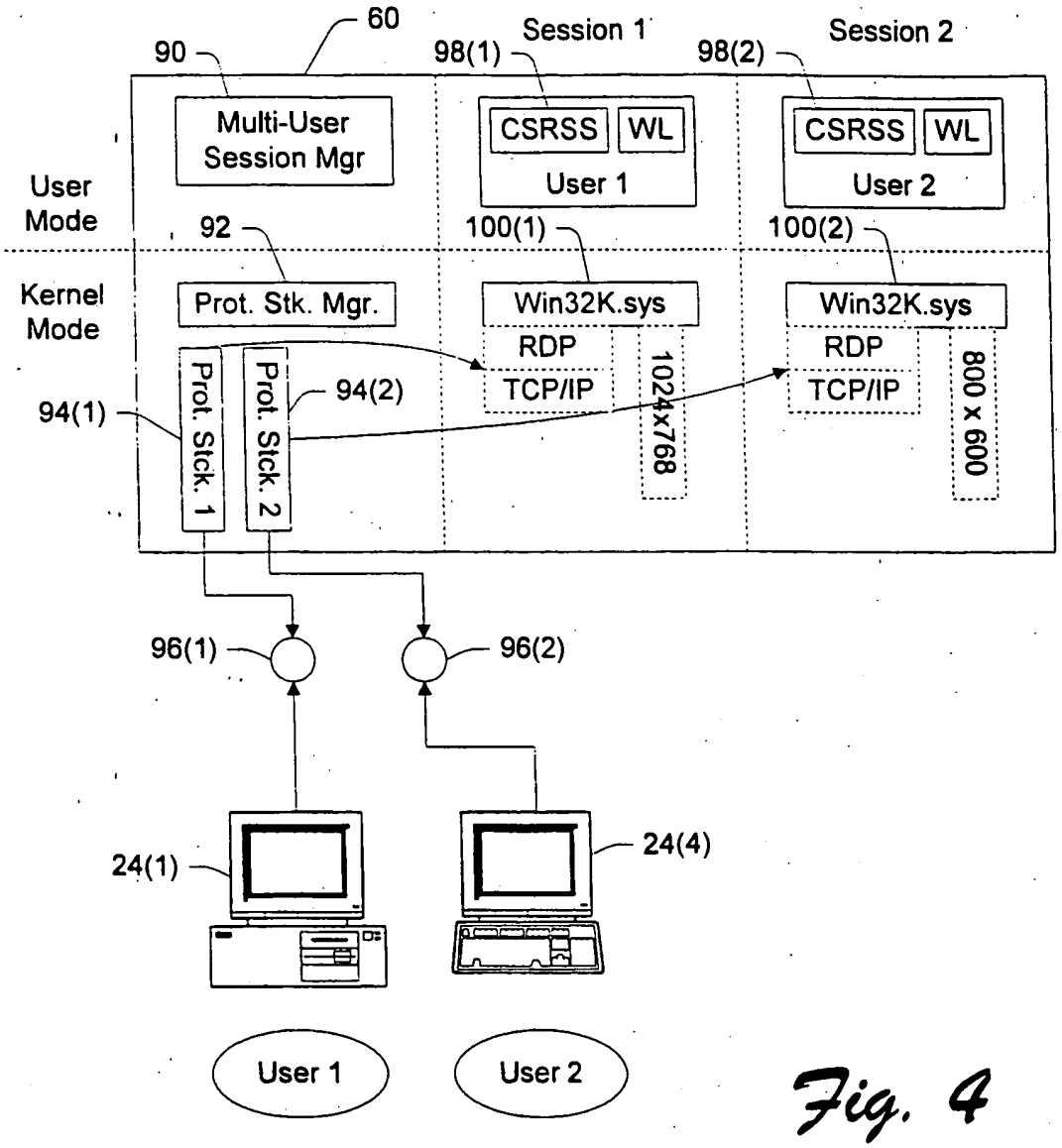

60
90
Session 1
98(1)
Session 2
98(2)
Multi-User Session Mgr
CSRSS
WL
User 1
CSRSS
WL
User 2
User Mode
92
100(1)
100(2)
Kernel Mode
Prot. Stk. Mgr.
Win32K.sys
RDP
TCP/IP
1024x768
Win32K.sys
RDP
TCP/IP
800 x 600
94(1)
Prot. Stck. 1
Prot. Stck. 2
94(2)
96(1)
96(2)
24(1)
24(4)
User 1
User 2

Fig. 4

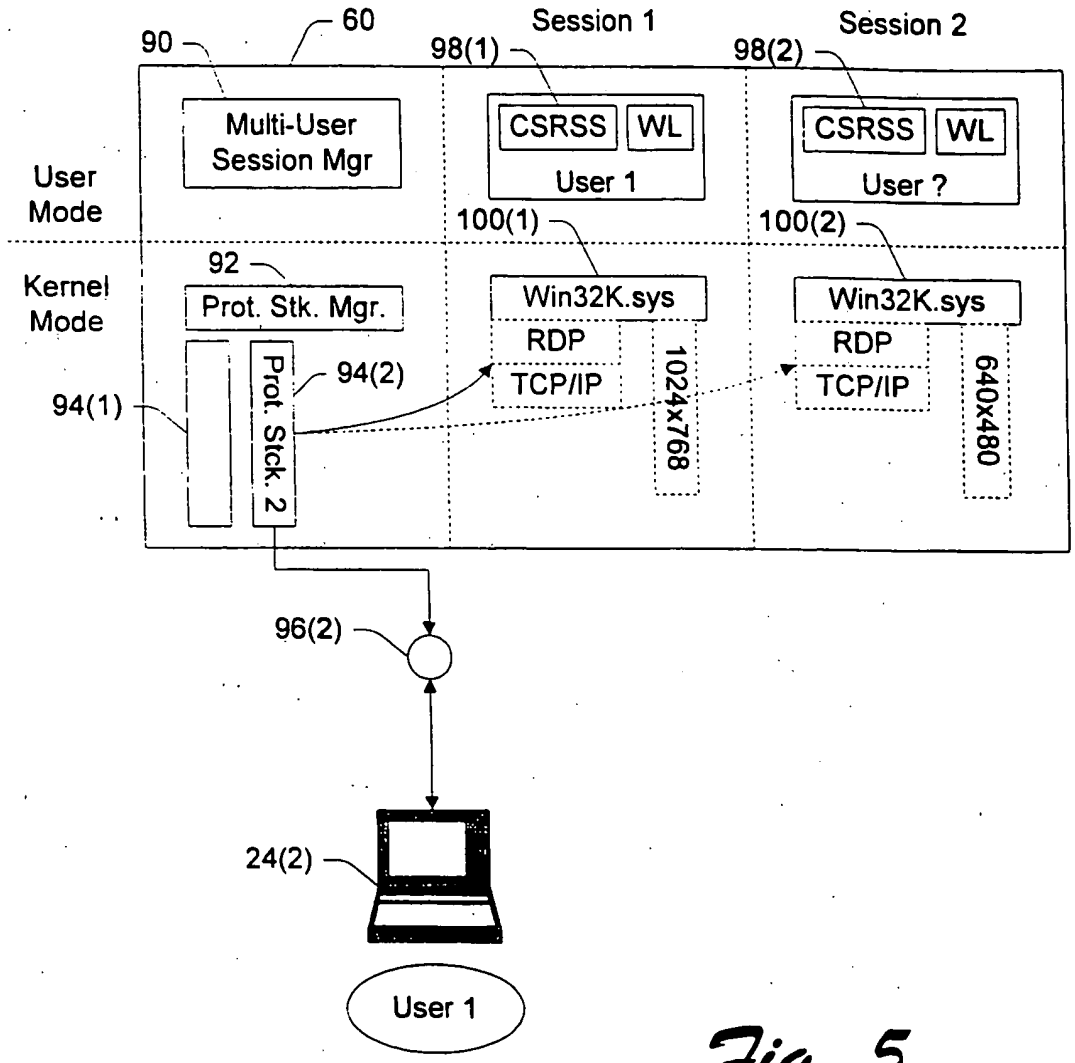

90
60
Session 1
98(1)
Session 2
98(2)
Multi-User Session Mgr
CSRSS
WL
User 1
CSRSS
WL
User ?
User Mode
100(1)
100(2)
92
Kernel Mode
Prot. Stk. Mgr.
Win32K.sys
RDP
TCP/IP
1024x768
Win32K.sys
RDP
TCP/IP
640x480
94(1)
94(2)
Prot. Stck. 2
96(2)
24(2)
User 1

Fig. 5

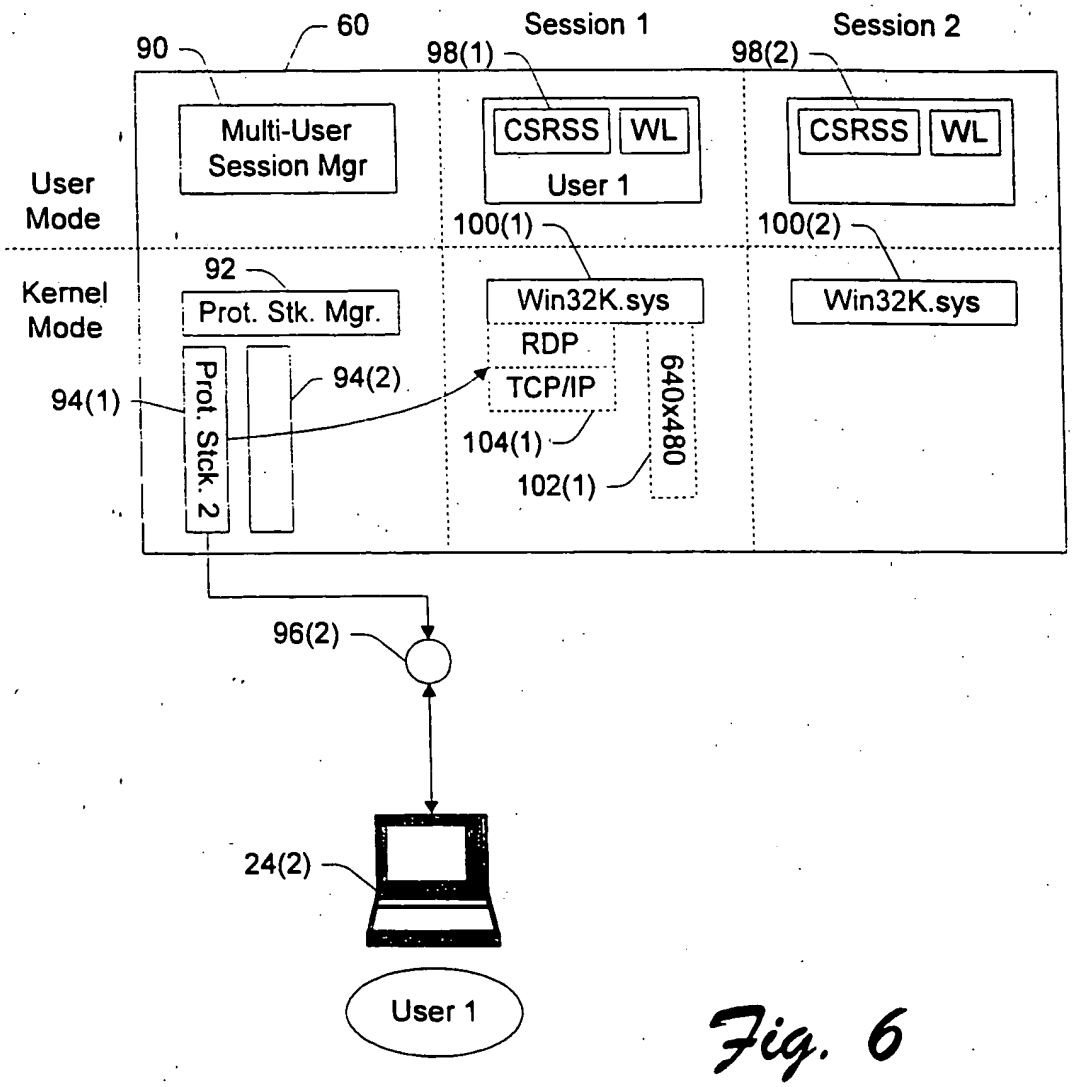

60
90
Session 1
98(1)
Session 2
98(2)
Multi-User
Session Mgr
CSRSS
WL
User 1
CSRSS
WL
User
Mode
100(1)
100(2)
92
Kernel
Mode
Prot. Stk. Mgr.
Win32K.sys
Win32K.sys
RDP
TCP/IP
640x480
94(1)
94(2)
Prot. Stck. 2
104(1)
102(1)
96(2)
24(2)
User 1

Fig. 6

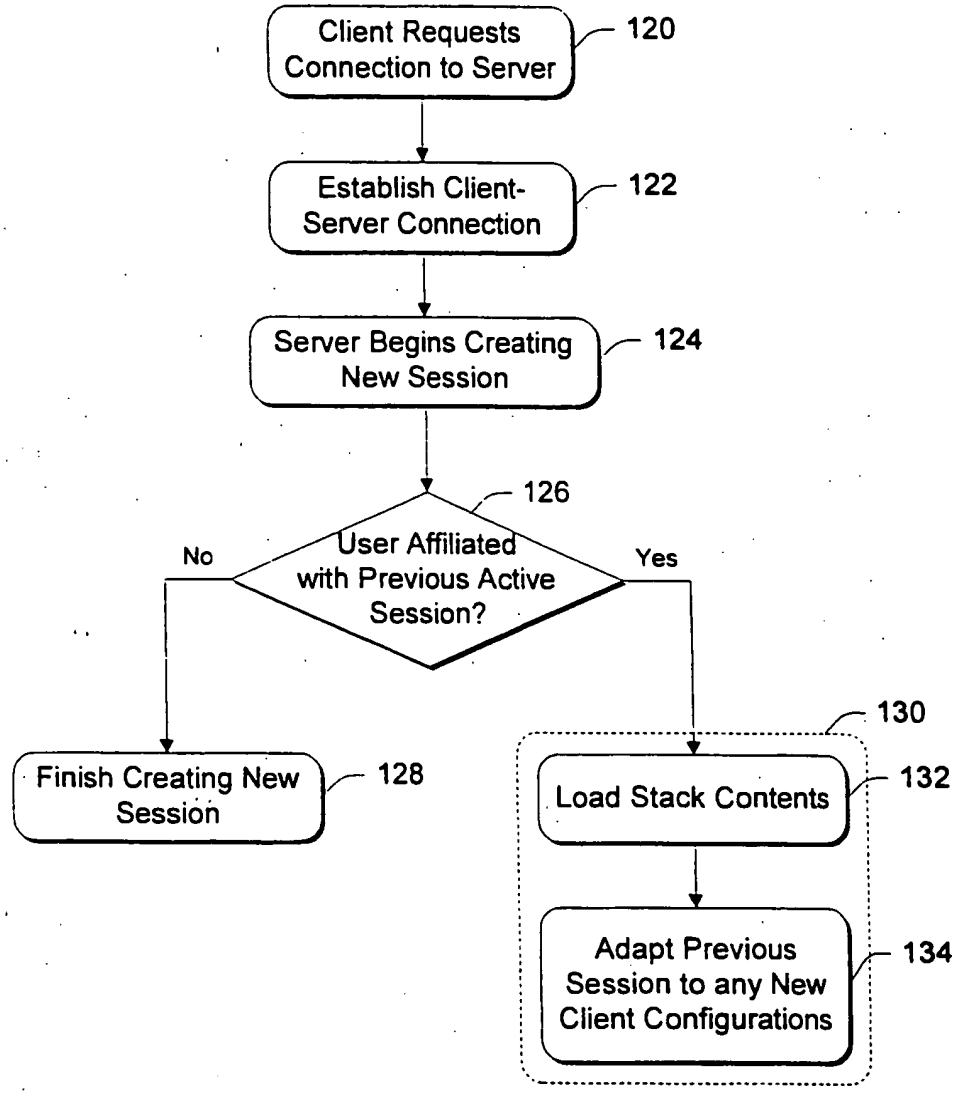

Client Requests Connection to Server
120
Establish Client-Server Connection
122
Server Begins Creating New Session
124
126
User Affiliated with Previous Active Session?
No
Yes
Finish Creating New Session
128
130
Load Stack Contents
132
Adapt Previous Session to any New Client Configurations
134

Fig. 7

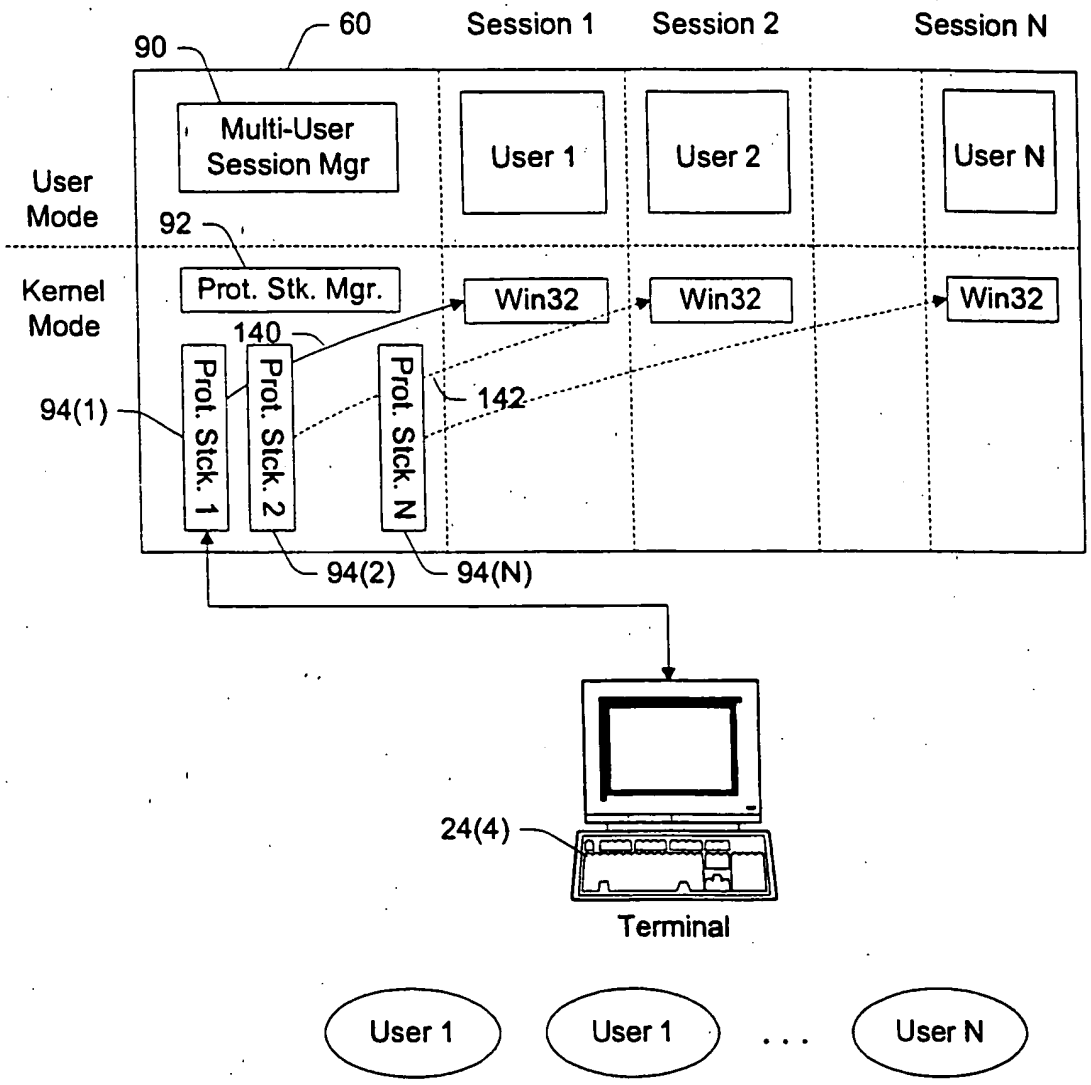

60
Session 1
Session 2
Session N
90
Multi-User Session Mgr
User 1
User 2
User N
User Mode
92
Kernel Mode
Prot. Stk. Mgr.
Win32
Win32
Win32
140
94(1)
Prot. Stck. 1
Prot. Stck. 2
Prot. Stck. N
142
94(2)
94(N)
24(4)
Terminal
User 1
User 1
. . .
User N

Fig. 8

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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04L 29/06, G06F 9/44

A3

(11) International Publication Number: **WO 99/26159**

(43) International Publication Date: 27 May 1999 (27.05.99)

(21) International Application Number: PCT/US98/23347

(22) International Filing Date: 2 November 1998 (02.11.98)

(30) Priority Data:

60/065,991	14 November 1997 (14.11.97)	US
09/093,969	8 June 1998 (08.06.98)	US

(81) Designated States: JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(88) Date of publication of the international search report: 5 August 1999 (05.08.99)

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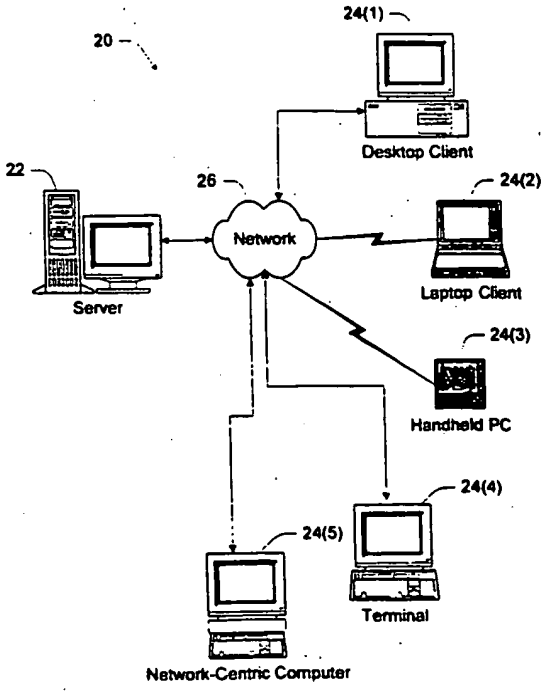
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(54) Title: SERVER OPERATING SYSTEM FOR SUPPORTING MULTIPLE CLIENT-SERVER SESSIONS AND DYNAMIC RECONNECTION OF USERS TO PREVIOUS SESSIONS

(57) Abstract

A server operating system supports multiple client-server sessions and enables a user to begin a session and later dynamically reconnect to that session even if the user uses two different client computers. The operating system has a multi-user session manager to enable multiple client-server sessions on the server and a multi-user stack protocol manager to manage one or more protocol stacks used in communicating with the clients. When a user connects to the server via a first client, the stack protocol manager assigns a first protocol stack to this first client-server connection and the session manager creates a first session for the user. When the user subsequently reconnects to the server using a second client that is different from the first client, the stack manager assigns a second protocol stack to a second client-server connection and the session begins creating a second session for the user. During this latter process, however, the session manager recognizes that the user is affiliated with the first session. The session manager adapts the first session to conform to the system configuration of the second client. The session manager then reassociates the second protocol stack with the reconfigured first session so that the user is returned to his/her original session, even though they logged on from a different client.



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BNSDOCID: <WO___9926159A2_I_>

INTERNATIONAL SEARCH REPORT

Intern nal Application No
PCT/US 98/23347

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04L29/06 G06F9/44

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04L G06F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SANJAY DASGUPTA ET AL: "A MOVABLE USER INTERFACE BASED ON A SIMPLE X-WINDOW LIKE PROTOCOL" COMPUTER AND COMMUNICATION, NEW DELHI, AUG. 28 - 30, 1991 TWO VOLUMES BOUND AS ONE, vol. VOLS. 3 & 4, 28 August 1991, pages 199-203, XP000333334 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS see the whole document	1-31

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[X] Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
6 May 1999	18/05/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Eraso Helguera, J

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 98/23347

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

information on patent family members

Inten nal Application No
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BNSDOCID: <WO 9926159A3 I >

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Attorney Docket No.: 3399P103

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg, et al.

Serial No.: 10/600,746

Filing Date: 06/19/2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Not Yet Assigned

Group Art Unit: 2681

Commissioner for Patents
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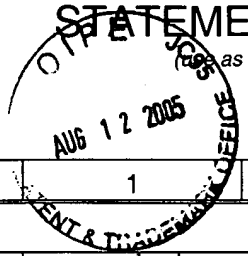
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Complete if Known	
Application Number	10/600,746
Filing Date	06/19/2003
First Named Inventor:	Rikard M. Kjellberg, et al.
Art Unit	2681
Examiner Name	Not Yet Assigned
Attorney Docket Number	3399P103

Sheet	1	of	2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-	6,076,166	06-13-2000	Moshfeghi et al.	
		US-	6,167,441	12-26-2000	Himmel	
		US-	6,275,692 B1	08-14-2001	Skog	
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		WO 01/97482 A1	12-20-2001	Telefonaktiebolaget LM Ericsson		
		WO 02/23857 A2	03-21-2002	Viafone, Inc.		
		WO 98/35469 A2	08-13-1998	The Sabre Group, Inc.		
		WO 98/35469 A3	08-13-1998	The Sabre Group, Inc.		

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				Filing Date	06/19/2003
				First Named Inventor:	Rikard M. Kjellberg, et al.
				Art Unit	2681
				Examiner Name	Not Yet Assigned
Sheet	2	**of**	2	Attorney Docket Number	3399P103

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]
		Erik Bladh et al., "GPRS – Applicability and Expectations", Växjö University, School of Mathematics and Systems Engineering, Reports from MSI, August 2002, pages 1-64.	

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 December 2001 (20.12.2001)

PCT

(10) International Publication Number
WO 01/97482 A1

(51) International Patent Classification[7]: H04L 29/06, H04Q 7/20

(21) International Application Number: PCT/SE01/01193

(22) International Filing Date: 29 May 2001 (29.05.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0002242-6 16 June 2000 (16.06.2000) SE

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(74) Agents: **HOLMBERG, Anders** et al.; Dr Ludwig Brann Patentbyrå AB, P.O. Box 17192, S-104 62 Stockholm (SE).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, 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, GW, ML, MR, NE, SN, TD, TG).

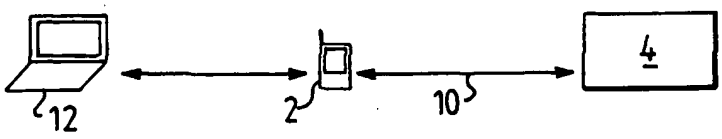
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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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WO 01/97482 A1

(54) Title: PROFILE AND CAPABILITY OF WAP-TERMINAL WITH EXTERNAL DEVICES CONNECTED



(57) Abstract: Data communication system and a method in a data communication system comprising a terminal (2), e.g. a mobile phone, adapted to communicate with an application server (4) using a wireless transmission protocol, preferably WAP, including a terminal profile. The wireless transmission protocol also includes an attached device's profile that is dynamically updated with data related to a device (12) attached to the terminal.

Profile and capability of WAP-terminal with external devices connected.

Field of the invention

The present invention relates to a data communication system and a method in a data communication system in accordance with the preambles of the independent claims.

Background of the invention

Wireless Application Protocol (WAP) is a technology that enables wireless access to Internet applications from a terminal, preferably a mobile phone.
The WAP forum, available at www.wapforum.org, has defined a WAP architecture for pulling (i.e. user initiated) information from Internet (e.g. Internet browsing) and pushing (i.e. application initiated) information (e.g. sending news messages, mail notification).

Wireless Application Environment (WAE) has adopted a model that closely follows the World Wide Web (WWW) model. All content is specified in formats that are similar to the standard Internet formats. Content is transported using standard protocols in the WWW domain and an optimized HTTP-like protocol in the wireless domain, a WAP communication protocol, preferably the Wireless Session Protocol (WSP). WAE has borrowed from WWW standards including authorizing and publishing methods wherever possible.

The WAE assumes the existence of a WAP gateway with functionality responsible for encoding and decoding data transferred from and to the terminal. The purpose of encoding content delivered to the terminal is to minimize the size of data sent to the terminal over-the-air as well as to minimize the computational energy required by the terminal to process that data.
The major elements of the logical WAE model is a terminal including a WAP user agent that wirelessly communicates with a gateway that includes encoders and decoders. The WAP gateway in turn communicates with an origin server including server applications.

A WAP user agent is defined as any software or device that interprets content (e.g. Wireless Markup Language, WML) and may include textual browsers, voice browsers, search engines, etc.

Capability and Preference Information (CPI) may include hardware characteristics (screen size, color capabilities, image capabilities, etc.), software characteristics (operating system vendor and version, support for used programs, list of audio and video encoders, etc.), application/user preferences (browser manufacturer and version, markup languages and versions supported, scripting languages supported, etc.), WAP characteristics (WML script libraries, WAP version, WML deck size, etc.) and network characteristics (bearer characteristics such as latency and reliability, etc.).
A User Agent Profile (UAProf) specification extends the WAP to enable end-to-end flow of a UAProf between the terminal, the intermediate network points and the origin server. UAProf is using capability and preference information as a set of components and attributes. UAProf is transmitted over wireless networks within WSP headers.

In summary the UAProf is concerned with capturing classes of terminal preference information. These classes include the hardware and software characteristics of the terminal as well as information about the network to which the terminal is connected.

Figure 1a shows schematically how a terminal 2, e.g. a mobile phone, establishes a mobile Internet session with an application in an application server 4 according to a well-established technique used today. Figure 1b shows a block diagram of the UAProf 6 including a terminal profile 8 used in figure 1a.

When a terminal establishes a mobile Internet session with an application, it will send its User Agent Profile to this application. This profile contains the attribute values of the terminal and/or references (e.g. in the form of an Internet-address) to the application server(s) where the attribute values can be found.
The scenario described in connection with figure 1 shows the opening of a WSP session and establishing of an initial UAProf. Upon opening a WSP session, the UAProf-aware terminal conveys its profile information using Profile and Profile-

Diff headers within the WSP connect request. The values of these headers are constructed by encoding the CPI.

While a UAProf-aware session is established, the client (terminal) may update the active UAProf at any time. To do this, the terminal transmits a WSP session resume message to the WAP gateway containing Profile and Profile-Diff headers with the new CPI.

Both in the scenario described in connection with figure 1 and when a UAProf is updated during an already established session the UAProf profile changes are changes to the terminal's (e.g. mobile phone's) settings or characteristics (e.g. the user may change the desired gray scale level for images, etc.).

When a WSP request is issued, the terminal may provide additional information or override or augment the basic UAProf already cached at the WAP gateway. The UAProf profile in the terminal consists of actual profile data and/or Uniform Resource Locators (URLs) pointing to the actual data stored on an origin server somewhere in the network. The latter is especially useful to point to data that is the same for all users of a particular terminal type, e.g. hardware characteristics. Standard attributes values pointed at by the URL can be overridden by attribute values explicitly specified in the terminal's profile. E.g. user preferences override standard settings. The level of overriding in UAProf is thus on attribute level.

In the UAProf specification, the terminal provided with attribute values may override the default settings stored on an origin server in the network.

In the mobile Internet world, users will increasingly have more than one user device, e.g. a laptop computer, a communicator or a mobile phone, to access an application. These user devices have different capabilities with regard to screen size, screen resolution, screen colors, memory, processor capacity, browser etc. A laptop computer and a communicator could be connected via a mobile terminal to the mobile network and are then concerned as attached devices. Furthermore, terminals could have other types of attached devices, like digital cameras, MP3 players, GPS systems, text-to speech converters etc.

In order to provide a user with a relevant and valuable service it would be necessary for the application that provides the service, to be adapted to the user's terminal and to the attached devices. This adaptation can mean that the information formatting or the information itself is adjusted to the terminal capabilities. An example of adjusting the information is when an application only sends a summary of an article in a newspaper instead of the whole article.

By terminal capability is meant the combined capability of the terminal and the attached device that in some cases only depends of the capability of the attached device.

As stated above the technique used today provides for profile changes reflecting changes to the client's (terminal's) settings and characteristics and not taking into account the capability of devices attached to the client.

The object of the invention is to be able to customize the information sent from an application server to a terminal depending of the capabilities of devices attached to the terminal.

Summary of the invention

The above-mentioned objects are achieved by the invention according to the characterizing portions of the independent claims.

Preferred embodiments are set forth in the dependent claims.

Thus, the wireless transmission protocol used for communication between a terminal and an application also includes, in addition to the terminal profile, an attached device's profile that is dynamically updated with data related to a device attached to the terminal.

The profile changes of the attached device's profile according to the present invention do not exclude changes to the terminal profile.

Short description of the appended drawings

Figures 1a and 1b illustrate schematically the transmission and the wireless protocol, respectively, used in the prior art.

Figure 2 is a schematic illustrating of a communication system where the present invention is applicable.

Figure 3 illustrates a block scheme of a User Agent Profile (UAProf) according to the present invention.

Figure 4 illustrates a preferred embodiment of the invention where an attached device is wirelessly attached to the terminal using the Bluetooth protocol.

Figure 5 schematically illustrates the communication between a terminal and an application server according to the present invention.

Figures 6a and 6b illustrate a first scenario where the present invention is implemented.

Figures 7a and 7b illustrate a second scenario where the present invention is implemented.

Figures 8a and 8b illustrate a third scenario where the present invention is implemented.

Figures 9a and 9b illustrate a fourth scenario where the present invention is implemented.

Figure 10 illustrates a fifth scenario where the present invention is implemented.

Figure 11 illustrates a preferred embodiment of the present invention.

Detailed description of preferred embodiments of the invention

Figure 2 is a schematic illustrating of a communication system where the present invention is applicable.

The system comprises a terminal 2, e.g. a mobile phone, adapted to communicate with an application 4 in an application server via the mobile network and the Internet 10 using a wireless transmission protocol, e.g. WAP or alternatively HTTP. In the figure is the WAP gateway between the terminal and the application server omitted for sake of clarity but it should be understood that the communication between the terminal and the WAP gateway is partly wireless. Any known communication media, e.g. the Internet, could perform the communication between the gateway and the server. According to an alternative embodiment the WAP gateway is omitted whereas there is an end-to-end communication between the terminal and the application server.

The system also comprises one or many devices 12 attached to the terminal. The attached device 12 may be e.g. a laptop computer, an MP3 player, a digital camera, a text-speech converter, a parking meter, a vending machine, a printer or any device adapted to be connected to a terminal. The attached device may be connected to the terminal 2 via any conventional electrical or optical cable or via the air interface using e.g. a short distance wireless protocol, e.g. the Bluetooth protocol, or by using an infrared link.

The connection from the terminal to the application is made via a cellular network and the Internet using for example Transmission Control Protocols/Internet Protocols (TCP/IP). The TCP/IP protocol specifies the addressing of nodes on the Internet and provides a method of sending packets of data from one node to another.

Figure 3 illustrates a block scheme of a User Agent Profile (UAProf) according to the present invention. UAProf comprises a terminal profile 8 and an attached device's profile 16. The terminal profile comprises different attributes, e.g. hardware attributes 18, software attributes 20, browser attributes 22 and auxiliary attributes 24.
The attached device's profile 16 comprises a number of components 26,28,30, each representing a different device. Each component is provided with relevant attributes 32,34,36, respectively, that may be hardware, software or browser attributes.

According to a preferred embodiment of the present invention the attached device's profile is implemented by defining a new schema in UAProf which is allowed under the specifications for UAProf. The new schema implementing the attached device's profile must comply with specifications that can be found in its entirety in "Wireless Application Group, User Agent Profile Specification" available at www.wapforum.org.
A schema includes components and components in turn comprise of attributes. A schema may be regarded as a complete profile structure/grammar. Components are e.g. "hardware characteristics", "software characteristics", "browser" and an attribute is e.g. "screen size". Thus, the schema defines the structure of the profile and the profile itself can thus be seen as instantiation of

a schema: i.e. the profile is a schema filled with actual data or pointers to data. WAP UAProf uses Resource Description Framework (RDF) for defining the structure/grammar of a schema, component and attribute. The above-mentioned concept using a schema is applied according to a preferred embodiment of the invention to define an attached device's profile. E.g. when a device is attached to a mobile phone (e.g. with Bluetooth) the device informs the phone about its capabilities by sending its profile. As long as the profile sent has a schema structure that complies with the constraints specified in WAP UAProf (and RDF), the phone will be able to understand it.

According to a preferred embodiment of the invention the attached device is wirelessly attached to the terminal using the Bluetooth protocol for communication. This connection is schematically illustrated in figure 4. Figure 4 shows capability handlers 38,40 and capability data means 42,44 arranged in a terminal (to the right in the figure) and in an attached device (to the left), respectively. The capability handler updates the capability data means in response of an attached device's profile received from an attached device. This update is made either in that the attached device automatically sends its profile to the terminal when it is connected or in that the terminal sends a terminal capability request to the attached device requesting the device's profile.

In figure 4 the terminal requests the profile from the attached device. The TCP/IP on top of the Bluetooth protocol is used. The following procedure is performed with references to figure 4:

(1) A Bluetooth connection is established.

(2) The capability handler 38 in the terminal discovers that there is a new device attached and sends a terminal capability enquiry request to the attached device. The request is handled by an attached device capability handler 40.

(3) The attached device capability handler 40 reads its capability data (i.e. the attached device's profile) from an attached device capability data means 44 provided in the attached device and sends it back to the terminal in response of the terminal capability enquiry request.

(4) The terminal's capability data means 42 is updated with the received profile.

Figure 5 schematically illustrates the communication between a terminal 2 and an application server 4 comprising an application. If devices are attached to the terminal the capability data means is provided with the attached device's profile. The capability data means may be updated in many different ways, e.g. according to the above-described procedures.

According to a preferred embodiment of the invention the application server requests from the terminal its capabilities (profiles) both regarding the terminal itself and any attached device's capabilities (profiles). This request may be transmitted via a WAP gateway or other nodes using other protocols. The part of the radio protocol used in the intermediate nodes between the terminal and the application server is not a part of the present invention and is therefore not described herein.

The following procedure is performed with references to figure 5:

(1) A pre-requisite is that a data channel is established between the terminal (mobile phone) and the application server using packet data or circuit data. Other protocol such as WAP on SMS could also be used.

(2) An application would like to find out the capability of the terminal and sends a terminal capability enquiry request to the terminal. The capability handler in the terminal is connected to the TCP stack via a port number. The application sends the request to that port number on the terminal and the request ends up in the capability handler in the mobile phone. This addressing is well known technology and is therefore not further described herein.

(3) The terminal's capability handler then reads out the capability data (profile) from the capability data means, including both attached devices' capabilities and terminal's capabilities, and sends the result (the profile) back in response to the terminal capability enquiry request.

The attached devices or ad-hoc devices may be divided in three different types: substituting devices, complementary devices and sporadic devices. The type of device determines whether or not the capabilities of the devices will influence the profile of the used wireless protocol.

The profile of a substituting device (partly) overrules (overrides) some of the mobile phone's profile attributes (e.g. when a laptop is attached, the laptop's hardware/software/browser attributes can overrule the phone's attributes when a session is set-up).

The profile of a complementary device is an addition to the mobile phone's profile.

The profile of a sporadic device is not included in the mobile phone's profile since this device cannot be considered an add-on to the phone's device to be taken into account by the application when deciding on information format and content. Examples of sporadic devices are a parking meter, a vending machine or a printer.

Apart from the situation described in connection with figures 1a and 1b, which is already used today, five principally different situations or scenarios will be described in order to illustrate the present invention.

The first scenario is illustrated in figure 6a. An attached device 12, e.g. a text-to-speech converter, establishes a session with a terminal 2, e.g. a mobile phone (illustrated above in figure 6a). This may be performed prior the terminal establishes a mobile Internet session with an application server 4. Figure 6b illustrates the protocol profiles, UAProf, comprising the terminal profile 8 with attributes and the attached device's profile 16 including a camera component 46 with its attributes 48.
In this first scenario, e.g., a text-to-speech converter is attached to the terminal. The application may take this into account when deciding what information to deliver and how this information is delivered. The text-to-speech converter is a complementary device and therefore the profile sent from terminal to application contains the capabilities of both the terminal and the text-to-speech converter.

In the second scenario an attached device establishes a mobile Internet session with the application via the terminal that is relaying the session. In this case the attached device works as a substituting device.

The second scenario is illustrated in figure 7a. An attached device 12, e.g. a laptop computer, establishes a session with a terminal 2, e.g. a mobile phone (illustrated above in figure 7a). This may be performed prior the terminal establishes a mobile Internet session with an application server 4. Figure 7b illustrates the protocol profile, UAProf, comprising the attached device's profile including a laptop component 50 with its attributes 52.

In this second scenario the attached device will send its profile along with the session establishment. The application server will receive the profile of the attached device and not that of the mobile phone, since the phone is acting as a sort of router. In this scenario the WAP/HTTP stack terminates in the device, which means that the WAP/HTTP sessions are set up transparently through the mobile phone. The profile will only contain the capabilities of the attached device, e.g. the laptop from which the mobile Internet session is established.

In the third scenario an attached device establishes a mobile Internet session with the application and the terminal is acting as a gateway in between.

The third scenario is illustrated in figure 8a. An attached device 12, e.g. a laptop computer, establishes a session with a terminal 2, e.g. a mobile phone (illustrated above in figure 8a). This may be performed prior the terminal establishes a mobile Internet session with an application server 4. Figure 8b illustrates the protocol profiles, UAProf, comprising the terminal profile 8 with attributes and the attached device's profile 16 including a laptop component 50 with its attributes 52.

In this scenario the attached device sets up a Mobile Internet session with the mobile phone and the mobile phone sets up a session with the application. The WAP stack is terminated in the mobile phone, but the information received from the application does not terminate in the phone but is passed on from the phone to the attached device. The profile sent, includes the capabilities of both the mobile phone and of the attached device that initiated the Mobile Internet session with the mobile phone. Other devices that may be attached to the mobile phone (e.g. a text-to-speech converter) are not included in the profile, since it is the initiating device that is preferred by the user and therefore is the other attached devices not relevant in this case. In this case the attached device works as a complementary device.

In the fourth scenario the terminal has already established a mobile Internet session with the application when a new device is attached to the terminal.
The fourth scenario is illustrated in figure 9a. A terminal 2, e.g. a mobile phone, has established a mobile Internet session with an application server 4 (illustrated above in figure 9a). An attached device 12, e.g. a camera, is then attached to the terminal and establishes a session with the terminal 2. Figure 9b illustrates the protocol profiles, UAProf, comprising attached device's profile 16 including a camera component 46 with its attributes 48.
This scenario is applicable, for example, when entering a car equipped with a text-to-speech converter and the user is asked whether the application needs to be informed about the new device available. This will allow the application to reconsider the way the information is presented, The question is not asked for sporadic devices like parking meters, vending machines or printers.
Since there is already an established mobile Internet session between the mobile phone and the application server, the application has already received a profile from the phone. Therefore a Diff_Profile needs to be sent to the application server, specifying what the additional capabilities are. This Diff_Profile is illustrated in figure 9b.

In the fifth scenario the application requests the profile prior to establishing a mobile Internet session to the terminal. The application wants to send out information to the terminal and thereby initiates the session and asks the terminal and device for its capabilities, compared to the normal case when the terminal initiates, and directly sends its and its attached devices capabilities.
The fifth scenario is illustrated in figure 10. An application server 4 requests the profile from a terminal 2, e.g. a mobile phone, to be able to tailor the push information format and content to the attached device 12, e.g. a camera or an MP3-player. The following profile is then returned from the terminal to the application: terminal profile + attached device's profile.
The application will also get the entire profile of the terminal, not overruled by any substituting devices' profiles, since the application might decide to push the information to the phone rather than to one of the substituting devices.
If there is currently no ongoing session between the terminal and the WAP gateway, and the WAP gateway does not store the profiles beyond the duration of a session, the WAP gateway (or the application) can query the mobile phone.

The first four scenarios are pull scenarios, i.e. user initiated, and the last one is a push scenario, i.e. application initiated.

Figure 11 illustrates how an application in an application server 4 can retrieve an attached device's 12 capabilities prior to pushing information in order to be able to tailor the information format and content. The following procedure is performed with references to figure 11:

(1). A terminal e.g. a mobile phone enters a car that is equipped with a text-to-speech converter. An ad-hoc network is established between the mobile phone 2 and the attached device.

(2). The profile of the complementary device (in this case the text-to-speech converter) is sent to the mobile phone that updates its profile record.

(3). The user of the mobile phone subscribes to news from a content provider (the application server) and the news application (located in the application server) decides to push the latest news information to the mobile phone.

(4). A terminal capability request (i.e. what is the capability of the mobile phone and any ad-hoc connected devices) is sent to the WAP gateway 54. The WAP gateway is capable of sending WAP push messages to the mobile phone. A MSISDN number is supplied in the request. The MSISDN number could for example be fetched by the application from the personal information related to the news subscription. The WAP gateway sends the push request to the mobile phone. In figure 11 PLMN stands for Public Land Mobile Network and could be e.g. UMTS (Universal Mobile Telephone System), GSM (Global Service for Mobile transmission) or GPRS (General Packet Radio Service). It should be noted that the terminal capability request could be sent by the application direct. The use of a WAP gateway illustrated here is only one possible solution.

The terminal capability request ends up in the mobile phone.
The now updated profile is sent back to the application server.

(5). With the new information the application can adopt the information to the new capabilities. In this example the news content is converted to a speech mark-up language.

The speech mark-up language news content is then sent to the mobile phone that uses the text-to-speech converter to present the information to the user.

The present invention is not limited to the above-described preferred embodiments. Various alternatives, modifications and equivalents may be used. Therefore, the above embodiments should not be taken as limiting the scope of the invention, which is defined by the appendant claims.

Claims

1. Data communication system comprising a terminal (2) adapted to communicate with an application (4) using a wireless transmission protocol (6) including a terminal profile (8), characterized in that said wireless transmission protocol also includes an attached device's profile (16) that is updated with data related to devices attached to the terminal.

2. Data communication system according to claim 1, characterized in that the update of the attached device's profile is terminal initiated.

3. Data communication system according to claim 1, characterized in that the update of the attached device's profile is attached device initiated.

4. Data communication system according to claim 1, characterized in that the application can retrieve the terminal profile and the attached device's profile from the terminal.

5. Data communication system according to any preceding claim, characterized in that said attached device's profile is dynamically updated.

6. Data communication system according to any preceding claim, characterized in that said attached device's profile comprises data related to the capabilities of the attached device.

7. Data communication system according to any preceding claim, characterized in that said wireless transmission protocol is the Wireless Application Protocol (WAP).

8. Data communication system according to claim 7, characterized in that said attached device's profile is implemented as a new schema in the User Agent Profile (UAProf) in WAP.

9. Data communication system according to any preceding claim, characterized in that said terminal is a mobile phone.

10. Data communication system according to any preceding claim, characterized in that said device attached to the terminal is wirelessly attached using the Bluetooth protocol.

11. Data communication system according to any preceding claim, characterized in that said attached device is a substituting device, wherein the profile of a substituting device partly overrides the terminal's profile.

12. Data communication system according to any preceding claim, characterized in that said attached device is a complementary device, wherein the profile of a complementary device is an addition to the terminal's profile.

13. Data communication system according to any preceding claim, characterized in that said attached device is a sporadic device.

14. Method in a data communication system comprising a terminal provided with a wireless transmission protocol including a terminal profile, characterized in that said method comprises the following step:

i) update an attached device's profile included in said wireless transmission protocol with data related to a device attached to the terminal.

15. Method according to claim 14, characterized in that the attached devices profile in said wireless transmission protocol is dynamically updated.

16. Method according to claim 14 or 15, characterized in that said method further comprises the following steps:

ii) transfer the attached device's profile to an application server, and

iii) tailor an application to be transferred from the application server to the attached device, via the terminal, in accordance with the attached device's profile.



FIG.1a

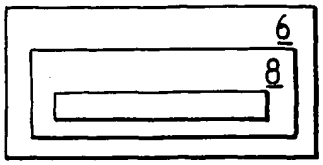


FIG. 1b

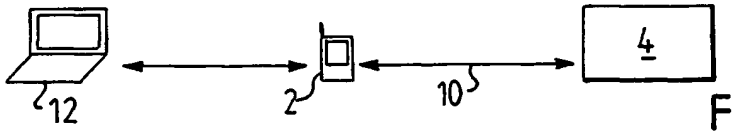


FIG. 2

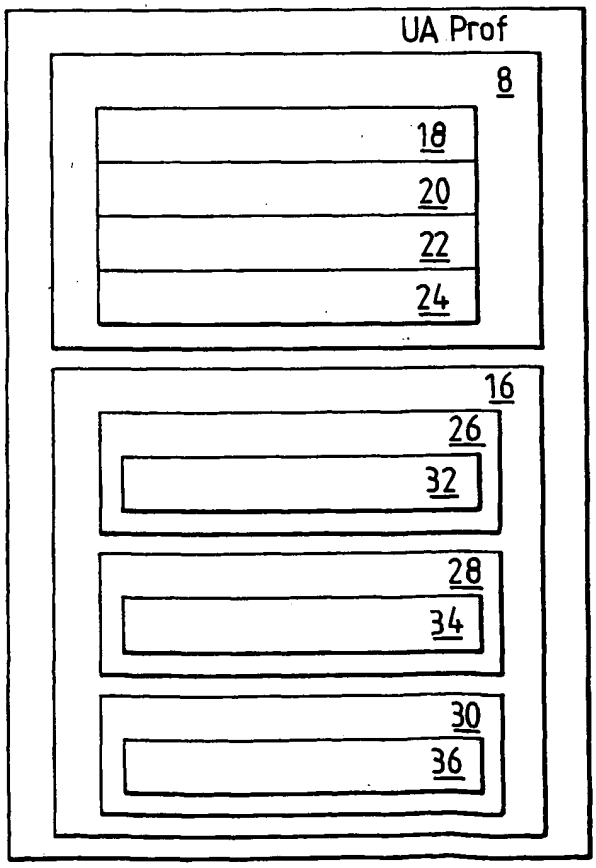


FIG.3

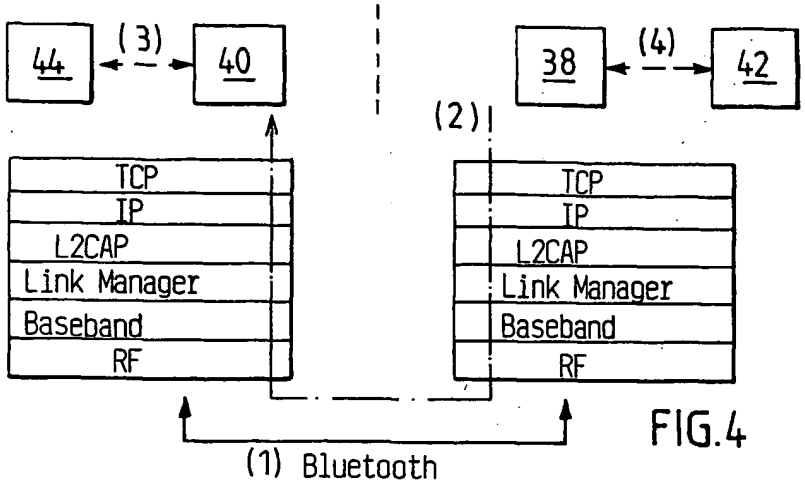


FIG.4

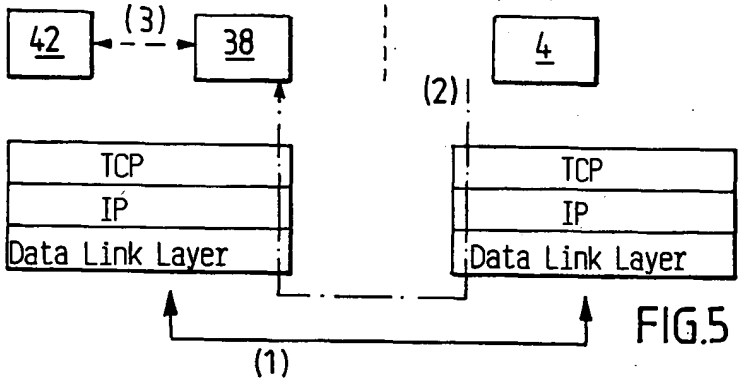


FIG.5

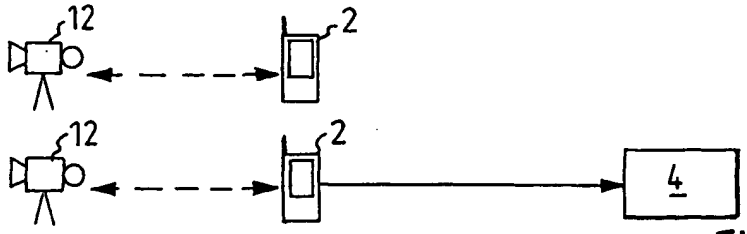


FIG.6a

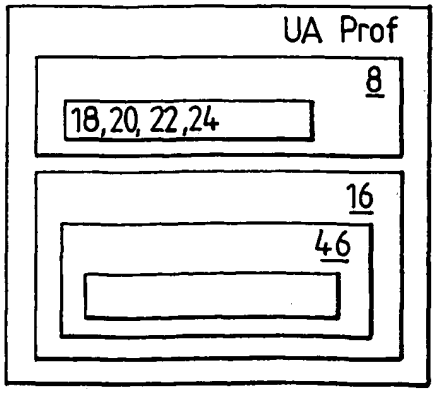


FIG.6b

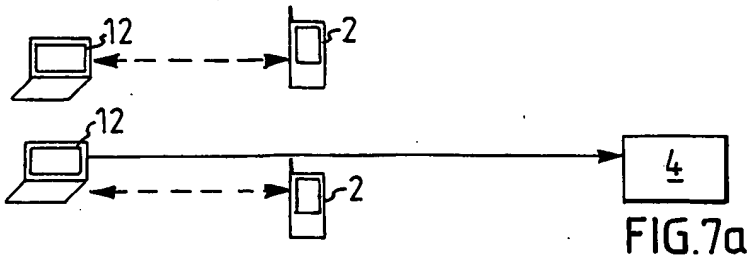


FIG.7a

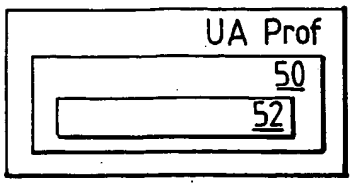


FIG.7b

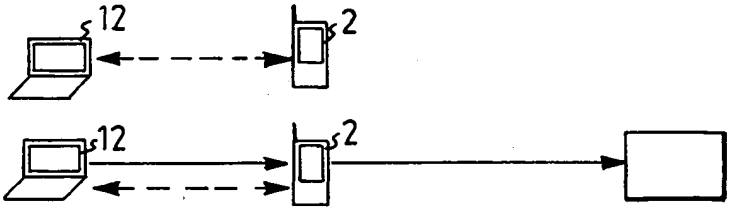


FIG.8a

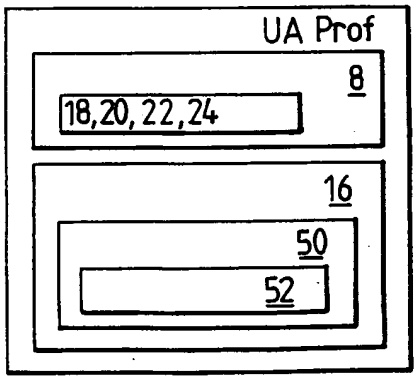


FIG.8b

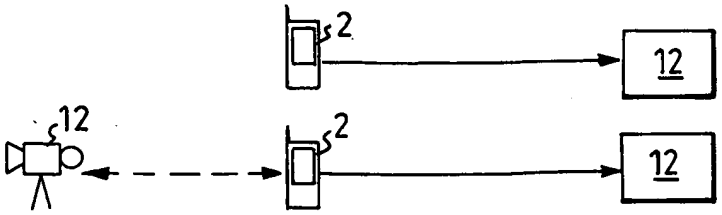


FIG.9a

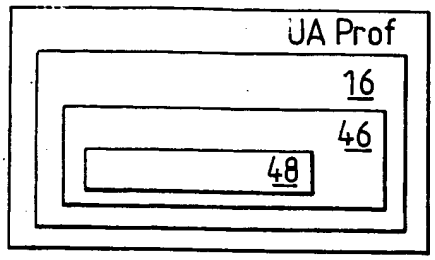


FIG.9b

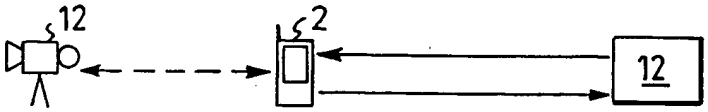


FIG.10

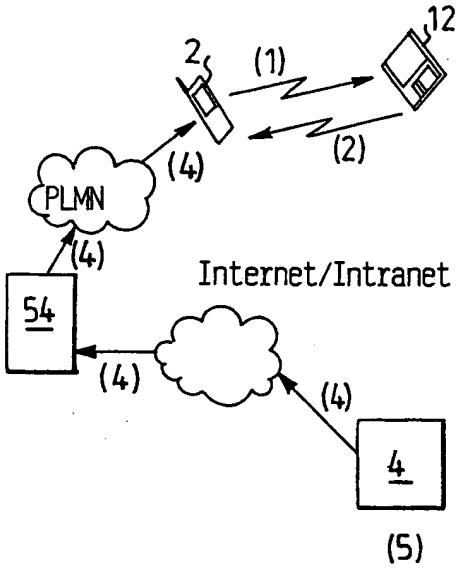


FIG.11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/01193

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 29/06, H04Q 7/20
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)

IPC7: H04L, H04Q

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

SE,DK,FI,NO classes as above

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 0064110 A1 (NOKIA NETWORKS OY), 26 October 2000 (26.10.00), page 1, line 30 - page 4, line 31, figures 1-3, claims 1,5,6, abstract	1-7,9,10, 12-15
P,Y	page 1, line 30 - page 4, line 31, figures 1-3, claims 1,5,6, abstract	8,11,16
	--	
P,X	WO 0133781 A1 (NOKIA MOBILE PHONES LTD), 10 May 2001 (10.05.01), page 4, line 31 - page 5, line 30; page 7, line 15 - line 36; page 12, line 19 - page 13, line 3, claims 1,6-9,11,12, 49-52, abstract	1-10,12-15
P,Y	page 4, line 31 - page 5, line 30; page 7, line 15 - line 36, page 12 line 19 - page 13 line 3, claims 1,6-9,11,12,49-52, abstract	11,16
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 November 2001	09 -10- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Mariana Eddin/JAn Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

BNSDOCID: <WO_____0197482A1_I_>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/01193

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WAG UAPROF Version 10-Nov-1999 "Wireless Application Group User Agent Profile Specification" Wireless Application Protocol Forum, Ltd 1999 Page 8 line 1 - page 9 line 32, page 13 line 13 - page 16 line 32, page 60 line 1 - page 68 line 6 ---	8,11,16
A	WO 9956431 A2 (NOKIA MOBILE PHONES LIMITED), 4 November 1999 (04.11.99) ---	1-16
A	WO 9838814 A2 (AT & T WIRELESS SERVICES INC), 3 Sept 1998 (03.09.98) --- --------	1-16

BNSDOCID: <WO 0197482A1_I_>

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/09/01

International application No.
PCT/SE 01/01193

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0064110 A1	26/10/00	AU 4033099 A	02/11/00
WO 0133781 A1	10/05/01	AU 1398501 A	14/05/01
		AU 1399001 A	14/05/01
		FI 992401 A	06/05/01
		WO 0133782 A	10/05/01
WO 9956431 A2	04/11/99	AU 4360999 A	16/11/99
		BR 9910049 A	02/01/01
		CN 1307775 T	08/08/01
		EP 1076976 A	21/02/01
WO 9838814 A2	03/09/98	EP 0966855 A	29/12/99
		US 6167261 A	26/12/00

BNSDOCID: <WO_____0197482A1_I_>

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G06F 17/30, 17/60

A3

(11) International Publication Number: **WO 98/35469**

(43) International Publication Date: 13 August 1998 (13.08.98)

(21) International Application Number: PCT/US98/01341

(22) International Filing Date: 23 January 1998 (23.01.98)

(30) Priority Data:
08/788,899 23 January 1997 (23.01.97) US

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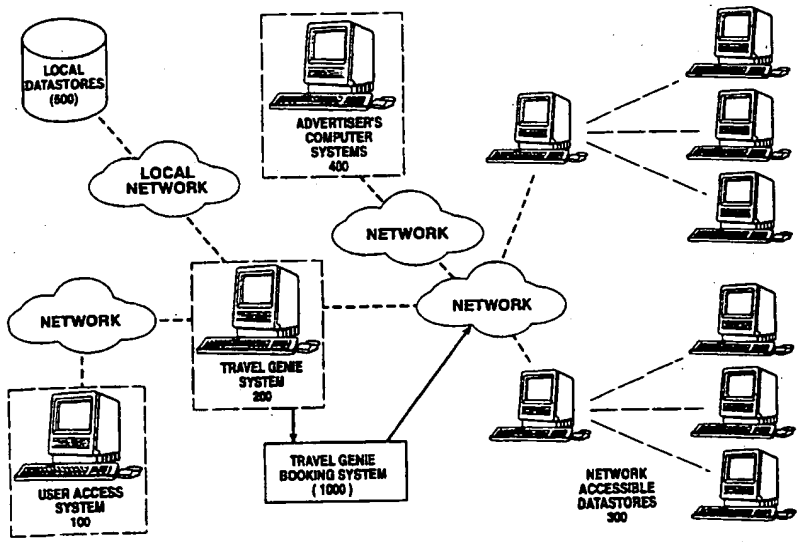
(74) Agents: GARRETT, Arthur, S. et al.; Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P., 1300 I Street, N.W., Washington, DC 20005-3315 (US).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(88) Date of publication of the international search report:
29 October 1998 (29.10.98)

(54) Title: INFORMATION AGGREGATION AND SYNTHESIZATION SYSTEM



(57) Abstract

An information aggregation and synthesization system and process (1000). The present invention provides aggregation and packaging of structured or unstructured information from disparate sources such as those available on a network such as the Internet. A network compatible/addressable interface device is operated by a user (100). The network interface device (100) communicates with local (500) or network accessible datastores (300) via an addressing scheme such as Uniform Resource Locator addresses (URLs) utilized by the Internet. Data passing between the network interface device (100) and the datastores (300, 500) is accessed, polled and retrieved through an intermediary gateway system (200). Such aggregated information is then synthesized, customized, personalized and localized to meet the information resource requests specified by the user via the network interface device (100).

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YU	Yugoslavia
ZW	Zimbabwe

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/01341

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 17/30, 17/60
US CL :Please See Extra Sheet.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : Please See Extra Sheet.

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

Microsoft Press Computer Dictionary

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

APS, IEEE/IEE Online Publications
search terms: Internet, WWW, world wide web, gateway, coupon, ad, advertis?, profile, implicit information

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 5,623,652 A (VORA et al.) 22 April 1997, abstract, col. 5, lines 18-52	1-7
X, P ---- Y, P	US 5,710,886 A (CHRISTENSEN et al) 20 January 1998, abstract, col. 8, line 42 through col. 9, line 44	8-11 ------- 12-23
Y	LITTLE, Thomas D.C., Commerce on the Internet, Multimedia at Work, 1994, pages 74-78	12-23
Y	AUBREY, David, Nomads of the Net (intelligent agents for data searching), Computer Shopper, v 15 n 12, p 616(4) December 1995, pages 1-8	12-18
T	US 5,740,549 A (REILLY et al.) 14 April 1998, abstract, col. 5	1-3

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search 16 JUNE 1998	Date of mailing of the international search report 20 AUG 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer PARSHOTAM LALL Telephone No. (703) 305-9715

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/01341

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	US 5,649,186 A (FERGUSON) 15 July 1997, abstract, col. 3	1-23
A	US 5,530,852 A (MESKE, JR. et al.) 25 June 1996, abstract	1-23
A	YUWONO et al., Search and Ranking Algorithms for Locating Resources on the World Wide Web, IEEE, 1996, pages 164-171	1-23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/01341

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/01341

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

705/14, 705/26; 707/10, 501; 395/200.36, 395/200.47 395/200.48, 395/200.49

B. FIELDS SEARCHED
Minimum documentation searched
Classification System: U.S.

705/14, 705/26; 707/10; 395/200.47 395/200.48, 395/200.49

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING
This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim(s) 1-7, drawn to accessing, retrieving, and proccssing data passing between a network communication device and databases through an intermediary gateway.
Group II, claim(s) 8-23, drawn to using software agents to develop implicit and explicit user information profiles to distribute electronic coupons.

The inventions listed as Groups I and II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Invention I has separate utility as a process for accessing, retrieving and processing data through an intermediary gateway without the software agents of invention II; and

Invention II has separate utility as a process for using software agents to generate user profiles from implicit and explicit information without the intermediary gateway of invention I.

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04L

A2

(11) International Publication Number: **WO 98/35469**

(43) International Publication Date: 13 August 1998 (13.08.98)

(21) International Application Number: PCT/US98/01341

(22) International Filing Date: 23 January 1998 (23.01.98)

(30) Priority Data:
08/788,899 23 January 1997 (23.01.97) US

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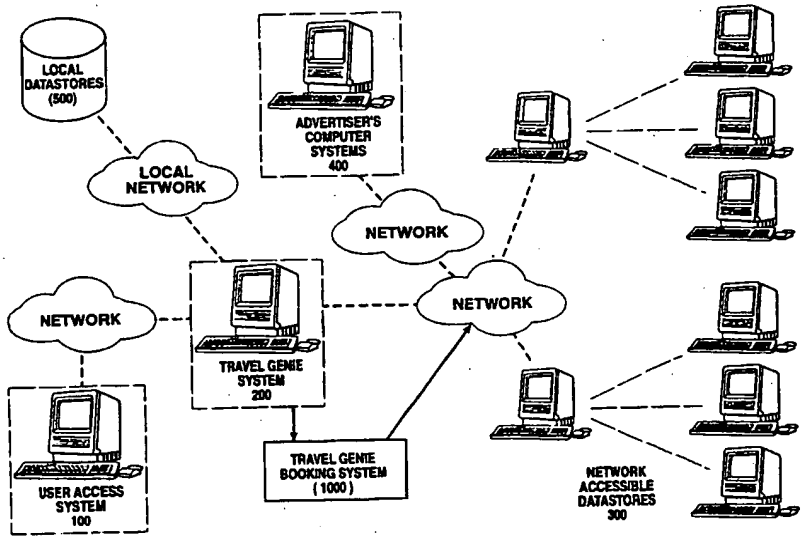
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(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: INFORMATION AGGREGATION AND SYNTHESIZATION SYSTEM



(57) Abstract

An information aggregation and synthesization system and process. The present invention provides aggregation and packaging of structured or unstructured information from disparate sources such as those available on a network such as the Internet. A network compatible/addressable interface device is operated by a user. The network interface device communicates with local datastores or network accessible datastores via an addressing scheme such as Uniform Resource Locator addresses (URLs) utilized by the Internet. Data passing between the network interface device and the datastores is accessed, polled, and retrieved through an intermediary gateway system. Such aggregated information is then synthesized, customized, personalized and localized to meet the information resource requests specified by the user via the network interface device.

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INFORMATION AGGREGATION AND SYNTHESIZATION SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of U.S. Patent Application No. 08/685,805 filed July 24, 1996, which is based on Provisional Application No. 60/015,384 entitled INFORMATION AGGREGATION AND SYNTHESIZATION SYSTEM, filed April 1, 1996.

BACKGROUND OF THE INVENTION

1. Field of the Invention.

The present invention is directed to an information aggregation and synthesization system which connects with local and network accessible datastores through an intermediary gateway system.

2. Prior Art.

Widespread use of personal computers, modems (modulator/demodulator devices that enable data to be transmitted) and data connections has allowed the growth of computer networks. The Internet serves as an example of a type of computer network, and indeed, is a large network of networks, all inter-connected, wherein the processing activity takes place in real time. The Internet offers mail, file transfer, remote log in and other services. The World Wide Web (WWW) is the fastest growing part of the Internet.

On the World Wide Web (WWW), a technology called hypertext allows Internet addressable resources to be connected, or linked, to one another.

In the past, certain, limited aspects, of the present invention have been proposed, such as monitoring of computer usage.

Lockwood (U.S. Patent No. 5,309,355) provides a computerized tool to augment sales and marketing capabilities of travel agency personnel. The system creates and displays customized sales presentations from (1) stored client profiles; (2) travel agent assessment of

client profiles; and (3) computerized reservation system responses to client profiles. Selected factors are analyzed by the operating program based upon an organization hierarchy of specifications.

Lockwood differs from the present invention in:

1) Data sources - Lockwood uses content from both a videodisk (static) and computerized reservation systems (dynamic). The present invention is capable of deriving content from totally dynamic sources on the World Wide Web (including Internet and local datastores or caches simulating a WWW component).

2) Client Profiles - Lockwood proposes that these be input by a Travel Agent. In the present invention, profiles are entered by the consumer (explicit) or collected through analysis of online session activity (implicit).

3) Data Organization - Lockwood uses preindexed videodisks. The present invention indexes prequalified WWW sites, updating these as they change or as users expand their WWW searches.

4) Programation - Lockwood places the entire index of information in a PROM. This index is exercised by the sequencer which displays a sales presentation. The present invention stores indices in magnetic medium but retrieval and presentation of the indexed information is executed dynamically on premised upon user input.

Remillard (U.S. Patent No. 5,404,393) discloses an electronic device and method for monitoring television activity and communicating the monitored activity to a facility and initiating appropriate actions. A controller initiates an automated configuration by acquiring configuration information. The controller monitors television channel selection information and assembles the monitored television information into a user profile. An option includes capturing images or text and forwarding to the user through a mail facility.

Remillard differs from the present invention in that it suggests a device to access distant information through a television set. The present invention utilizes network addressable information resource and human interface elements such as those used by the Internet, one of which may in fact be attached to a TV. Remillard's invention (or that of others) may be used as a means to acquire WWW information but does not contemplate the present invention.

Levinson (U.S. Patent No. 5,404,505) provides information in a database which is tagged with indices to form an hierarchical structure. Software having a set of subscriber requests handling routines interacts with a data filter subsystem. The data filter subsystem receives incoming data stream and selects those packets that meet certain selection criteria. A special smart caching routing is provided for anticipating future requests by the user.

Levinson differs from the present invention:

1) Levinson proposes a satellite based information retrieval system. This is based on fixed data sources (Compuserve, Prodigy) being queried by a user on a telephone line with the results being returned via a television connection. The present invention uses a similar infrastructure to return requested information to the user but our process for identifying content that is relevant is software agent based and retrieval of dynamic content is from the WWW vs. fixed data sources. The present invention can use any means: for example, TV, Cable Modem, RF, ISDN, Modem, fixed line (T-2, T-3 etc.).

2) Levinson would establish user inputted profiles for "Automatic Data Retrieval". The present invention supplements user provided profile information by constructing implicit profile recognition patterns, based upon historical search activity.

3) Levinson's invention does not specify any of the six components proposed in the present invention.

Griffin et al. (U.S. Patent No. 5,422,809) provides an information storage and retrieval system for storing, referencing and retrieving various travel information from a database. A querying device queries the user for input used to define the field for the travel destination desired. Statistical records are produced which provide relevant information relating to travel destinations using the system. Information is thus provided which can be used to evaluate the popularity of particular destinations.

Griffin et al. differs from the present invention in that it discloses a kiosk system and the processes and subprocesses for self service travel planning and reservations. While the present invention provides similar capability using other means, the six features of the present invention are not disclosed in this patent.

Senda (U.S. Patent No. 5,459,859) discloses an information providing system using a communication network which stores attribute/schedule information from each subscriber and uses that information to match with other subscribers.

Senda differs from the present invention in that it is a software based system for meeting a system while traveling. It involves a best fit match between profiles. The present invention also provides a "best fit" but between software agents and data being viewed. Senda has both formatted selection and source data inputted for a specific purpose (to meet someone). The present invention uses software agents to format selection data but the source data is unformatted from the WWW.

Belove et al. (U.S. Patent No. 5,491,820) discloses a storage transmission mechanism for retrievable items and may be used on the Internet. The system may include a filter on each client or on the server between the user and the Internet.

Belove et al. differs from the present invention in that it is a client server object caching system. Except for the pruning mechanism that limits the information

cached at the client side, there is no resemblance to the present invention.

Accordingly, it is a principal object and purpose of the present invention to provide an information aggregation and synthesization process and system connecting a network operable device and a plurality of local or network accessible datastores wherein data passing there between is accessed, polled and retrieved through an intermediary gateway system.

SUMMARY OF THE INVENTION

The present invention includes at least six different aspects or functional components which are related, all involving use of a computer accessible data network such as the Internet. While the individual aspects may be utilized together, they may also be used separately.

The user initiates access to the system through a network addressable interface device (such as a personal computer, Internet Appliance, an interactive television or even a personal digital assistant or smart telephone). The user is then connected to the information aggregation and synthesization system via a network service provider (most likely through the Internet or some variation). The user logs on to the system either by name, address, or with some pseudonym (or some combination). This allows the user's activity to be tracked and establishes a log of the user's activity during the current online experience (session). The user is also asked for explicit profile information concerning preferences. These preferences will be used to narrow the information retrieval and may be collected when the user first logs in or incrementally as the user asks for specific information. This profile information will be kept and updated as the individual user's preferences change.

Once the user is logged in, the information aggregation and synthesization system will facilitate the user's access to local information or information distributed on a network (this network could be a local

area network or a wide area network such as the Internet). All user access to information is through the system.

This information is topically oriented (Germany travel, the Olympics, Spring Break or even new cars), composed of files and file references using the Hypertext Markup Language ("HTML") or similar tagged reference format that may be prescreened for relevance and appropriateness. Selected text can be "expanded" at any time to provide other information. These words are, thus, linked to other documents. This information is indexed in this fashion in advance of the user's logging in.

A gateway is provided into the WWW for shopping while retaining the user passing through the information aggregation and synthesization system. A gateway is provided to poll, access and retrieve information from various locations. A filtering process is provided and the resulting information is returned to the requested party.

The user is presented with a variety of search, display and output options. The search options include: 1) Search using key words or combinations; 2) Use of complex software text search agents that have been predefined by the information aggregation and synthesization system site operators. These agents take advantage of the expansive subject matter expertise in understanding which search parameters will best serve the user's search needs; 3) Use of search patterns and agents from this user's previous sessions, perhaps expanded by available specials and promotions; 4) Natural Language Query; and 5) Some combination of 1), 2), 3) and 4).

The user selects information to be viewed from the results of the search. This information is retrieved from its source and presented to the user in the manner and at the time requested. The available display options include but are not limited to: display on the user's network capable device, personal TV channel, customized Internet page, custom CD-ROM, electronic mail, mobile devices (Personal Digital Assistants, telephones and pagers) and

facsimile. Information retrieval and display can be text, still pictures, videos, Interactive multimedia, audio and geographic.

In certain situations, data from the datastores destined for the user is converted prior to delivery to the user. The data stream returned to the user may be modified to fit the bandwidth, character set and display limitations of the network and may be modified to meet the limitations of the user interface device.

Along with displays, including those for data entry, searches, search results, information retrieval, the user will be presented with advertisements and/or coupons based on criteria entered by advertisers. This criteria may take the form of simple logic, linking an ad/coupon with a display or be derived from complex software text search agents that analyze one or more of the following: The user's looking pattern, the user's psychographic profile, the user's personal profile, the availability of the advertiser's/couponer's goods or services at the instant in time that the criteria is being exercised. The placement of the ad/coupon will be logged along with user profile information and provided to the advertiser/couponer in some form of report.

During a user session or when a user completes a session, the user's looking activity is analyzed for patterns, preferences and trends and the profile annotated or updated so that when they next use the information aggregation and synthesization system, the nominated searches will be customized to their individual desires.

The six aspects of the information aggregation and synthesization system are:

I. URL Munging

The World Wide Web ("WWW") is characterized by computer (user) connection through an Internet Service Provider to any WWW address or site. Hence, use of the WWW is like placing individual telephone calls to many merchants, trying to compare products and services. URL

Munging is the process that allows the goods and services of many merchants to be displayed through a single virtual shopping center.

This involves encapsulating and indexing the content of various merchants as well as modifying parts of the internal structure, repurposing and redirecting it to be integrated into the information aggregation and synthesization process. This allows content from and access to multiple merchants to be aggregated, synthesized and accessed at a single WWW site.

II. WWW CD-Rom

World Wide Web ("WWW") access from homes is often constrained by the lack of sufficient data communications bandwidth within a typical residential infrastructure (WWW information may be accessed through the Internet WWW, a local Internet WWW, or a local datastore or cache simulating a WWW component).

The Internet user will select World Wide Web (WWW) content for retrieval using a search engine to return selected WWW references. The user will then select certain of these references to be included in a custom CD which will be burned or recorded onto a CD and then sent by express delivery to the user.

III. Software Agent Advertising Insertion.

Currently, advertisements in WWW pages are tightly tied to each page, are inserted based on keywords or on a psychographic profile of the user.

Certain criteria will be entered which delineates a pattern that is requested to be monitored. When this pattern is seen (or is in close match) in the user's WWW activity, the insertion mechanism is activated. If a certain web page is requested, the present invention will display a particular advertisement. The ad will be inserted based on the content of the existing web page being read. An analysis of the text stream of the user's interactive session will be performed on-line. For instance, if the user accesses web pages for Holiday Inns

on the West Coast, the insertion mechanism could be established to automatically insert ads for Hilton Inns on the West Coast.

IV. Automated Profile Generation.

Presently, user's profiles are collected based on explicit entry by the user, and extraction from demographic data collected from a variety of sources.

In the present invention, the searching patterns of the user on the Internet are monitored. A set of software text agent profiles is developed and may be integrated with explicitly collected profile information. The automated profile generation will have both explicit profile information gathering and implicit profile information gathering capabilities.

As the user uses the information aggregation and synthesization system, the pattern of information being viewed is analyzed. During a user's session, advanced text analysis tools are used in real-time to understand the interests of the user by synthesis of the text stream of pages looked at. This synthesis is used as input to a statistical correlation with similar interests of a larger population. The results of this correlation are used to predict the extended interests of the user. These are matched using intelligent software text agents and a variety of reasoning techniques. The user is presented with search ideas as well as promotions and specials from suppliers based on these searching patterns.

V. Automated Lead Generation

Currently, leads are generated by recording user's WWW site selection. (For Example, user's visiting a "Chicago" information site would be "Chicago" leads.)

In the present invention, the user WWW viewing patterns are recorded. These and optionally the user's profile are matched against software text agents entered by a supplier. When these agents match a pattern/profile, the

supplier is notified. When this profile is approximately matched, the supplier is notified.

VI. Software Agent Unmet Needs Generation.

Currently, there is no on-line immediately accessible system to analyze unmet needs of Internet users.

In the present invention, records will be maintained from user usage of the Internet on what consumer queries are unmet by the WWW content retrieved. The invention will intuitively construct a profile from user inputted data. This will be done by recognizing unanswered queries and/or user initiated requests. From this, a profile will be developed to identify new markets. As an example, if one hundred people inquire about snorkeling off the coast of Texas, this information could be sold to a tour provider who could not only prepare a travel package but sell the leads to a company. Thus, the system will be able to gather "negative" leads.

In the course of a session, the user may desire information not yet available. This information could be in the form of a product, a service or an event. The user then can establish a persistent (stays around after the user's session is over) complex software text search agent to monitor future information additions to the System and alert the user through a variety of means (facsimile, electronic mail, text page, voice, pager) that the information that was requested is available or in some instances, provide the information directly. The set of persistent agents will also be analyzed by the information aggregation and synthesization system operators and provided to potential suppliers who would in turn develop new product offerings which would be added to the information aggregation and synthesization system sources.

DETAILED DESCRIPTION

In the embodiments described herein and accompanying figures, a travel information scenario is depicted. It will be understood that the present invention is capable of performing similarly for other venues, such as mortgages,

automobile sales and any other interactive exchange of information sought by information content seekers and potentially satisfied by information content providers.

Initial Setup For User

Referring to the drawings in detail, Figure 1 illustrates a diagram showing the interface of the present system 200 with a user on a user access system 100 and various data sources. Figure 2 illustrates several of the datastore categories. The use of the present invention has at least five phases:

Initial Setup For User
Initial Setup For Advertisers and Lead Generation
Ongoing Maintenance
User Session
Post Session Activity

A theme or definition of a class of information (e.g., central California travel and tourism or new automobiles) is identified. Data sources (Local DataStores (500...N) and Network Accessible DataStores (300...N)) are screened for relevance, quality of information and appropriateness (or may be included de facto based on their title or description). These are indexed using a text indexing software tool 2981 and the indices stored on the system index DataStore 220. An initial set of Preestablished Software Text Agents are defined. These agents are words or combinations of words that form a word based search pattern. This initial set of agents is relevant to the searches that might be performed against the class of information that was indexed. (i.e., Agents about automobiles would be developed to search a class of indexed information about new cars). These are stored in the Preestablished Software Text Agent DataStore 231. The System 200 uses any multipurpose computer central processing units with the ability to handle multiple inputs and outputs with the necessary hard disk storage and to run World Wide Web (WWW) or other network server software.

Figure 1A illustrates a modified arrangement of the interface of the present system 200 with alternate user access systems and alternate network interface devices.

The present system 200 is in communication with a limited band width limited character set system (LBLCS) 289 which is a subsystem of input/output system 280.

Although today's WWW access is normally with broad band, high speed networks, many corporate intranets operate on limited capability, slow speed networks. The LBLCS system 289 allows conversion of the rich media used on today's WWW into text-only media with multi-media references as anchors that preserve the essential information to be passed in HTML or other tagged reference format to the user. For users with limited band width limited character set networks, the WWW datastore information which is returned to the user is altered. Any graphics files are identified, eliminated and replaced with a text anchor. For example, certain networks or user access systems can not handle graphics files. A text page which is returned to the user 110 or 120 which contains graphic files will be identified. The graphic file itself will be eliminated and in its place a text reference, such as "(picture)", is inserted.

User access system 110 is connected through a limited private network to the LBLCS 289 subsystem. Figure 1b illustrates a block diagram of the LBLCS subsystem.

User interface system 120 illustrates a connection through a limited dial network into the LBLCS subsystem 289.

The return datastream from the datastores to the user is modified to fit the bandwidth, character set and display limitations of the network and of the user access device.

In one implementation of the present system, terminals for travel agents may be provided with access to the system 20. In certain cases, travel agent terminals are much more limited than ordinary personal computer CPU's. Through the usage of present invention, agents will be provided access

to the information aggregation and synthesization system 200.

Initial Setup For Advertisers and Lead Generation

Advertisers:

Advertisers, using a user access system 100 enter criteria that should be met for an advertisement/coupon placement. These criteria are in the form of the complex software text search agents described above. This includes a match "threshold". When this threshold is met or exceeded, an ad/coupon will be appended to a system session. Statistical analysis known as clustering is used to evaluate the data.

The ad/coupon may be resident on the user access system 100, an advertiser's computer system (400...N) or stored in the Advertising DataStore 250. Additionally, the Advertiser may include conditional criteria for ad/coupon placement (available inventory, in stock levels, excess capacity, etc.). This criteria is referenced when the "threshold" is met and if satisfactory, the ad/coupon is appended. This criteria may be tested against data input through the user access system 100, data on the advertising DataStore 250 or data on the advertiser's computer system (400...N). Additionally, advertisers can input World Wide Web (WWW) referential information (hot links) to be displayed with ads/coupons or on geographic map displays. These are stored on the advertising Datastore 250.

Lead Generation:

Lead Purchasers, using a user access system 100 enter criteria that should be met for the generation of a lead. These criteria are in the form of the complex software text search agents described above. This includes a match "threshold". When this threshold is met or exceeded, information about the current user and the information being viewed is stored in the lead DataStore 270 for variable output transmission to the lead purchaser.

Ongoing Maintenance

Index Updating:

Local DataStores (500...N) and network accessible DataStores (300...N) will change randomly and will become out of synchronization with the system index DataStore 220. The data monitoring system 2982 will periodically monitor local DataStores (500...N) and network accessible DataStores (300...N) and when there is a change, update the index DataStore 220.

Data addition:

Operators will add data to the local DataStores (500...N) and users using a user access system 100 will nominate data from the network accessible DataStores (300...N) to be added to the index DataStore 220. Operators will update the indices using the data indexing service 2981 if the data passes the screening outlined in the initial setup for users above.

User Session

- Login and Profiles
- Browsing
- Data Retrieval
- User Interrupt
- Ad/Coupon Insertion
- Persistent Agents

Login and Profiles:

Users using a user access system 100 access the information aggregation and synthesization system 200 through the Internet or other public or private network. The user either logs in by name or by pseudonym or from data previously stored in the user access system 100. New users create an account on the user profile DataStore 210. Previous users are identified to an existing account. The user is presented with a variety of options to create or update profile information in the user profile DataStore 210. This involves a single data entry option or many mini-options based on the browsing activity.

Browsing:

The user is also presented with browsing options based on: activity from a previous session in the browsing activity DataStore 240; predeveloped software text agents and personalized software text agents (developed in the Post Session Activity) stored in the Personal Search Text Agent DataStore 232; or combinations of all as well as situational opportunities developed by the user greeting subsystem 291. The user selects the search options to be used (or simply enters search criteria directly). This search criteria is used to search the index DataStore 220 and a list of data sources is presented to the user for selection. The user indicates the information to be viewed. The user will also be presented with options to refine his search through the altering of search agent criteria (Search Reduction System 293).

Data Retrieval:

The requested data is retrieved either from local DataStores (500...N) or network accessible DataStore (300...N) and presented to the user via the session management system 292. The user may jump to data referenced in the presented data. Subject to the appropriate policies of the site operation, the session management system 292 will further retrieve and present this data to the user. The user may request that data be overlaid on a geographic display using the Geographic Display I/O System 287 so that referenced information may have geographic relevance.

User Interrupt:

The user interrupt system 294 will periodically notify the user of specialized software text agents that they may want to pursue. These Agents are stored in the agent DataStore 230 and are derived by the real time session analysis system 295 which monitors the browsing activity DataStore 240 during the user's session.

Ad/Coupon Insertion:

During the session, ads/coupons are inserted alongside displayed data (text, picture or index displays) from the ad DataStore 250, based on ad/coupon insertion agents 233 and inserted by the session management system 292. A Record of Insertion along with appropriate user information (may be general or precise to the name of the user) is stored in the advertising activity DataStore 260.

Persistent Agents:

At any time, the user may establish a persistent software Text Agent (using the persistent agent entry system 297, stored in the unmet needs agent DataStore 234) with criteria, if met sometime in the future, will cause the user to be notified through the I/O System 280. These can be explicit or implicit query parameters.

Post Session Activity

Periodically, either due to a preset time interrupt, or user or advertiser event driven activity, the following can occur:

- Unmet Needs Analysis
- Advertising Report
- Profile Updating
- Lead Report
- Targeted Output
- Output Activity

Unmet Needs Analysis:

Users using the user access system 100 will be able to establish persistent (stays in the system after the user quits using the system) software text agents which describe some criteria, which, if met, will cause them to be notified. These are stored in the unmet needs agent DataStore 234. These unmet needs agents 234 are analyzed using the unmet needs analysis system 299 and reports are created through the I/O System 280 for suppliers who could potentially meet those needs.

Advertising Report:

Information about each Ad/Coupon appended to an information aggregation and synthesization system along with known information about the user is stored in the advertising activity DataStore 260. This is reported out periodically to the advertisers/couponers using the I/O System 280.

Profile Updating:

During a session or after a user discontinues use, the data viewed (recorded in the browsing activity DataStore 240) is analyzed by the session profile update 2921 and the user profile DataStore 210 is updated with keywords or personal search text agent DataStore 232.

Lead Report:

Periodically, the Software Text Lead Agents stored in the lead generation agent DataStore 235 are used to analyze the data viewed (recorded in the browsing activity DataStore 240) and reports prepared for lead purchasers using the I/O System 280.

Targeted Output:

Users through the user input system 100 will be able to designate information to be output and the format that the I/O System 280 will use.

Output Activity (Using the I/O System 280):

All output systems will provide for the addition of specials, ads and/or coupons.

Options are:

Personalized Page 281 - This will create a page accessible through the WWW where the user can access requested information.

SMTP Electronic Mail 282 - This allows the delivery of user requested information using the SMTP capability of the Internet and other popular electronic mail systems.

CCITT Class 3 or Class 4 Facsimile 283 - This allows user requested data to be formed as a printed page and sent via Fax to a Fax receiver of the user's choice.

Voice output direct or to a Voice Mail Box 284 - This translates the user requested data to audio, connects to the user or their voice mail system and transmits the audio.

Personal TV or video feed 285 - This formats the data in a form compatible with transmitted video and allows viewing on demand.

Custom CD-ROM 286 - This places the requested data, indices, viewers and all necessary software on a user Unique CD-ROM for physical delivery.

Geographic Display I/O System 287 - This allows the user to view content geographically, to look at the geographic proximity of merchants and services and provides a vehicle for ads and hot links.

Mobile/Portable System 288 - This allows Specially formatted Genie Information to be displayed or translated for a wide variety of mobile and portable devices.

Identification of Key System Components by reference numerals:

100 User Access System
- 110 Limited private network user access system
- 120 Limited dial network user access system

200 System comprised of:

210 User Profile DataStore

220 Travel Genie Index DataStore

230 Agent DataStore
- 231 Preestablished Software Text Agents
- 232 Personal Search Text Agents
- 233 Ad/Coupon Insertion Agents
- 234 Unmet Need Agents
- 235 Lead Generation Agents

240 Browsing Activity DataStore

250 Advertising DataStore

260 Advertising Activity DataStore

270 Lead DataStore

280 I/O System
- 281 Personalized Page Output System
- 282 SMTP Electronic Mail System
- 283 CCITT Class 3 or Class 4 Facsimile
- 284 Voice Output
- 285 Personal TV or Video Feed
- 286 Custom CD-ROM
- 287 Geographic Display I/O System
- 288 Mobile/Portable Device System
- 289 Limited Bandwidth Limited Character Set System

290 Operations System
- 291 User Greeting System
- 292 Travel Genie Session Management System
- 2921 Session Profile Update
- 293 Search Reduction System
- 294 User Interrupt System
- 295 Real Time Session Analysis System
- 296 Ad/Coupon Insertion System
- 297 Persistent Agent Entry System
- 298 Data Support Systems
- 2981 Data Indexing Service
- 2982 Data Monitoring System
- 299 Unmet Needs Analysis System

300 Network Accessible DataStores
- 301...N

400 Advertiser's Computer Systems
- 401...N

500 Local DataStores
- 501...N

100 User Access System

This is a network addressable interface device, such as a conventional personal computer capable of initiating and maintaining a network connection and sending, receiving and displaying data including a digitized data visual representation device such as a monitor and auxiliary

storage, such as a floppy disk drive. It may also be a TV set, smart telephone or network appliance with similar capabilities. It will maintain a connection through a modem (a modulator/demodulator device) that enables data to be transmitted and received.

200 DataStores

Figure 2 illustrates DataStores utilized as a part of the invention. The information aggregation and synthesization system includes:

210 User Profile DataStore

This contains data about the user, preferences, situational preferences, accounting information, psychographic profile, personal profile and other relevant information related to the user by individual identifier.

220 System Index DataStore

This is the index of data accessible by the system. It is established initially and updated as data changes or new data sources are added. It is queried by Agents from the Agent DataStore 230 or by key words.

230 Agent DataStore

231 Preestablished Software Text Agents

These are complex software text search patterns predefined by the site subject matter experts using their extensive knowledge of information contained within the site's indices.

232 Personal Search Text Agents

These are complex software text search patterns that may be individual words or word sets and/or combinations of words and Preestablished Software Text Agents 231 including the results of the post session analysis 2921 that provide individually customized searching of the Index DataStore 220.

233 Ad/Coupon Insertion Agents

These are complex software text search patterns that when matched within the text being reviewed within a given session, cause an advertisement/coupon to be added into the display. These can be direct insertion or conditioned from criteria on the Advertiser's Computer Systems (400...N) and/or the user's profile from the user profile DataStore 210.

234 Unmet Need Agents

These are complex software text search patterns created by the user to persist after the end of the user session looking for patterns and/or specific events or data that are observed within the System 200 at some future time.

235 Lead Generation Agents

These are complex software text search patterns that when matched within the text being reviewed within a given session, causes an addition to the Lead DataStore 270 for output to the lead purchaser using the I/O System 280.

240 Browsing Activity DataStore

This is the record of the "looking" activity of each user in each session.

250 Advertising DataStore

This is the storehouse of ads to be presented when a match is made by the Ad/Coupon Insertion Agent 233

260 Advertising Activity DataStore

This is the record or ads presented by the Ad/Coupon Insertion System 296 and information about the user seeing the ads from the Browsing Activity DataStore 240 and the user profile DataStore 210

270 Lead DataStore

When a Lead Generation Agent 235 makes a match, Data about the user from the user profile DataStore 210 and the Browsing Activity DataStore 240 is stored here.

280 I/O System

These are the various ways that output can be channeled, for the user, the advertiser or the lead purchaser.

281 Personalized Page Output System

This allows output text and associated objects to be formatted for general or selective viewing through any system using Hypertext Markup Language (HTML), VRML (Virtual Reality Modeling Language) or other network compatible display based language either locally or over a network.

282 SMTP Electronic Mail System

This allows output text for whatever purpose to be formatted in a format compatible with the SMTP (Simple Mail Transport Protocol) and transmitted to a designated addressee.

283 CCITT Class 3 or Class 4 Facsimile

This allows output text and associated objects for whatever purpose to be formatted to be compatible with the CCITT Class 3 or Class 4 Fax standard and transmitted to a designated fax receiver.

284 Voice Output

This allows output text for whatever purpose to be formatted into voice for transmission to a human receiver or a voice mail box.

285 Personal TV or Video Feed

This allows output text and associated objects for whatever purpose to be formatted as a TV signal (any international standard) to be accessed and replayed using local or network

capability at the request of an individual user (or a class of users).

286 Custom CD-ROM

This allows the user to designate certain data to be placed onto a CD-ROM along with all necessary search and viewing software as well as non user requested ads and promotions.

287 Geographic Display I/O System

This allows data requested by the user to be overlaid on a geographic reference system (a map).

288 Mobile Device System

This allows output to be formatted for a variety of devices including but not limited to: pagers, personal digital assistants, mobile computing devices and other wireless devices.

289 Limited Bandwidth, Limited Character Set (LBLCS) Data Network

The software module input/output system identifies graphic files, removes them and replaces them with text anchors. The LBLCS module may be resident on the I/O system 280 or be established on separate hardware.

290 Operations System

291 User Greeting System

This is the subsystem that identifies users, customizes search screens, incrementally collects explicit profile information and formulates search agent screens and search specials which may be situational or seasonal or both.

292 Session Management System

This tracks and records a user's browsing activity, sets ID tokens, establishes accounts, translates anonymous users to named users and

manages the user's implicit profile information.

2921 Session Profile Update

Uses the Browsing Activity DataStore 240 records, to analyze and update the user's profile in the user profile DataStore 210.

293 Search Reduction System

This aids the search by suggesting changes to the complex software text search agents to refine the user's search.

294 User Interrupt System

Based on the Real Time Session Analysis of the users looking activity (stored in 240), determines associated references, agents or other information to be offered to the user and interrupts the user's session with an interactive data screen.

295 Time Session Analysis System

This monitors the user's browsing activity and analyzes the apparent interests to trigger the user interrupt system 294.

296 Ad/Coupon Insertion System

This looks at the current display requested by the user with a Ad/Coupon Insertion Agent 233, determines which ads should be placed (or rotated) and makes the placement (or establishes the rotation).

297 Persistent Agent Entry System

This is the mechanism whereby the user enters the Unmet Need Agent 234. This agent monitors text and data changes and if the requested data/pattern occurs, the user is notified via the I/O System 280.

298 Data Support Systems

2981 Data Indexing Service

This is the facility that indexes designated DataStores (either Network Accessible DataStore (300...N) or Local

DataStores (500...N) upon operator input or periodically and stores these indices in the Index DataStore 220.

2982 Data Monitoring System

This facility, periodically or on demand, checks indices stored in the Index DataStore 220 against actual data (either Network Accessible DataStore (300...N) or Local DataStores (500...N)) and if it has changed, queues for operator review or updates indices.

299 Unmet Needs Analysis System

This analyzes the persistent agents for common patterns or specific requests that can be custom tailored. The results are outputted through the I/O System 280.

300 Network Accessible DataStores

301...N

These are an infinite number of network data sources that are included in the scope of the information aggregation and synthesization. These are represented by (300...N)

400 Advertiser's Computer Systems

401...N

These are DataStores established by advertisers to store ads/coupons to be presented or to set additional conditions for display.

500 Local DataStores

501...N

These are similar to the 300 series but locally vs. wide area network accessible.

Each of the six aspects of the present invention will be discussed in detail.

I. URL Munging

The present invention becomes a gateway to network data content provided by others. The present

invention directs access which is controlled through an intermediary gateway system.

The user, through a network addressable interface device such as the user access system 100, will connect with a local or network accessible DataStore. The user will select a page (designated by a Uniform Resource Locator or URL) to be used. The URL will be modified or "munged" so that retrieval must go through the present invention when the user executes a retrieval request. This then permits return of requested data to the user from the DataStore, at all times passing through the present invention 200.

The URLs embedded in each page that pass through are indexed by the present invention or "munged" so that any hyper linking to another WWW site always goes through the present invention. As an example, "WWW.anywhere.com" is converted to "WWW.travelgenie.com? WWW.anywhere.com", even though the user will see a direct path to the distant site.

Accordingly, when the user clicks on a URL (or types it in a browser's search request), the user will connect to the requested site through the system 200.

The present invention may be utilized with a wide variety of network addressable interface devices. When the invention is utilized on a limited bandwidth, limited character set data network, the datastream returned to the user will pass through the LBLCS network 289. The datastream is modified to fit the bandwidth, character set and display limitations of the network and the limitations of the user access device.

II. WWW - CD ROMS

The user of a network addressable interface device will select World Wide Web (WWW) data content for retrieval using a search engine to return selected WWW references. The user will then select and designate certain of these references to be included

in a custom CD-ROM which will be burned or recorded onto a compact disc and then sent by express delivery to the user.

The user will designate pages and other WWW data content including but not limited to HTML files, audio files, still images and other graphic files from the WWW. Through the session management system 292, selected material will be designated and retrieved. The retrieved data will be included in a custom CD-ROM produced by a service bureau and then sent by a delivery service to the user. Figure 5 shows a process flow diagram.

Optionally, the designated data may be communicated to the user via automated telephone means, may be communicated to a user via electronic replication, or may be copied on to auxiliary computer storage such as through a floppy disk drive.

III. Software Agent Advertising Information

Advertising is provided which benefits the user while optimizing the advertiser's expenditure by only presenting ads or coupons (or ads and coupons in a rotation if multiple ads/coupons qualify) that are pertinent to that particular user.

Certain criteria will be entered which delineates a pattern that is requested to be monitored. When this pattern is seen (or is in close match) in the user's WWW activity, the insertion mechanism is activated. If a certain web page is requested, the present invention will display a particular advertisement. The ad will be inserted based on the content of the existing web page being read. An analysis of the text stream of the user's interactive session will be performed on-line. When certain text patterns are observed (or close matches are observed), an advertisement is inserted into the display.

The advertising may be static or connected to the advertiser's computer DataStore which designates

specific ads or coupons based on the pattern match and other conditions which may be required.

Figure 6 illustrates a flow diagram for the software agent advertising insertion.

The software agent criteria is entered by the merchant in the agent data store 230 which delineates a pattern that needs to be monitored.

As an example, if the user accesses web pages for "Holiday Inns on the West Coast", the insertion mechanism would be established to automatically insert ads for "Hilton Inns on the West Coast".

IV. Automated Profile Generation

Browsing patterns of the user are analyzed and these patterns update profiles automatically.

Figure 7 illustrates a flow diagram for the Automated Profile Generation.

The looking patterns of the user are monitored to develop a set of software text agent profiles that are integrated with explicitly collected profile information to assist the user in narrowing down information for future sessions as well as suggesting references, merchandise or services during the current session. This is accomplished by statistical analysis of the text stream.

The searching patterns of the user on the Internet are monitored by monitoring the text stream. A set of software text agent profiles is developed and may be integrated with explicitly collected profile information. The explicit information is gathered by queries to the user. The explicit and implicit data are merged to develop software text agents that support the user's future shopping sessions.

During a user's session, advanced text analysis tools are used in real time to understand the interests of the user by synthesis of the text pages looked at. This synthesis is used as input for statistical correlation with similar interests of a

larger population. The results of this correlation are used to predict extended interests of the user. These are matched using intelligent software text agents and a variety of reasoning techniques including case based reasoning and fuzzy logic to establish a recommended list of search ideas, promotions and specials. The use of collaborative filtering may also be employed. As an example, if the text analysis indicates that the user has looked at downhill and cross-country skiing, past usages from a larger population may indicate that the user will also be interested in ice skating.

As seen in Figure 7, real time analysis of data is illustrated at box 295. The real time session analysis is in communication with the user interrupt system 294 so that the session may be interrupted at an appropriate point. At the same time, a post session profile update 2921 will update profiles based on browsing activity from a past session and thereafter stored in user profile DataStore 210.

V. Automated Lead Generation

It is known that suppliers will pay for information gathered about user's specific interests. When tied to a specific user, these become "leads" that a supplier can use for off-line follow up. The automated lead generation aspect will analyze a user's profile and session looking activity against a profile established by a supplier. When this profile is approximately matched, the supplier is notified so it can contact the user to offer goods or services. Statistical analysis using complex software text agents is used to determine the match.

Figure 8 illustrates a flow diagram of the lead generation.

In the present invention, the user's WWW viewing patterns are monitored. These and optionally the user's profile 210 are matched against software text

agents entered by a supplier in an agent DataStore 230. When these agents match a pattern or profile, the supplier is notified. Additionally, when this profile is approximately matched, the supplier is notified. Lead purchasers, using a user access system 100, will enter criteria that should be met for the generation of a lead. These criteria are in the form of complex software text search agents. When this threshold is met or exceeded, information is stored in the lead DataStore 270 for variable output transmission to a lead purchaser.

VI. Software Agent Unmet Needs Generation

In the present invention, records will be maintained from user usage of the Internet and other networks on what consumer queries are unmet by the WWW content retrieved.

Figure 9 illustrates a flow diagram.

If the user does not find what they are looking for, a "watcher" agent may be set up to advise them if the object of their search occurs at some future time. An example would be a tour, a price or some other information. Through the session management system 292 a threshold will be established on the user need.

The invention will intuitively construct a profile from user inputted data. This will be done by recognizing unmet or unanswered queries and/or user initiated requests. From this, a profile will be developed to identify new markets. The system will thus be able to gather "negative" leads. This information may be extracted and sold to suppliers who will build new products and services and then use the system as a mechanism to notify the potential customer.

Whereas, the present invention has been described in relation to the drawings attached hereto, it should be understood that other and further modifications, apart from

those shown or suggested herein, may be made within the spirit and scope of this invention.

What Is Claimed:

1. An information aggregation and synthesization process, which process comprises:

operating a network addressable interface device by a user;

communicating between said network addressable interface device and a plurality of local or network accessible DataStores through network specific addressing means; and

accessing, retrieving and processing data passing between said network capable device and said DataStores through an intermediary gateway system.

2. An information aggregation and synthesization process as set forth in Claim 1 wherein said network specific addressing means includes Uniform Resource Locators (URLs).

3. An information aggregation and synthesization process as set forth in Claim 1 wherein said network addressable interface device includes a computer central processing unit, a network data conversion device, a visual data representation device, a user input device and network communication software.

4. An information aggregation and synthesization process as set forth in Claim 3 wherein said network addressable interface device includes auxiliary storage means.

5. An information aggregation and synthesization process as set forth in Claim 1 including the step of analyzing text contained within data retrieved from each said DataStore passing through said intermediary gateway system.

6. An information aggregation and synthesization process as set forth in Claim 5 wherein said analyzed text is modified and redirected by said intermediary gateway system using a tagged reference format.

7. An information aggregation and synthesization process as set forth in Claim 1 wherein said step of

retrieving and processing data passing between said network capable device and said datastores includes the additional step of identifying graphic material in said data retrieved from said datastores and replacing said graphic material with a text anchor.

8. An information aggregation and synthesization process, which process comprises:

operating a network addressable interface device by a user;

communicating between said network capable device and a plurality of local DataStores or network accessible datastores through network specific addressing means;

analyzing of returned text stream from said datastores; and

retrieval from an advertising datastore and insertion of advertising/coupons based upon a threshold matching of a predetermined criteria based on said text stream analysis.

9. An information aggregation and synthesization process as set forth in Claim 8 wherein said network specific addressing means includes Uniform Resource Locators (URLs).

10. An information aggregation and synthesization process as set forth in Claim 8 wherein said analyzing is performed through an intermediary gateway system.

11. An information and aggregation and synthesization process as set forth in Claim 8 including the additional step of identifying graphic material in data returned from said datastores and replacing said graphic material with a text anchor.

12. An information aggregation and synthesization process, which process comprises:

operating a network addressable interface device by a user;

communicating between said network capable device and a plurality of local datastores or network accessible datastores through network specific addressing means;

gathering of explicit information from said user and gathering of implicit information to develop a user profile; and

developing software text agents based on said information gathered.

13. An information aggregation and synthesization process as set forth in Claim 12 wherein said network specific addressing means includes Uniform Resource Locators (URLs).

14. An information aggregation and synthesization process as set forth in Claim 12 wherein said implicit information is gathered by monitoring and analyzing of text streams returned from said datastores.

15. An information aggregation and synthesization process as set forth in Claim 14 wherein said text stream analysis is performed by statistical analysis and collaborative filtering.

16. An information aggregation and synthesization process as set forth in Claim 12 including the additional step of identifying graphic material in data returned from said datastores and replacing said graphic material with a text anchor.

17. An information aggregation and synthesization process, which process comprises:

operating a network addressable interface device by a user;

communicating between said network capable device and a plurality of local datastores and network accessible datastores;

analyzing text contained within data retrieved from each said datastore;

establishing text data criteria to be met stored in a datastore;

determining a matched threshold for said text data criteria; and

communicating information from said matched threshold about said user to a lead purchaser.

18. An information aggregation and synthesization process as set forth in Claim 17 including preparing a lead report from said information about said user.

19. An information aggregation and synthesization process, which process comprises:

operating a network addressable interface device by a user;

connecting between said network capable device and a plurality of local datastores and network accessible datastores;

establishing software text agent criteria stored in a datastore;

analyzing text contained within data from each said datastore;

determining a threshold match between said software text agent criteria and said datastores;

offering information to a third party to meet unmet needs identified; and

providing notification of search satisfaction to said user.

20. An information aggregation and synthesization process as set forth in Claim 19 including the additional step of recognizing unmet user queries or user initiated requests.

21. An information aggregation and synthesization process, which process comprises:

operating a network addressable interface device by a user;

communicating between said network capable device and a plurality of local datastores or network datastores through network specific addressing means;

analyzing of text stream of said datastores;

accessing, polling and retrieving data passing between said network capable device and said datastores through an intermediary gateway system;

retrieval from and insertion of advertising/coupons from an advertising datastore based

upon a threshold matching of a predetermined criteria based on said text stream analysis;

gathering of explicit information from said user and gathering of implicit information to develop a user profile;

providing information about said user to a lead purchaser; and

providing information to a third party to meet needs identified.

22. An information aggregation and synthesization process as set forth in Claim 21 wherein said network specific addressing means includes Uniform Resource Locators (URLs).

23. An information aggregation and synthesization process as set forth in Claim 21 wherein said analyzing is performed through an intermediary gateway system.

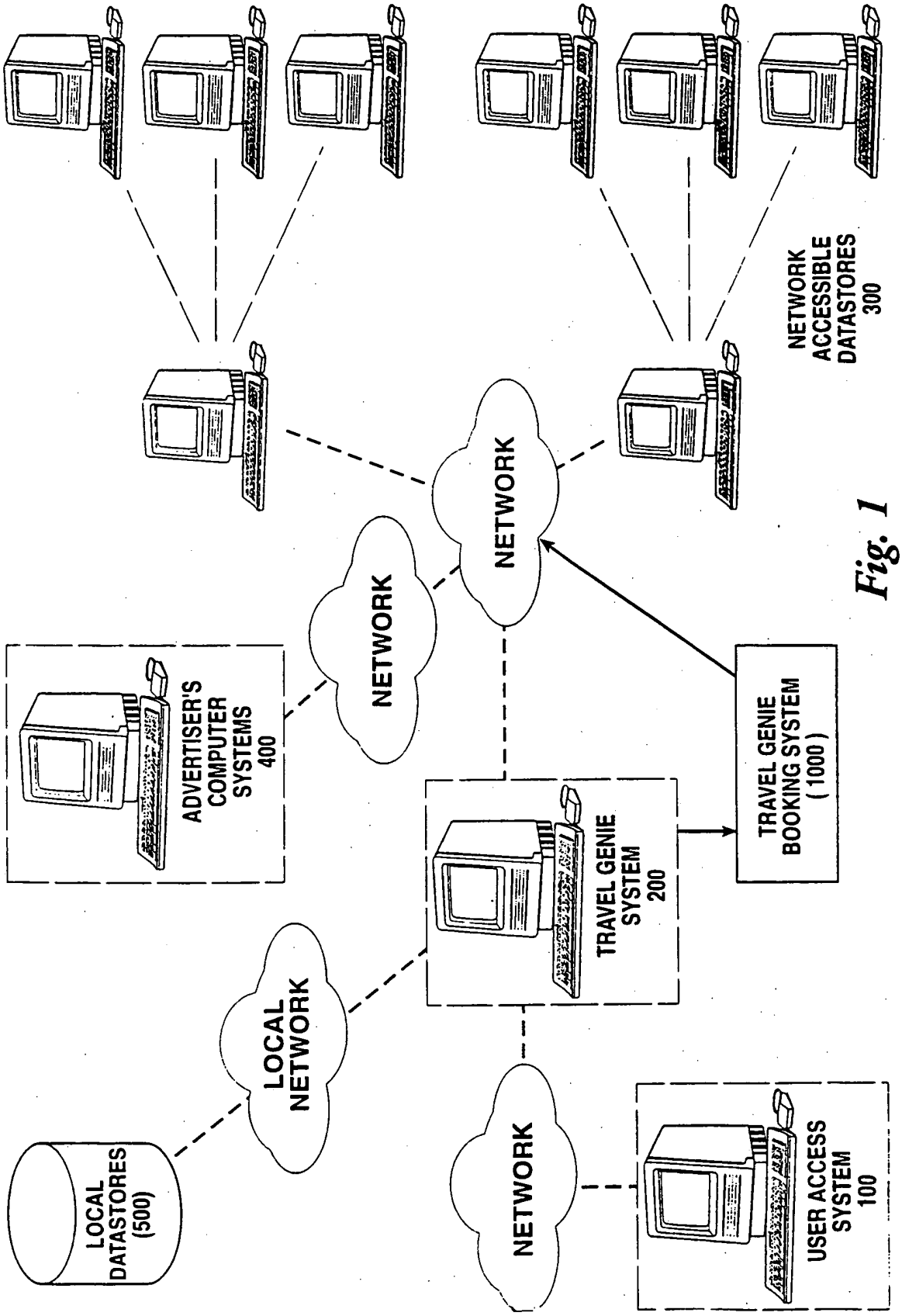

NETWORK ACCESSIBLE DATASTORES 300
NETWORK
NETWORK
ADVERTISER'S COMPUTER SYSTEMS 400
TRAVEL GENIE BOOKING SYSTEM (1000)
TRAVEL GENIE SYSTEM 200
LOCAL NETWORK
NETWORK
LOCAL DATASTORES (500)
USER ACCESS SYSTEM 100

Fig. 1

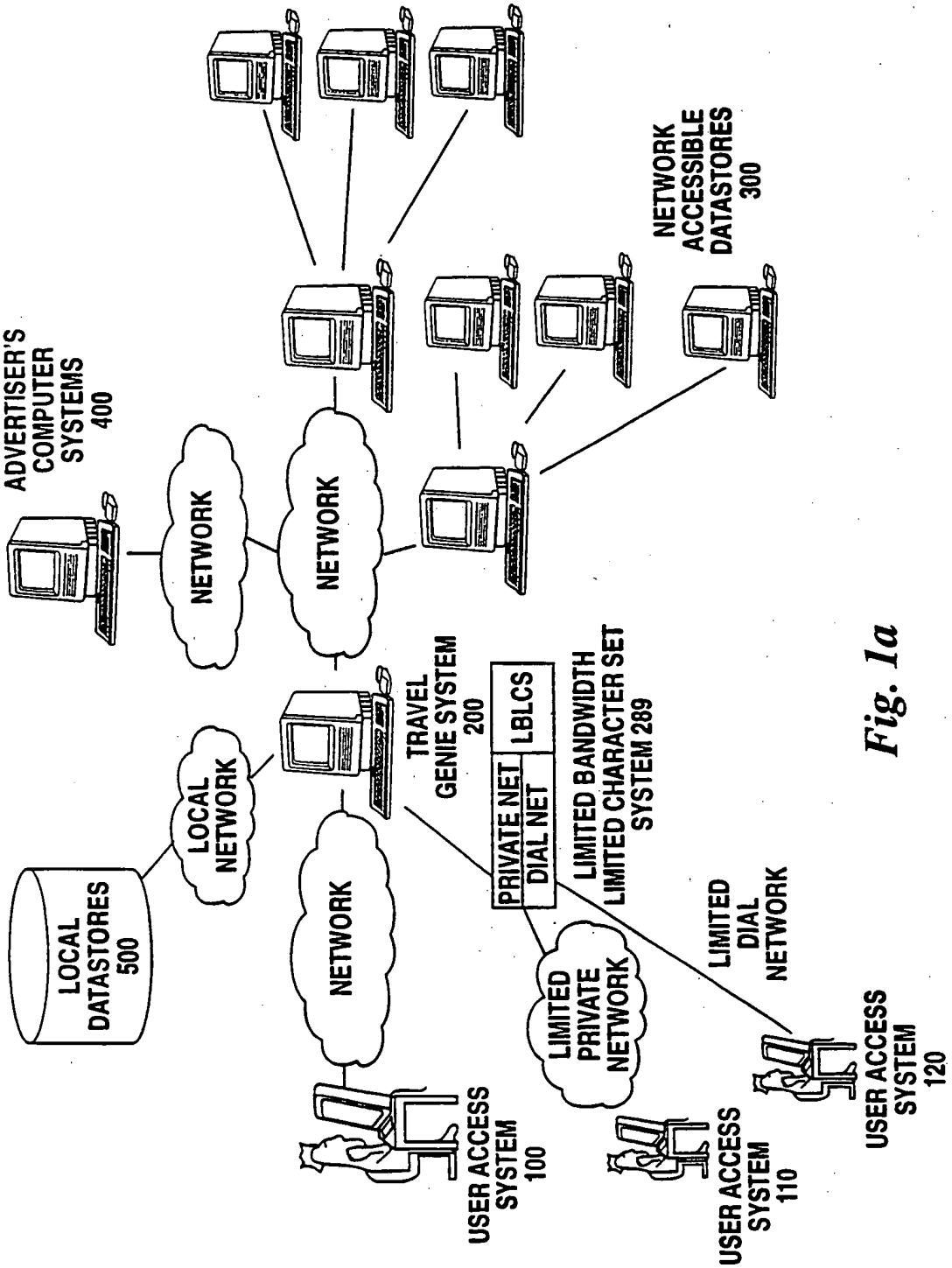

ADVERTISER'S COMPUTER SYSTEMS 400
NETWORK
NETWORK
NETWORK ACCESSIBLE DATASTORES 300
TRAVEL GENIE SYSTEM 200
LBLCS
PRIVATE NET
DIAL NET
LIMITED BANDWIDTH LIMITED CHARACTER SET SYSTEM 289
LOCAL NETWORK
LOCAL DATASTORES 500
NETWORK
LIMITED PRIVATE NETWORK
LIMITED DIAL NETWORK
USER ACCESS SYSTEM 100
USER ACCESS SYSTEM 110
USER ACCESS SYSTEM 120

Fig. 1a

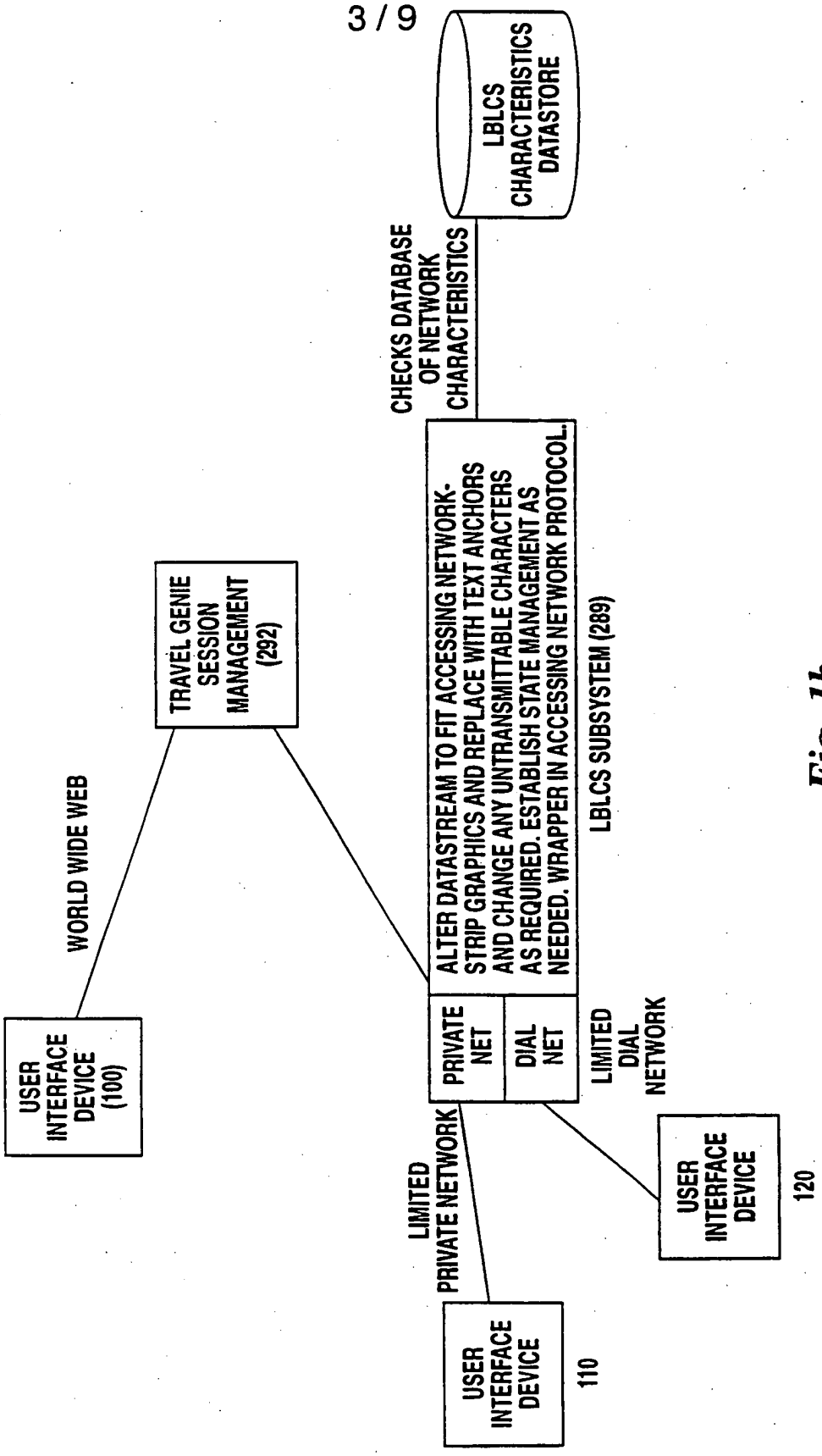

LBLCS CHARACTERISTICS DATASTORE
CHECKS DATABASE OF NETWORK CHARACTERISTICS
ALTER DATASTREAM TO FIT ACCESSING NETWORK-STRIP GRAPHICS AND REPLACE WITH TEXT ANCHORS AND CHANGE ANY UNTRANSMITTABLE CHARACTERS AS REQUIRED. ESTABLISH STATE MANAGEMENT AS NEEDED. WRAPPER IN ACCESSING NETWORK PROTOCOL.
LBLCS SUBSYSTEM (289)
TRAVEL GENIE SESSION MANAGEMENT (292)
WORLD WIDE WEB
USER INTERFACE DEVICE (100)
PRIVATE NET
DIAL NET
LIMITED DIAL NETWORK
LIMITED PRIVATE NETWORK
USER INTERFACE DEVICE
120
USER INTERFACE DEVICE
110

Fig. 1b

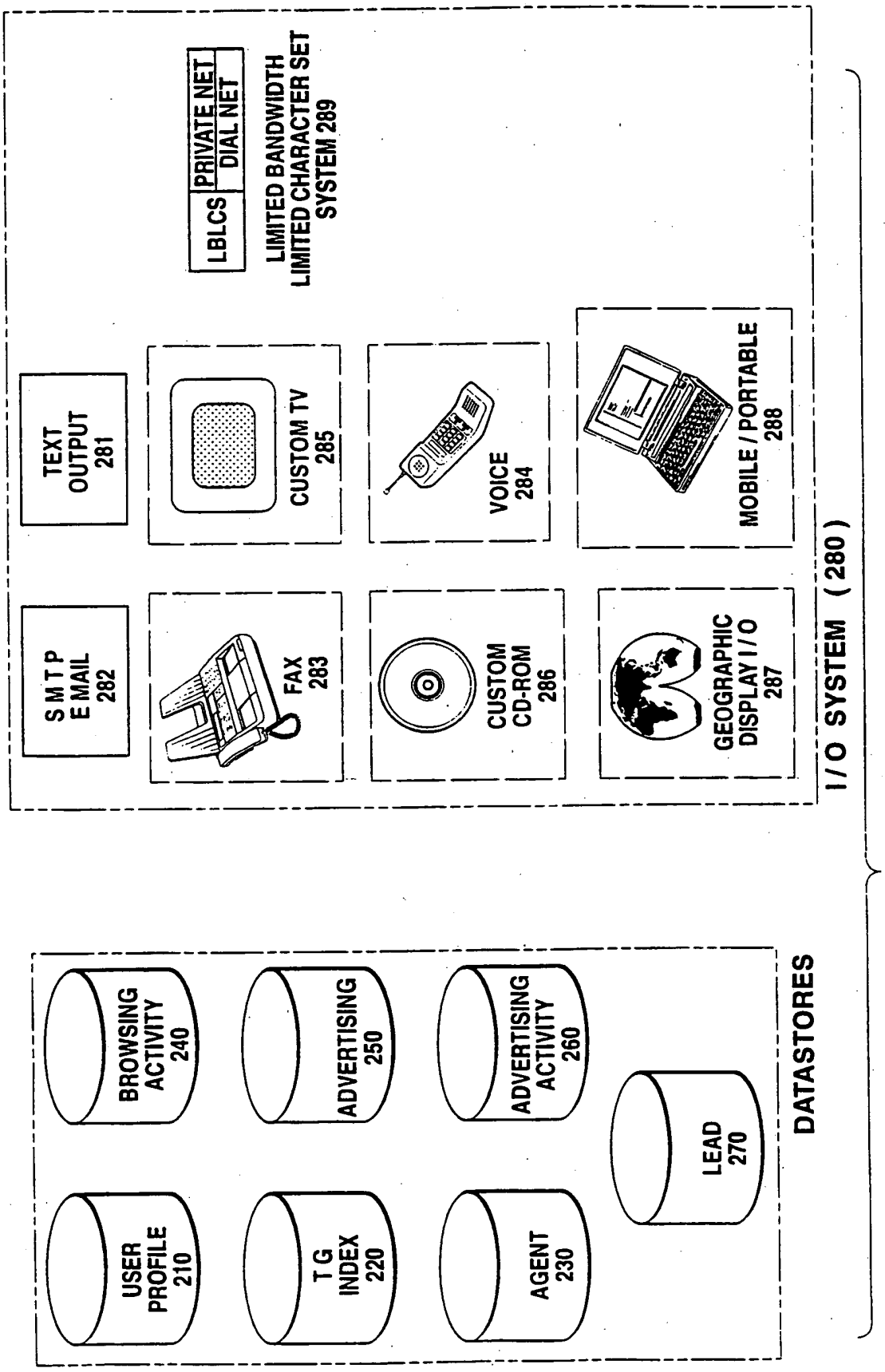

I/O SYSTEM (280)
LIMITED BANDWIDTH
LIMITED CHARACTER SET
SYSTEM 289
LBLCS
PRIVATE NET
DIAL NET
TEXT OUTPUT 281
CUSTOM TV 285
VOICE 284
MOBILE / PORTABLE 288
SMTP E MAIL 282
FAX 283
CUSTOM CD-ROM 286
GEOGRAPHIC DISPLAY I/O 287
DATASTORES
BROWSING ACTIVITY 240
ADVERTISING 250
ADVERTISING ACTIVITY 260
USER PROFILE 210
T G INDEX 220
AGENT 230
LEAD 270

Fig. 2

SUBSTITUTE SHEET (RULE 26)

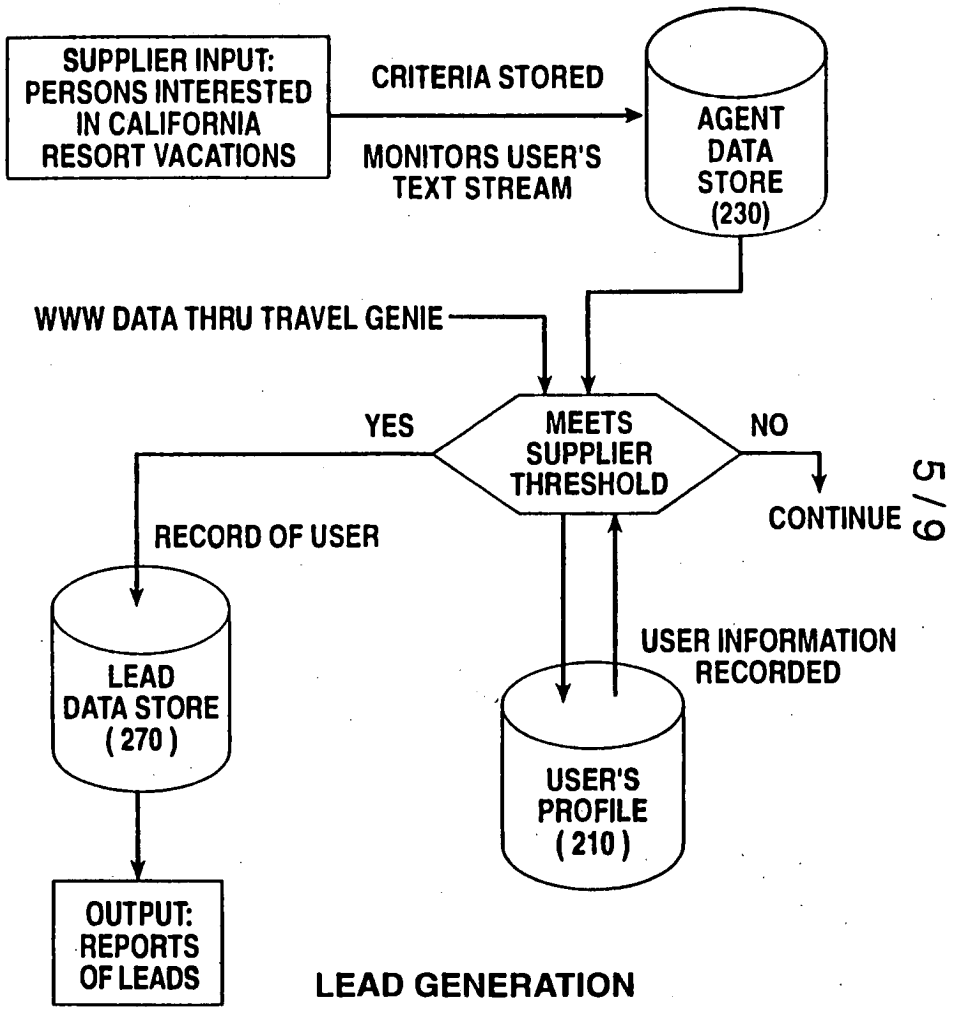
DIALOG MANAGEMENT (201)

2011 NATURAL LANGUAGE QUERY
2012 FOREIGN LANGUAGE TRANSLATION
2013 CUSTOM USER INTERFACE
2014 SITUATIONAL AND LOCATIONAL CUSTOMIZATION
2015 INTEGRATED VIRTUAL REALITY
2016 INTERACTIVE TV

AGENT DATA STORE (230)

231 PREESTABLISHED SOFTWARE TEXT SEARCH AGENTS
232 PERSONAL SEARCH TEXT AGENTS
233 AD / COUPON INSERTION AGENTS
234 UNMET NEEDS AGENTS
235 LEAD GENERATION AGENTS

Fig. 3



LEAD GENERATION

Fig. 8

OPERATIONS SYSTEM (290)

291 USER GREETING SYSTEM	
292 TG SESSION MANAGEMENT	2921 SESSION PROFILE UPDATE
	2931 SEARCH REDUCTION SYSTEM
	2932 PICTURE SEARCH SYSTEM
	2933 COLLABORATIVE DESTINATION ASSESSMENT
	2934 SMART INDEXES
	2935 SMART SEARCH
293 SEARCH REDUCTION SYSTEM	
294 USER INTERRUPT SYSTEM	
295 R / T SESSION ANALYSIS SYSTEM	
296 AD / COUPON INSERTION SYSTEM	2961 SMART ADS
297 PERSISTENT AGENT ENTRY	
298 DATA SUPPORT SYSTEMS	2981 DATA INDEXING SERVICE
	2982 DATA MONITORING SERVICE
299 UNMET NEEDS ANALYSIS SYSTEM	2991 REAL TIME MARKETPLACE

Fig. 4

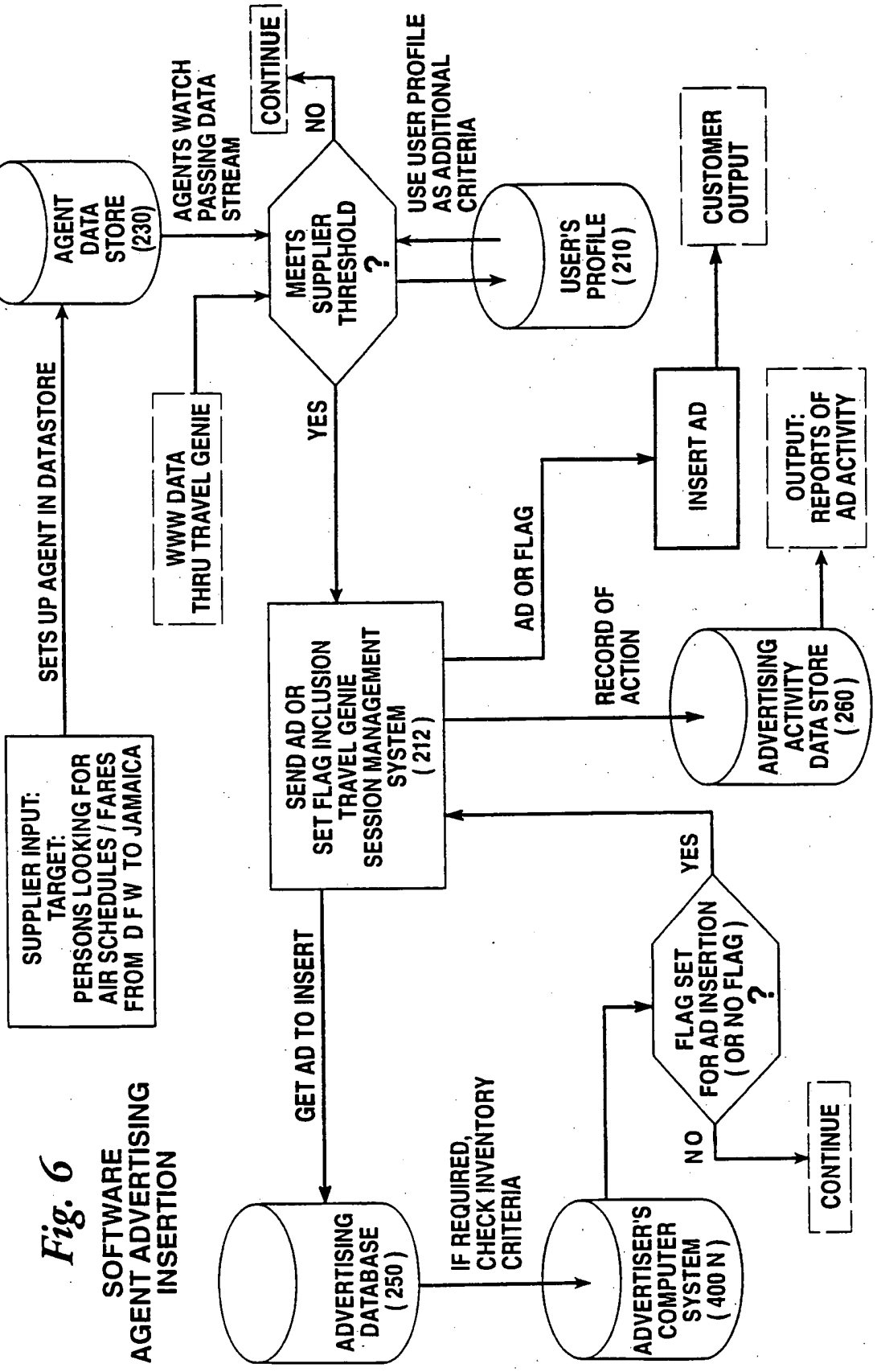
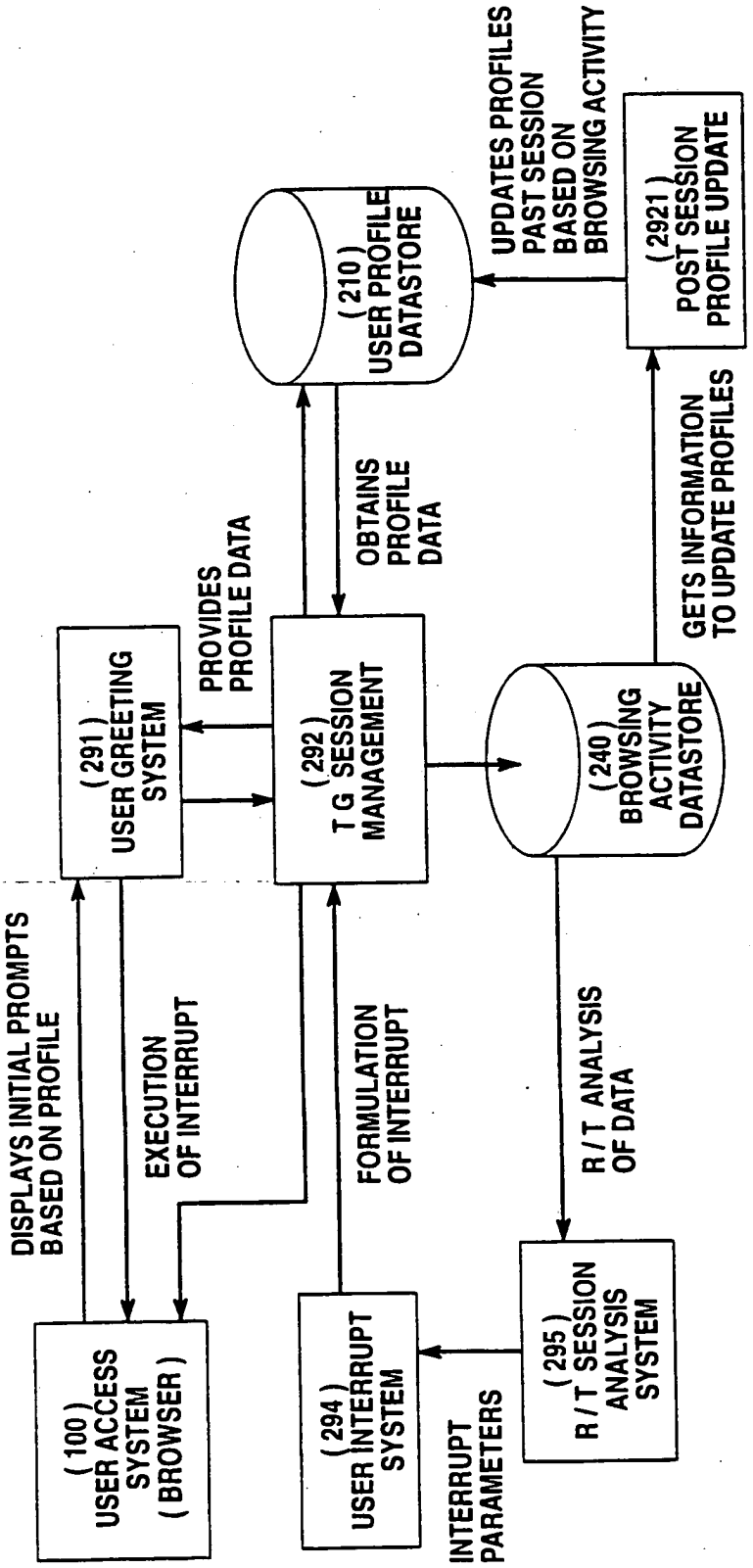


Fig. 6

SOFTWARE
AGENT ADVERTISING
INSERTION



AUTOMATED PROFILE GENERATION

Fig. 7

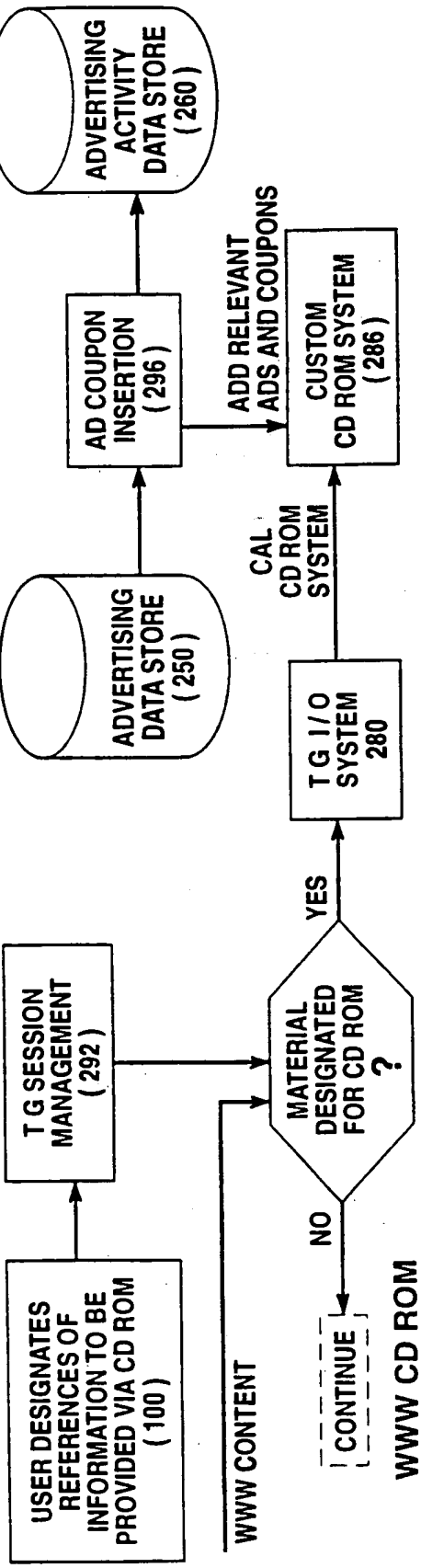

USER DESIGNATES REFERENCES OF INFORMATION TO BE PROVIDED VIA CD ROM (100)
T G SESSION MANAGEMENT (292)
MATERIAL DESIGNATED FOR CD ROM ?
YES
NO
WWW CONTENT
CONTINUE
T G I/O SYSTEM 280
CAL CD ROM SYSTEM
CUSTOM CD ROM SYSTEM (286)
ADD RELEVANT ADS AND COUPONS
AD COUPON INSERTION (296)
ADVERTISING DATA STORE (250)
ADVERTISING ACTIVITY DATA STORE (260)
WWW CD ROM

Fig. 5

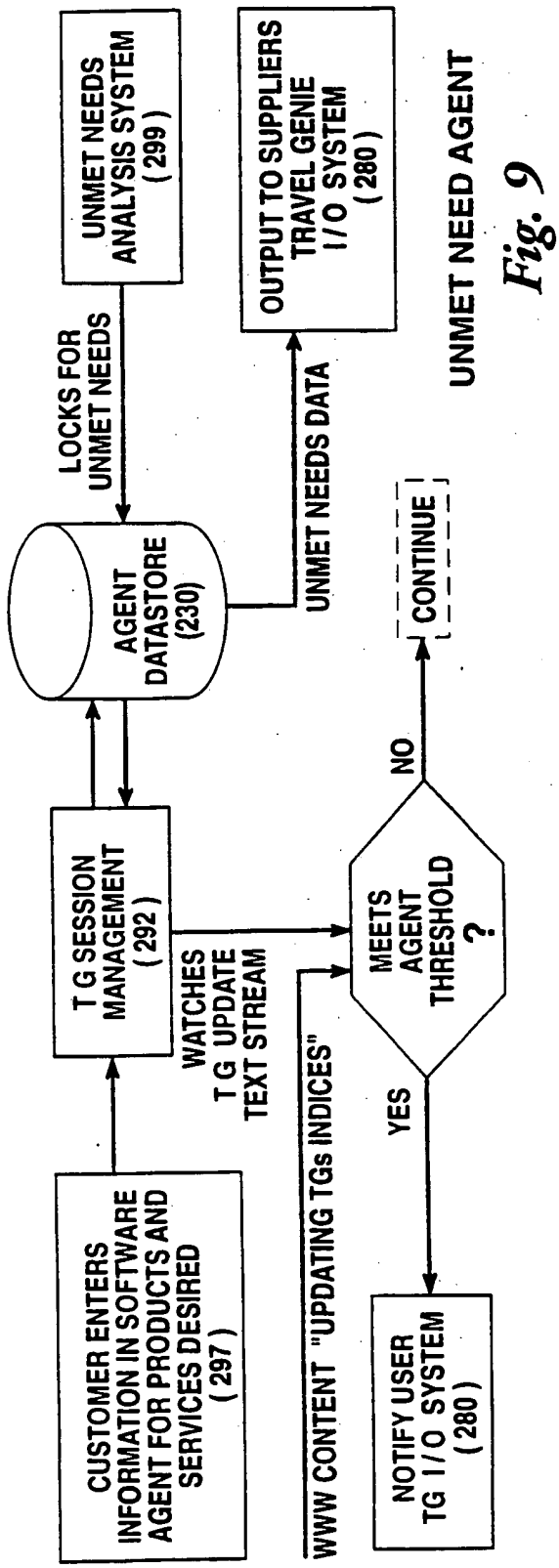

CUSTOMER ENTERS INFORMATION IN SOFTWARE AGENT FOR PRODUCTS AND SERVICES DESIRED (297)
T G SESSION MANAGEMENT (292)
WATCHES T G UPDATE TEXT STREAM
AGENT DATASTORE (230)
LOCKS FOR UNMET NEEDS
UNMET NEEDS ANALYSIS SYSTEM (299)
UNMET NEEDS DATA
OUTPUT TO SUPPLIERS TRAVEL GENIE I/O SYSTEM (280)
MEETS AGENT THRESHOLD ?
NO
YES
CONTINUE
WWW CONTENT "UPDATING TGs INDICES"
NOTIFY USER TG I/O SYSTEM (280)
UNMET NEED AGENT

Fig. 9

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 March 2002 (21.03.2002)

PCT

(10) International Publication Number
WO 02/23857 A2

(51) International Patent Classification[7]: H04L 29/00

(21) International Application Number: PCT/US01/42113

(22) International Filing Date:
10 September 2001 (10.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/231,845 11 September 2000 (11.09.2000) US

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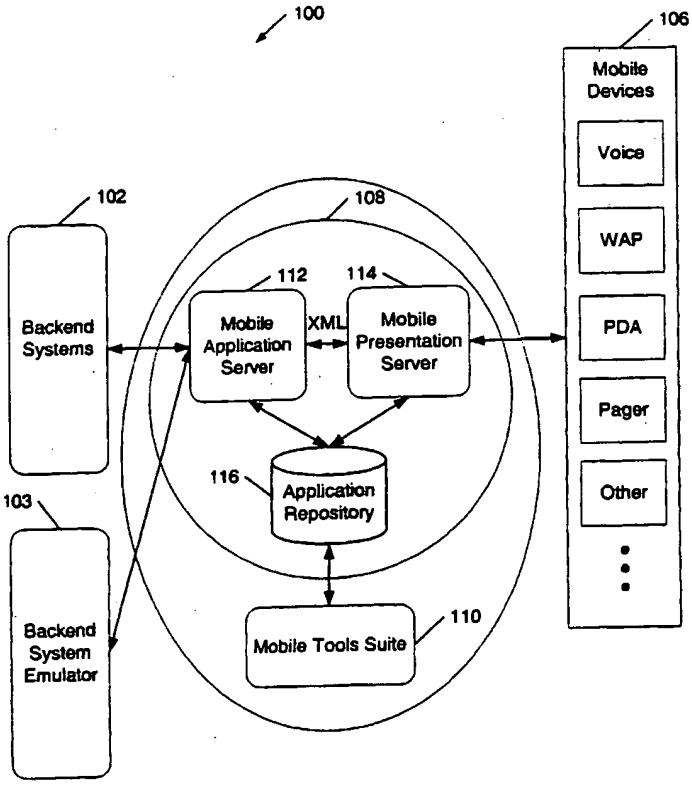
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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, 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, 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).

[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR INTEGRATING APPLICATIONS AND MOBILE NETWORKS



(57) Abstract: A method and system for integrating an application executing on a backend system with a mobile device that communicates over a network with the application. The integration includes retrieving from a storage area a method corresponding to a function in the application on the backend system, invoking the method corresponding to the function in the application and creating an interface to the application on the backend system. Information received from the application corresponds to the information requested by the mobile device. This information from the application is transformed to a format suitable for presentation on a mobile device by a presentation server and assisted by a hierarchical universal device library description of mobile devices and browsers.

WO 02/23857 A2

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

METHOD AND SYSTEM FOR INTEGRATING APPLICATIONS AND MOBILE NETWORKS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority to Provisional Application Serial No. 60/231,845 filed by ViaFone, Inc. September 11, 2000 entitled "Integrating ViaFone Mobile Application Platforms" and is incorporated by reference herein.

BACKGROUND OF THE INVENTION

Mobile devices have attracted industry attention as a gateway for people to access enterprise and Internet based applications. In response, a diverse set of businesses are interested in deploying data-enabled and voice-enabled services over mobile device networks. Many device manufacturers have developed different types of mobile devices and corresponding applications with hopes of gaining market share and industry dominance. Unfortunately, the results of these efforts have produced a wide-range of hardware and software solutions resulting in mobile device diversity and many incompatibilities. Without significant consolidation, evolution of these technologies will result in increased challenges developing data-enabled and voice-enabled applications for mobile devices.

Developing data-enabled application development for mobile devices is particularly difficult as the underlying enabling technologies do not rely on standards and continue to evolve. This is a particular problem when presenting data on different mobile devices. Different display sizes on the mobile devices frequently require customized applications that match the display requirements of the mobile device. Likewise, input methods on the mobile devices also require customized drivers and application routines to accommodate a variety of input modes including alphanumeric keyboards, numeric-only keyboard and pen-based input configurations. Together, the different display devices and input modes can make developing even the most rudimentary applications for a set of mobile devices a formidable task.

In addition to the different displays and input modes, data-enabled applications must also accommodate browsers and presentation methods tailored to each of the different mobile devices. Mobile device and browser/presentation method combinations associated with data-enabled solutions include wireless phones equipped with Wireless

Application Protocol (WAP) browsers, Palm OS applications, and i-Mode as well as various two-way pager and e-mail devices. Because these presentation methods may differ significantly, many applications are often only capable of working with one browser, one mobile device and one presentation method.

Even within the WAP standard, manufacturers will often create their own customized version and deviate from the standard WAP browsers. Consequently, a data-application may perform differently on a standard WAP browser by OpenWave Systems, Inc. than a WAP browser developed and designed to work on the Nokia line of cellular phones. Further, many WAP browser features are network-dependent and take advantage of proprietary services and features offered by the different carrier networks. Each difference or incompatibility described above provides additional development hurdles for developing mobile device applications.

Voice-enabled applications for mobile devices are also difficult to develop and face other technical challenges. Typically, the voice-enabled application provides voice-based information through the mobile device and performs voice recognition on the users responses to determine a course of action. Without a standard and a corresponding set of tools, these voice-enabled applications require a high-level of technical and development expertise specific to voice-application development. Even moderately complex voice-enabled application development requires a support team consisting of specialized voice talent, directors, sound engineers, dialog designers and usability testers. Because of their complexity, testing of these systems often runs into several months and adds delay and increased costs to the development cycle.

Difficulties also exist developing the infrastructure for mobile voice and data enabled applications. First, companies must be able to integrate mobile data and voice applications into existing enterprise and Internet applications. This requires expertise on both the mobile applications and existing legacy platforms to leverage existing corporate information. To avoid comprising security of these existing systems, security breeches between the non-mobile legacy systems and the new mobile systems must be identified quickly and closed.

Second, mobile applications should be developed to exploit mobile device functionality and not merely replicate existing non-mobile systems already deployed. Many valuable features on mobile devices and applications are not available on non-

mobile systems thereby greatly increasing the value of the mobile voice and data applications. For example, mobile applications can take advantage of location-based services and personalized communications. Unfortunately, the general difficulty in developing mobile applications and lack of expertise often makes accommodating these valuable features impracticable.

For at least these reasons, it is important to develop systems, methods, standards, and tools to accelerate and simplify the development and deployment of data-enabled and voice-enabled mobile applications.

SUMMARY OF THE INVENTION

One aspect of the invention can be used to integrate an application executing on a backend system with a mobile device that communicates with the application over a network. Integrating the mobile device and the application includes retrieving from a storage area a method corresponding to a function in the application on the backend system, invoking the method corresponding to the function in the application and creating an interface to the application on the backend system, receiving information from the application corresponding to information from the application requested by the mobile device and transforming the information received from the application on the backend system to a format suitable for presentation on the mobile device.

Another aspect of the invention provides for exchanging information between a mobile device and an application on a backend system. Facilitating this exchange includes tracking one or more applications on the backend system, invoking a method that causes a function on an application to execute in response to a request for the function from the mobile device enhancing functions on the mobile device using a set of application services that facilitate communication and exchange of information between the mobile device and the application on the backend system.

Yet another aspect of the invention includes presenting information onto a mobile device produced from a backend system running an application. Presenting this information includes providing a hierarchical database capable of organizing information describing characteristics of families of mobile devices, wherein information on a specific mobile device is associated with at least one family of mobile devices in the hierarchical organization of information, identifying one or more strings from a stream of information

associated with a mobile device, recognizing the mobile device by comparing the one or more strings in the stream of information with corresponding strings in the hierarchical database, and selecting an entry in the hierarchical database. The entry includes characteristics compatible with the mobile device including the recognition and generation of information on the mobile device.

The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features and advantages of the invention will become apparent from the description, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram illustrating a system for integrating a variety of backend application systems with a number of mobile devices;

FIG. 2 is a block diagram of the mobile application server used by the system in FIG. 1;

FIG. 3 is a block diagram of the mobile application presentation server used by the system in FIG. 1 for presenting data and voice information on the mobile devices;

FIG. 4 is a block diagram of the mobile tools suite used by the system in FIG. 1 that populates an application repository with information for integrating mobile devices and backend applications;

FIG. 5 illustrates the hierarchical organizational structure in a universal device library (UDL) to store operational information on mobile devices and the browsers they use;

FIG. 6 is a flowchart diagram of the operations performed when integrating backend systems and mobile devices by the system in FIG. 1;

FIG. 7 is a flowchart diagram of the operations performed by a mobile server to deliver information from a mobile device to backend systems in FIG. 1;

FIG. 8 is a flowchart diagram of the operations performed by the mobile presentation server in FIG. 1;

FIG. 9 is a flowchart diagram of the operations performed using the mobile tools suite to populate the application repository; and

FIG. 10 is a block diagram illustration of a computer system capable of being configured to operate as one or more portions of the system in FIG.1.

DETAILED DESCRIPTION

Systems and methods consistent with the present invention are used to integrate backend applications with mobile devices having different specifications and operating characteristics. Each mobile device can have different display sizes, data entry methods (i.e., keypad, touchscreen, handwriting or voice recognition), processor capabilities, communication protocols (i.e., CDMA, GSM, SMS, GPRS, AMPS and others) as well as application and browser requirements. On conventional platforms, it is difficult to deliver backend applications from an enterprise or the Internet to these mobile devices as the information and presentation schemes must be tailored to accommodate the individual peculiarities of each mobile device; essentially new applications must be developed for each application and mobile device pair.

The present invention overcomes these integration obstacles by unifying the interfaces to both the backend applications and the mobile devices. For example, methods compatible with an intermediary language are generated for each backend application and stored in an application repository. These methods are accessed and invoked by a mobile device through the intermediary language and results are rendered and presented on the individual mobile devices. Mobile devices are identified dynamically by analyzing a stream of data transmitted and received by the mobile device. This identification information is used to access a hierarchical database having characteristics of the mobile device and browsers that are then used to render the information on the mobile device. Even if the mobile device cannot be located, the closest matching family of mobile devices in the hierarchical database is located to ensure a high-level of compatibility. Many of the parameters provided within a family of mobile devices and browsers closely resemble operational characteristics of related mobile device.

Referring to FIG. 1, a block diagram illustrates a system for integrating a variety of backend application systems with a number of mobile devices. Integration system 100, hereinafter system 100, includes backend systems 102, mobile devices 106, mobile application platform 108 and mobile tools suite 110. Backend systems 102 include enterprise and general applications developed for Customer-Relation Management (CRM), Enterprise Resource Planning (ERP), Personal Information Management (PIM), Sales Force Automation (SFA), Field Service Administration (FSA), Supply Chain

Management (SCM) and other applications. Additional third-party applications may also include Siebel Systems, i2, WebMethods, SAP, Microsoft and PeopleSoft™ applications for human resources, distribution, manufacturing and supply chain management. Generally, backend systems 102 are servers originally developed for use with desktop systems that now need to be accessed through the voice and data capabilities of mobile devices 106.

Developers use tools in mobile tools suite 110 to create metadata and methods facilitating integration of backend systems 102 into mobile application platform 108. Mobile devices 106 connect to mobile application platform 108 which in turn invokes methods in real-time to gain access backend system 102.

Mobile application platform 108 includes a mobile application server 112, a mobile presentation server 114 and an application repository 116 to facilitate access to backend system 102. Backend systems emulator 103 is also included as part of mobile application platform 108 and is used for testing mobile application platform 108 before deploying platform 108 in a "live" setting. Backend systems emulator 103 simulates the interaction between mobile application server 112 and backend systems 102.

Mobile application server 112 invokes methods on behalf of mobile devices 106 to access backend systems 102. Typically, these methods are stored and retrieved from application repository 116 as needed. In one implementation, results from various backend systems 102 are converted to an intermediary language compatible with XML and passed to mobile presentation server 114 for adaptation to the particular mobile device. Mobile presentation server 114 identifies the characteristics of the mobile device including display size and browser type and modifies the information for presentation on the mobile device in the most suitable format. For example, mobile presentation server 114 can modify the resolution of an image to fit the display of a particular mobile device.

FIG. 2 is a block diagram of mobile application server 112 used by integration system 100 in FIG. 1. Mobile application server 112 provides application services 203 and an integration manager 202.

Application services include a security component 204, an alert component 206, a session management component 208, a localization component 210, a personalization component 212, a synchronization component 214, a voice dialog manager 216, and a data dialog manager 218. Application services 203 provide services typically available

on multi-user and multi-process computer systems but not uniformly provided for on mobile devices 106. Having these application services 203 makes applications in backend systems 102 appear feature-rich and robust despite limited operating system functions and resource management provided on cellular phones, PDAs and other thin clients.

Security component 204 and the security features provided ensure that sensitive information remains secure when accessed through a mobile device. For example, security component 204 provides uniform authentication and authorization facilities for each of mobile devices 106. Secure component 204 can limit communication of sensitive information to mobile devices depending on the mobile device encryption capabilities, authentication and authorization of the mobile device user and the end-to-end security of the network transmitting information. In one implementation, these security mechanisms can be used to ensure that a mobile device accesses sensitive information from a personal information management (PIM) application over a secure network connection. A number of third party security methods can be plugged into and used by security component 204. Third party security methods supported by security component 204 include SecurID, Digital Certificates, HTTPs, Secure Socket Layer (SSL)and other methods developed by Security Dynamics, PKI, Certicom, Verisign, and RSA.

Alert component 206 allows mobile devices to receive real-time/synchronous or asynchronous notification of events associated with one or more applications in backend systems 102. This is useful if a response generated by an application in backend systems 102 is delayed or takes time for processing. For example, a service call assignment made on backend systems 102 generates an alert delayed until the proper service personnel are available for consultation. Alert component 206 registers the alert when the service call request is made and then notifies the proper mobile device and/or application in backend systems 102 when the specific service personnel indicates their availability. In addition, alert component 206 can send alerts to multiple mobile devices and in response the mobile devices can forward the alerts to other mobile devices and computer systems connected to mobile application platform 108.

By also transmitting state information along with the alert of a particular transaction or event, a mobile device can use preexisting information associated with the alert, respond to the alert and continue processing of the transaction or event. For

example, a user receiving an alert rejecting the offer above can respond to the alert with a subsequent offer immediately and without reentering information about the bid or the user.

Session management component 208 maintains logical connectivity between the mobile device and applications in backend systems 102. Even if physical connectivity is interrupted, session information maintains a logical connection and makes it appear that an mobile device has a continuous or uninterrupted connection to applications on backend systems 102. This is useful if connectivity between the mobile device and mobile application is accidentally interrupted or terminated without proper termination procedures. If state information is stored, session management component 208 can re-establish communication with an application and recreate some or all of the processing. Also, session management 208 can also be used to gracefully terminate communication with backend systems 102 including initiation of database roll-back or other similar events to ensure data integrity and reliability in transactions.

Synchronization component 214 facilitates updating a mobile device with information while a mobile device is offline and applications on backend systems 102 continue to process information and transactions. When the mobile device is brought back on-line, synchronization component 214 updates information stored on mobile devices 106 according to information on one or more applications on backend systems 102. Conversely, synchronization component 214 also facilitates updating applications on backend systems 102 if information is introduced or modified on the mobile device while the device is offline.

Localization component 210 uses location based services and locale information to customize features of an application in backend systems 102. Location based services locates a mobile device using technologies such as Global Positioning Systems (GPS). This information is provided applications in backend systems 102 to tailor information to a users geographic position. For example, a person accessing a CRM system with a mobile device can use location-based information to request a list of customers within a given distance from the person's location.

Locale information provided to the application by localization component 210 specifies how to tailor information for a particular country, region or culture. In many applications a locale variable causes the application to generate information in a preferred

language, currency, date/time format and other information peculiar to the geographic or cultural region. In one implementation, localization component 210 acts as a proxy for mobile devices 106 and selects a locale variable in the application for generating information. Information generated by the one or more applications in backend systems 102 correlates to the selected locale and appears on mobile devices 106 in the correct format or language.

If the application in backend systems 102 does not offer multiple locales, an alternate implementation of the present invention translates information generated by the application into the locale selected for use on mobile devices 106. For example, this may include automatically translating the default language in the application into the language associated with the desired locale. This latter implementation may also automatically perform currency translations between a default currency used by the application and the currency in the desired locale.

Personalization component 212 provides support for a user to select options and preferences for interacting with an application on backend systems 102. For example, one personalization includes automatic entry of login/passwords and requesting "favorite" information from applications in backend systems 102. Using personalization, a sales manager can set personalization component 212 to automatically login from a mobile device and request a "favorite" monthly sales report be generated and customized according to specific format and content requirements.

Voice dialog manager 216 in FIG. 2 manages communications and related transformations between voice and data information. Facilities for speech recognition and speech-synthesis (text-to-speech) transformations are provided through voice-dialog manager 216. Data information passes through voice dialog manager 216 and is converted to a series of choices in a voice-dialog that the user hears on a mobile device. These choices can be a fixed set of voice menu choices or choices made available through a natural-language system. Voice-dialogs can be setup in advance statically or dynamically as the user interacts with the mobile device. In each implementation, voice dialog manager 216 receives and processes a user's response using a voice recognition engine. This processing includes converting voice commands and information into to text for further processing by applications in backend systems 102.

Data dialog manager 218 in FIG. 2 manages data used by the applications in backend system 102 and their representation on mobile devices 106. Data information passes through data dialog manager 218 and is presented on mobile devices 106 using menus and other types of user-interface components. Data can be represented statically using predetermined menus or dynamically using menus created in response to certain data conditions. In one implementation, data dialog manager 218 is responsive to data compatible with XML and receives additional formatting control for displaying XML using style sheets compatible with Extensible Stylesheet Language (XSL). After displaying the data, the mobile device receives a user's response through the user-interface components and processes the response using data dialog manager 218. Data dialog manager 218 recognizes and converts certain commands and information into to text for further processing by applications on backend systems 102.

Integration manager 202 tracks specific applications available in backend systems 102 and the corresponding methods registered for accessing these systems stored in application repository 116. Integration manager 202 intercepts requests for applications in backend systems 102 while an appropriate method or methods are identified for execution. Integration manager 202 receives requests in an intermediary language such as XML and then invokes a method in a language or format appropriate for the particular application on backend systems 102. In certain cases, integration manager 202 can also be used to ensures proper XML code is generated and used during data processing. Languages, interface protocols and syntaxes supported by integration manager 202 are compatible with XML, SQL, HTML, LDAP, CORBA, COM, and IIOP. For example, integration manager can be implemented using a hash table that maps applications and functions offered by the applications to specific methods developed in the appropriate language and interface protocol. Accordingly, a Microsoft application like Outlook may be accessed using a method written in COM while an object-oriented CRM application written in Java may be accessed using CORBA compatible methods.

FIG. 3 is a block diagram of mobile application presentation server 114 used by the system in FIG. 1 to properly present data and voice information to mobile devices 106. Mobile application presentation server 114 includes a universal device library (UDL) 302, a set of voice device adaptors 304, 306 and 308 along with a set of data device adaptors 310, 312, 314 and 316 for presenting information on mobile devices 106.

Presenting voice and data information is difficult because the mobile devices have many different designs and functional capabilities. Of course, the more accurately one can identify the features and capabilities of a mobile device then the more precisely and efficiently information can be presented. UDL 302 stores information on a wide range of mobile devices arranged in a hierarchical organization that emphasizes characteristics shared between the various mobile devices. Ideally, if a mobile device is identified in UDL 302 then the characteristics of the mobile device are well-known and both voice and data information can be readily presented. However, even if the mobile device cannot be identified then characteristics associated with a "family" of similar devices in UDL 302 are located and used. Because families of mobile devices share a number of common elements, data and voice information can still be accurately and efficiently presented on the mobile device. Additional information on the hierarchical organization of information in UDL 302 is described later herein in conjunction with FIG. 5.

Mobile presentation server 114 selects the voice, data or voice and data device adaptors for presenting on mobile devices by analyzing a stream of data transmitted and received by the target mobile device. This locates an entry in UDL 302 that identifies voice and data capabilities of the mobile device as well as features associated with a browser used on the mobile device. In the case of voice communication, mobile presentation server 114 selects one of voice server 304, voice XML 306 or other voice device adaptor 308 to transmit voice information to a user for interaction. Depending on the voice device adaptor selected, a different voice dialog may be accessed and retrieved from application repository 116.

For data communication, mobile presentation server 114 selects one of WML 310, HDML 312, HTML 314, or other data device adaptor 316 to transmit data information to a display associated with mobile device106. Each different data device adaptor may require mobile presentation server 114 to access application repository 116 for details on rendering different protocols or languages properly on the mobile device display. For example, putting titles on the display of a mobile device may be handled differently for different languages or protocols. In one language, there may not be a standard method for putting titles on the screen of a mobile display device. If that occurs, the corresponding data-device adaptor may be instructed to insert title information and render titles on each screen. In contrast, another language may automatically render screen title information

on each screen. Accordingly, the corresponding device adaptor for this language would not be required to insert screen titles since the underlying language supports rendering screen titles.

FIG. 4 is a block diagram of mobile tools suite 110 used by the system in FIG. 1 to populate an application repository with information used for integrating mobile devices and backend applications. Mobile tools suite 110 includes an application builder 402, a dialog builder 404, an integration builder 406, an administrator component 408 and a reporter component 410.

A developer uses application builder 402 to create application metadata and other information describing the interaction of an application in an intermediary language. In one implementation, this intermediary language is compatible with XML and is typically stored in application repository 116. Mobile application presentation server 114 in FIG. 3 uses this metadata and other information to create menus, forms, messages and other user-interface elements in a language appropriate for display on the target mobile device. The metadata provides mobile application presentation server 114 with abstract descriptions of the application operation and assists in generating platform specific code to display these elements on the mobile display. In FIG. 3, mobile application presentation server 114 selects and uses one of data application device adaptor 304, 306, and 308 to generate this platform specific code however device adaptors compatible with other languages and syntaxes can also be used.

Dialog builder 404 performs a similar function as application builder 402 but for voice device adaptors 310, 312, 314 316 and is also compatible with other languages and syntaxes. Metadata created through dialog builder 404 describing the voice-dialogs is also stored in application repository 116. Metadata for the voice-dialogs creates voice rather than data based interactions and is not limited by a display size or the number and size of buttons available on a mobile device. Instead, the voice interactions are presented over a mobile device speaker and responses are received over a microphone on the mobile device.

Integration builder 406 creates a set of methods and routines used to access applications on backend systems 102. A developer creates methods using interface builder 406 that access applications through an appropriate application programming interface or a native programming language used in the application. For example,

methods for accessing Microsoft products may be developed in Visual Basic or using the COM/DCOM interface protocol. These methods are stored in advance in a table and associated with certain functions typically requested by mobile devices 106. As previously described, mobile application server 112 uses integration manager 202 to access and invoke these methods in the table as required and then pass the resulting information produced to the mobile devices in an language compatible with XML or another intermediary language.

Administrator component 408 is used to control access to features of integration system 100 and the entering of information in application repository 116 and UDL 302. Updates made to UDL 302 include entering characteristics of new devices and updating existing device characteristics with new or upgraded features.

Reporter component 412 provides tools for gathering statistics and information on the acces of applications on backend systems 102 through mobile devices 106. This includes collecting the number and frequency of times applications accessed by mobile devices through implementations of the present invention. In addition, reporter component 412 gathers throughput data measuring the speed which information is generated by the applications on backend systems 102 and presented on mobile devices 106.

FIG. 5 illustrates the hierarchical organizational structure in UDL 302 for storing information about mobile devices and their corresponding browsers. UDL 302 provides a comprehensive listing of characteristics for families of mobile devices and specific mobile devices associated with these families.

A base family at the top of the hierarchy has a set of attributes passed down to the devices in the lower part of the tree. Each entry in the hierarchy adds more attributes that are passed down or inherited by the children devices that descend below. Device attributes including display size and resolution, cache size, input methods, and acceptable content types as well as browser or browsers are stored in UDL 302. Many of these device attributes relate to the user-agent processing data in the browser. Other device attributes relate to the physical characteristics of the mobile device.

Stylesheets are also associated with entries in UDL 302 and are used to provide a uniform presentation of information across families of devices. In one implementation, these style sheets are compatible with the XSL style sheet description language. Like

other attributes in the tree hierarchy, children devices entered below inherit the style sheet attributes. In one implementation, additional style feature causes the style to change for descendant entries but not the parent entries.

In FIG. 5, UDL 302 is organized into families of mobile devices that operate in a similar manner or are compatible with similar software applications. In the implementation illustrated in FIG. 5, UDL 302 has a base family 502, a set of user agent families 504, 506, 508, and a set of user-agent variants 510, 512, 514, 516, 518, 520. Below user-agent variants are user-agent version families and device attributes of the physical devices. If the exact mobile device and user-agent/browser cannot be identified in UDL 302, a family of devices compatible to the mobile device can be located by moving up the tree until a family of related mobile devices is identified. For example, the top-level entry for a WAP compatible Nokia phone is likely to provide reasonable compatibility with most other Nokia WAP phones.

Base family 502 describes the grouping criteria for the families below. It is the "root" or base family that encompasses all mobile devices, browsers and corresponding user-agents. User-agent families 504, 506 and 508 groups together mobiles devices that user a similar user-agent. In one implementation, the user-agent families are grouped according to the different languages user-agents process including HTML, WAP and other languages. Within each language exists user-agent variants 510, 512, 514, 516, 518 and 520. In one implementations, these user-agent variants describe user-agents that accept the same language but may be produced by different vendors. For example, one user-agent variant may be developed by Nokia while another user-agent variant is developed by OpenWave. User-agent variants can also describe subsets of a language like HTML that have distinctive differences. Compact HTML is a variant of HTML used by some user-agents while iMode is another variant of HTML that uses different user-agents in the browsers. User-agent version families 522, 524 and 526 relates to different versions of a user-agent in a particular variant. Eventually, attributes of specific physical devices are described as device attributes 528, 530 and 532. This latter entries describe the actual combination of the physical device in light of the particular user-agent version family.

This hierarchical organization and grouping makes UDL 302 easy to manage and use for organizing many different types of mobile devices. Adding new mobile devices

to UDL 302 is relatively easy because the new entries inherit all the features of parent devices in the tree. For example, a new Nokia device with a larger display and more memory would be added into the tree below similar Nokia devices without explicitly adding all the features in common with the parent devices in the tree. Similarly, a mobile device running a new WAP version would be added to the tree below language 506 to describe the differences in the version.

FIG. 6 is a flowchart diagram of the overall operations performed when integrating backend systems and mobile devices into system 100 in FIG. 1. Additional details on these operations are described later herein in conjunction with FIG. 7 and FIG. 8.

Initially, an application in backend systems 102 is executed that generates data for publishing on a mobile device (602). This data is combined with an intermediary language for further processing (604). For example, this intermediary language can be compatible with XML or another intermediary language. Data transmitted and received by the mobile device is used to identify the proper entry in UDL 302 (606). In one implementation, user-agent information sent from a browser includes information that identifies the browser and version as well as the target mobile device processing the information.

Once the mobile device is identified, the data and information is transformed from the intermediary language to the target language (608). Voice device adaptors 304, 306, and 308 convert the data into appropriate voice dialogs compatible with voice server 304, voiceXML 306 or other voice languages for use on the mobile device. Data adaptors 310, 312, 314, and 316 are used to convert data in the intermediary language into menus, messages, and other user-interface elements for display on mobile devices 106. Typically, abstract information about the application stored in application repository 116 is also used to create these user-interface elements for the display. Once generated, the mobile application logic and presentation instructions are executed (610) and the information is rendered on the mobile device in accordance with UDL 302 (612). A user operating the mobile device enters data or voice commands in response to the information provided. This data and/or voice information is received on the mobile device (614).

The reverse of the process described above is performed to get the information from the mobile device to the application in backend systems 102. This includes

transforming input received on the mobile device to an intermediary language for further processing (616). For example, this intermediary language may also be compatible with XML. Integration manager 202 intercepts the intermediate language and invokes appropriate methods and sends information to the applications for further processing (618).

FIG. 7 is a flowchart diagram of the operations performed by mobile application server 112 to deliver information from a mobile device to backend systems 102 in FIG. 1. This flowchart provides additional operations associated with integration manager 202 invoking methods to access applications (618) in FIG. 6.

Mobile application server 112 receives information from a mobile device in a mobile device format (702). The information from the mobile device can be either voice information from a voice-enabled application or data from a data-enabled application. Voice information is converted for further processing using speech recognition. In one implementation, voice information from the mobile device is in a format compatible with Voice XML. Of course, voice representations compatible with other formats other than Voice XML can also be used with the various implementations of the invention. Speech recognition can utilize one or more different types of speech-recognition engines including systems developed by Nuance Communications of Menlo Park, California.

Mobile application server 112 enhances the information with application services that facilitate communication and the exchange of information between the mobile device and the application on the backend system 102 (704). As described above, these application services include security, session management, synchronization, alert processing, localization, and personalization services. Alternate implementations may include greater or fewer application services as deemed necessary to integrate backend systems 102 with mobile devices 106.

Mobile application server 112 processes data information from an intermediary language into an appropriate language for an application in backend systems 102 (706). In one implementation, mobile application server 112 receives information compatible with XML and performs transformations that make it compatible with one or more languages and/or protocols including Structured Query Language (SQL), HyperText

Markup Language (HTML), Lightweight Directory Access Protocol (LDAP), Common Object Request Broker Architecture (CORBA) and Component Object Model(COM).

Within mobile application server 112, integration manager 202 in FIG. 2 is tasked with performing additional transformations and invoking methods corresponding to functions associated with one or more applications in backend systems 102 (708). As illustrated in FIG. 1 and FIG. 2, integration manager 202 obtains integration methods from application repository 116 generated in advance using mobile tools suite 110. Applications associated with backend systems 106 perform the requested functions and integration manager 202 receives the results (710). To process the results, one or more operations described above are performed in reverse. Application services 203 and corresponding operations described above are used as a guideline to processing the results returned from backend systems 106 before they are presented on mobile devices 106. To convert text-to-voice and present on mobile devices 106, voice synthesis is performed using one or more different types of voice synthesis engines including systems developed by Lernout & Hauspie Speech Products N.V. of Belgium.

FIG. 8 is a flowchart diagram of the operations performed by the mobile presentation server 114 in FIG. 1. This flowchart provides additional details for presenting information on mobile devices (612) as described in FIG. 6.

A mobile device sends a request for information from applications on backend systems 102 that mobile presentation server 114 intercepts and processes. A portion of the request passed onto mobile application server 112 is used to invoke methods and obtain information from applications. Another portion of the request received by mobile presentation server 114 includes user-agent and accept string headers that facilitate identifying capabilities of the mobile device and browser (802). In one implementation, the user-agent header and accept header are placed in an HTTP header along with other header information by a user-agent associated with the browser of a mobile device. The user-agent header identifies the version of the user-agent associated with the browser and in some cases the capabilities of the user-agent. The accept header further defines capabilities of the user-agent by indicating strings or commands the user-agent associated with the browser will "accept" and process correctly. Together, the user-agent header and accept header assists mobile presentation server 114 to interact and provide proper information to a user-agent.

A recognizer associated with mobile presentation server 114 uses the user-agent header, the accept header and potentially other information to identify an entry or entries in UDL 302 and determine characteristics of the mobile device and browser (804). In one implementation, the recognizer performs a series of operations comparing the user-agent header and accept header information with entries in UDL 302. These comparison operations identify the mobile device and browser entry in UDL 302 or identify a family of devices and browsers that closely relate to the mobile device and browser combination.

Depending on the mobile device used, the recognizer may be able to identify the mobile device and browser in UDL 302 (806). If a match is made, mobile presentation server 114 selects and uses the definitions and characteristics from UDL 302 for the specific mobile device and the browser (808). Alternatively, if the mobile device and browser cannot be identified (806), mobile presentation server 114 selects the nearest match in the hierarchy of UDL 302 (810). Generally, the nearest match in UDL 302 identifies a family of browsers and mobile devices in the hierarchy with definitions and characteristics that closely match the targeted mobile device. As previously described, these definitions and characteristics can include display size and resolution, cache size, input methods, and acceptable content types as well as preferred browser or browsers for rendering information. Using this information from applications on backend systems, mobile presentation server 114 facilitates rendering results on the target mobile device 106(812).

FIG. 9 is a flowchart diagram of the operations performed using mobile tools suite 110 to populate application repository 116. A system administrator or person typically uses these tools to integrate mobile devices 102 with applications in backend systems 106.

Integration builder 406 creates tables mapping access methods to functions within applications on backend systems 102 (902). These access methods cause applications in backend systems 106 to execute specific functions and provide results. For example, access methods can be created that cause a CRM application to generate contact information for a particular customer. Once created, integration builder 406 stores this access method in application repository 116 (908).

Dialog builder 404 builds dialogs for both voice and data interactions (904). For voice applications on a mobile device, dialog builder 404 specifies a combination of voice

prompts, natural-language processing and voice preferences used by a mobile device when interacting with an application on backend systems 106. These voice-dialogs are also stored in application repository 116 (908) and used to aurally present information. Similarly, for data applications on a mobile device, dialog builder 404 specifies a combination of menu choices, input methods and data preferences used by a mobile device when interacting with a particular application in backend systems 106. These data-dialogs are also stored in application repository 116 (908) and used to visually present information. Of course, hybrid applications on a mobile device with both aural and visual interfaces would store a combination of voice-processing and data-processing instructions described above in application repository 116.

Application builder 402 describes applications in backend systems 106 with an abstraction layer (906). This abstraction layer is used by various application services 203 to coordinate behavior between the operation of mobile devices 106 and applications in backend systems 102. Information in the abstraction layer can include security information, alert information, session management information, locale information, personalization information, and synchronization information in accordance with the description above. This information is also stored in application repository 116 (908).

Aspects of the invention can be implemented in digital electronic circuitry, or in computer hardware, firmware, software, or in combinations of them. Apparatus of the invention can be implemented in a computer program product tangibly embodied in a machine-readable storage device for execution by a programmable processor; and method steps of the invention can be performed by a programmable processor executing a program of instructions to perform functions of the invention by operating on input data and generating output.

The invention can be implemented advantageously in one or more computer programs that are executable on a programmable system including at least one programmable processor coupled to receive data and instructions from, and to transmit data and instructions to, a data storage system, at least one input device, and at least one output device. Each computer program can be implemented in a high-level procedural or object-oriented programming language, or in assembly or machine language if desired; and in any case, the language can be a compiled or interpreted language. Suitable processors include, by way of example, both general and special purpose

microprocessors. Generally, a processor will receive instructions and data from a read-only memory and/or a random access memory.

Typically, a computer will include one or more mass storage devices for storing data files; such devices include magnetic disks, such as internal hard disks and removable disks; magneto-optical disks; and optical disks. Storage devices suitable for tangibly embodying computer program instructions and data include all forms of non-volatile memory, including by way of example semiconductor memory devices, such as EPROM, EEPROM, and flash memory devices; magnetic disks such as internal hard disks and removable disks; magneto-optical disks; and CD-ROM disks. Any of the foregoing can be supplemented by, or incorporated in, ASICs (application-specific integrated circuits).

To provide for interaction with a user, the invention can be implemented on a computer system having a display device such as a monitor or LCD screen for displaying information to the user and a keyboard and a pointing device such as a mouse or a trackball by which the user can provide input to the computer system. The computer system can be programmed to provide a graphical user interface through which computer programs interact with users.

An example of one such type of computer is shown in FIG. 10 and is capable of being configured to operate as one or more portions of the system in FIG.1. Either mobile application server 112, mobile presentation server 114, application repository 116 or mobile tools suite 110 in FIG. 1 can be implemented in accordance with the present invention using one or more software or hardware components as illustrated and described. Computer 1000 includes a memory 1002, a processor 1004, a network communication port 1006, a secondary storage 1008, input-output ports 1010 and telephony communication port 1012 coupled together over bus 1014. Network communication port 1006 can be connected to the Internet or other public network while telephony communication port 1012 is typically connected to a switched network used for voice communication. Computer 1000 can be preprogrammed, in ROM, for example, or is programmed (and reprogrammed) by loading a program from another source (for example, from a floppy disk, a CD-ROM, or another computer).

Memory 1002 is capable of holding computer programs, including programs implementing aspects of the present invention, stored in secondary storage 1008 or on a remote device connected over a network coupled to network communication port 1006.

Programs include mobile application server components 1014, mobile presentation server components 1016, mobile tools suite components 1018 and an operating system 1020. Universal device library (UDL) 1022 is typically stored on secondary storage 1008 as is application repository 1024.

While specific embodiments have been described herein for purposes of illustration, various modifications may be made without departing from the spirit and scope of the invention. For example, data device adaptors and voice adaptors compatible with WML, HDML, HTML and Voice XML respectively are described yet data device adaptors and voice adaptors compatible with other languages and syntaxes can also be used. Accordingly, the invention is not limited to the above-described implementations, but instead is defined by the appended claims in light of their full scope of equivalents.

CLAIMS

What is claimed is

1. A system for integrating an application executing on a backend system with a mobile device capable of communicating to the backend system over a network, comprising:

a mobile application server capable of interfacing with the application by invoking methods corresponding to functions in the application and receiving information from the application;

a mobile presentation server capable of receiving the application information from the mobile application server and transforming the information for presentation on a mobile device; and

an application repository capable of storing the methods used by the mobile application server for interfacing with the application.

2. The system of claim 1 further including a hierarchical database of mobile device information capable storing information describing the characteristics of a mobile device and a family of related mobile devices wherein the mobile presentation server uses this information in the hierarchical database for presenting information from the application onto the mobile device.

3. The system of claim 1 wherein the mobile application server further includes,

an integration manager that maps the methods to functions in the application and is capable of mapping at least one function to at least one method in response to a request for application information from the mobile device.

4. The system of claim 1 wherein the mobile application server further includes a set of application services capable of enhancing functionality on a mobile device and

improving the communication and exchange of information between the mobile device and the application on the backend system.

5. The system of claim 1 wherein the mobile application presentation server further includes a voice device adaptor capable of performing voice processing functions and a data device adaptor, wherein the voice device adaptor and data device adaptor facilitate the exchange of voice information and data information with the mobile device.

6. A method of integrating an application executing on a backend system with a mobile device capable of communicating to the backend system over a network, comprising:

retrieving from a storage area a method corresponding to a function in the application on the backend system;

invoking the method corresponding to the function in the application and creating an interface to the application on the backend system;

receiving information from the application corresponding to information from the application requested by the mobile device; and

transforming the information received from the application on the backend system to a format suitable for presentation on the mobile device.

7. The method of claim 6 wherein the transforming further includes retrieving information describing the characteristics of a mobile device from a hierarchical database of mobile device information describing the characteristics of the mobile device and a family of mobile devices related to the mobile device.

8. The method of claim 6 wherein invoking the method further includes,

mapping at least one method to at least one function associated with an application on the backend system, wherein the function is capable of providing information from an application on the backend system when executed.

9. The method of claim 6, further comprising,

enhancing functionality on the mobile device using a set of application services

that facilitates improving communications and the exchange of information between the mobile device and the application on the backend system.

10. The method of claim 7 further comprising,

rendering information on the mobile device in accordance with the hierarchical database of mobile devices having information describing the characteristics of the mobile device and a family of mobile devices related to the mobile device.

11. A system for exchanging information between a mobile device and an application on a backend system, comprising:

an integration manager component capable of tracking one or more applications on the backend system and further capable of invoking a method that causes a function in an application to execute in response to a request for the function from the mobile device; and

a set of application services capable of enhancing functionality on a mobile device and further capable of improving the communication and exchange of information between the mobile device and the application on the backend system.

12. The system of claim 11 wherein the set of application services includes:

a security component capable of controlling the information exchanged between the mobile device and the application on the backend system according to security levels associated with the mobile device and the application.

13. The system of claim 11 wherein the set of application services includes:

an alert component capable of facilitating synchronous and asynchronous communications of events between the application on the backend system and the mobile device.

14. The system of claim 11 wherein the set of application services includes:

a session management component capable of managing and maintaining logical

connectivity for sessions between the application on the backend systems and the mobile device.

15. The system of claim 11 wherein the set of application services includes:

a synchronization component capable of updating information on both the mobile device and the application on the backend system and ensuring that the information on both the mobile device and the application are consistent when information is modified on either the mobile device or the application.

16. The system of claim 11 wherein the set of application services includes:

a localization component capable of utilizing location based services and locale information to customize features of an application on the backend system.

17. The system of claim 11 wherein the set of application services includes:

a personalization component capable of customizing an application on the backend system according to a user's personal options and preference when accessing the application from the mobile device.

18. The system of claim 11 wherein the set of application services includes:

a voice dialog manager component capable of managing communications and transformations between data communications used on the application and voice communications used on the mobile device.

19. The system of claim 11 wherein the set of application services includes:

a data dialog manager component capable of managing communications and

transformations between data communications used on the application and data communications used on the mobile device.

20. A method of exchanging information between a mobile device and an application on a backend system, comprising:

tracking one or more applications on the backend system;

invoking a method that causes a function on an application to execute in response to a request for the function from the mobile device; and

enhancing functionality on the mobile device using a set of application services that facilitate communication and exchange of information between the mobile device and the application on the backend system.

21. The method of claim 20 wherein enhancing functionality further comprises, controlling the information exchanged between the mobile device and the application on the backend system according to security levels associated with the mobile device and the application.

22. The method of claim 20 wherein enhancing the functionality further comprises, facilitating synchronous and asynchronous communications of events between the application on the backend system and the mobile device through the use of alerts.

23. The method of claim 20 wherein enhancing the functionality further comprises, managing and maintaining logical connectivity for sessions between the application on the backend systems and the mobile device.

24. The method of claim 20 wherein enhancing the functionality further comprises, updating information on both the mobile device and the application on the backend system and ensuring that the information on both the mobile device and the application are consistent when information is modified on either the mobile device or the application.

25. The method of claim 20 wherein enhancing the functionality further comprises, utilizing location based services and locale information to customize features of an application on the backend system.

26. The method of claim 20 wherein enhancing the functionality further comprises, customizing an application on the backend system according to a user's personal options and preferences when accessing the application from the mobile device.

27. The method of claim 20 wherein enhancing the functionality further comprises, managing communications and transformations between data communications used on the application and voice communication used on the mobile device.

28. The method of claim 20 wherein enhancing the functionality further comprises, managing communications and transformations between data communications used on the application and data communication used on the mobile device.

29. A system for presenting information onto a mobile device from a backend system running an application, comprising:

a hierarchical database capable of organizing information describing characteristics of families of mobile devices wherein information on a specific mobile device is associated with at least one family of mobile devices in the hierarchical organization of information; and

a set of device adaptors capable of matching a stream of information associated with the mobile device with an entry in the hierarchical database of information to determine the characteristics of the mobile device.

30. The system of claim 29 wherein the set of device adaptors includes a data device adaptor capable of using the entry identified in the hierarchical database to generate data compatible with the mobile device.

31. The system of claim 29 wherein the set of device adaptors includes a voice device adaptor capable of using the entry identified in the hierarchical database to generate voice information compatible with the mobile device.

32. The system of claim 30 wherein the data information is compatible with XML.

33. The system of claim 31 wherein the voice information is compatible with VoiceXML.

34. A method of presenting information on a mobile device produced from a backend system running an application, comprising:

providing a hierarchical database capable of organizing information describing characteristics of families of mobile devices, wherein information on a specific mobile device is associated with at least one family of mobile devices in the hierarchical

organization of information;

identifying one or more strings from a stream of information associated with a mobile device;

recognizing the mobile device by comparing the one or more strings in the stream of information with corresponding strings in the hierarchical database;

selecting an entry in the hierarchical database wherein the entry includes characteristics compatible with the mobile device based on the recognition; and

generating information on the mobile device according to the characteristics selected from the entry in the hierarchical database.

35. The method of claim 34 wherein the identifying step further comprises locating a user-agent header in the stream of information associated with the mobile device.

36. The method of claim 34 wherein the identifying step further comprises locating an accept header in the stream of information associated with the mobile device.

37. The method of claim 34 wherein selecting an entry in the hierarchical database further comprises,

determining if an entry in the hierarchical database corresponds to the mobile device; and

selecting an entry from the hierarchical database having characteristics corresponding to a family of mobile devices compatible with the mobile device and in based on the determination.

38. The method of claim 34 wherein the generating includes rendering information on a display of the mobile device according to the selected entry in the hierarchical database.

39. The method of claim 34 wherein the generating includes converting data information into voice information for use on the mobile device.

40. The method of claim 39 further comprising performing voice recognition on voice information received from the mobile device.

41. A computer program product, tangibly stored on a computer-readable medium, for integrating an application executing on a backend system with a mobile device capable of communicating to the backend system over a network, comprising instructions operable to cause a programmable processor to:

retrieve from a storage area a method corresponding to a function in the application on the backend system;

invoke the method corresponding to the function in the application and creating an interface to the application on the backend system;

receive information from the application corresponding to information from the application requested by the mobile device; and

transform the information received from the application on the backend system to a format suitable for presentation on the mobile device.

42. A computer program product, tangibly stored on a computer-readable medium, for exchanging information between a mobile device and an application on a backend system, comprising instructions operable to cause a programmable processor to:

track one or more applications on the backend system;

invoke a method that causes a function on an application to execute in response to a request for the function from the mobile device; and

enhance functionality on the mobile device using a set of application services that facilitate communication and exchange of information between the mobile device and the application on the backend system.

43. A computer program product, tangibly stored on a computer-readable medium, for presenting information on a mobile device produced from a backend system running an application, comprising instructions operable to cause a programmable processor to::

provide a hierarchical database capable of organizing information describing characteristics of families of mobile devices, wherein information on a specific mobile device is associated with at least one family of mobile devices in the hierarchical organization of information;

identify one or more strings from a stream of information associated with a mobile

device;

recognize the mobile device by comparing the one or more strings in the stream of information with corresponding strings in the hierarchical database;

select an entry in the hierarchical database wherein the entry includes characteristics compatible with the mobile device based on the recognition; and

generate information on the mobile device according to the characteristics selected from the entry in the hierarchical database.

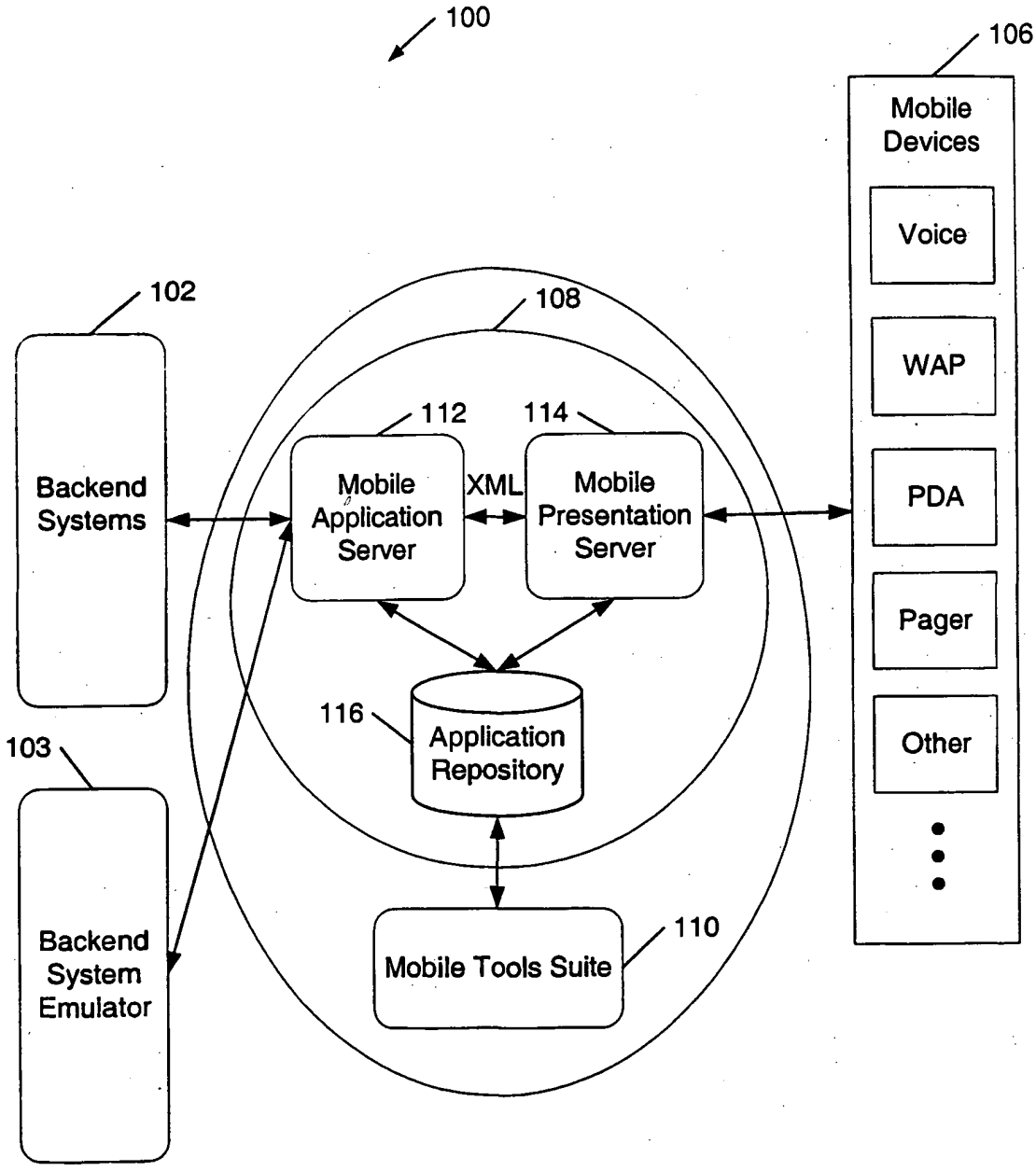

100
106
Mobile Devices
Voice
WAP
PDA
Pager
Other
102
108
112
114
Backend Systems
Mobile Application Server
XML
Mobile Presentation Server
116
Application Repository
103
Backend System Emulator
Mobile Tools Suite
110

FIG. 1

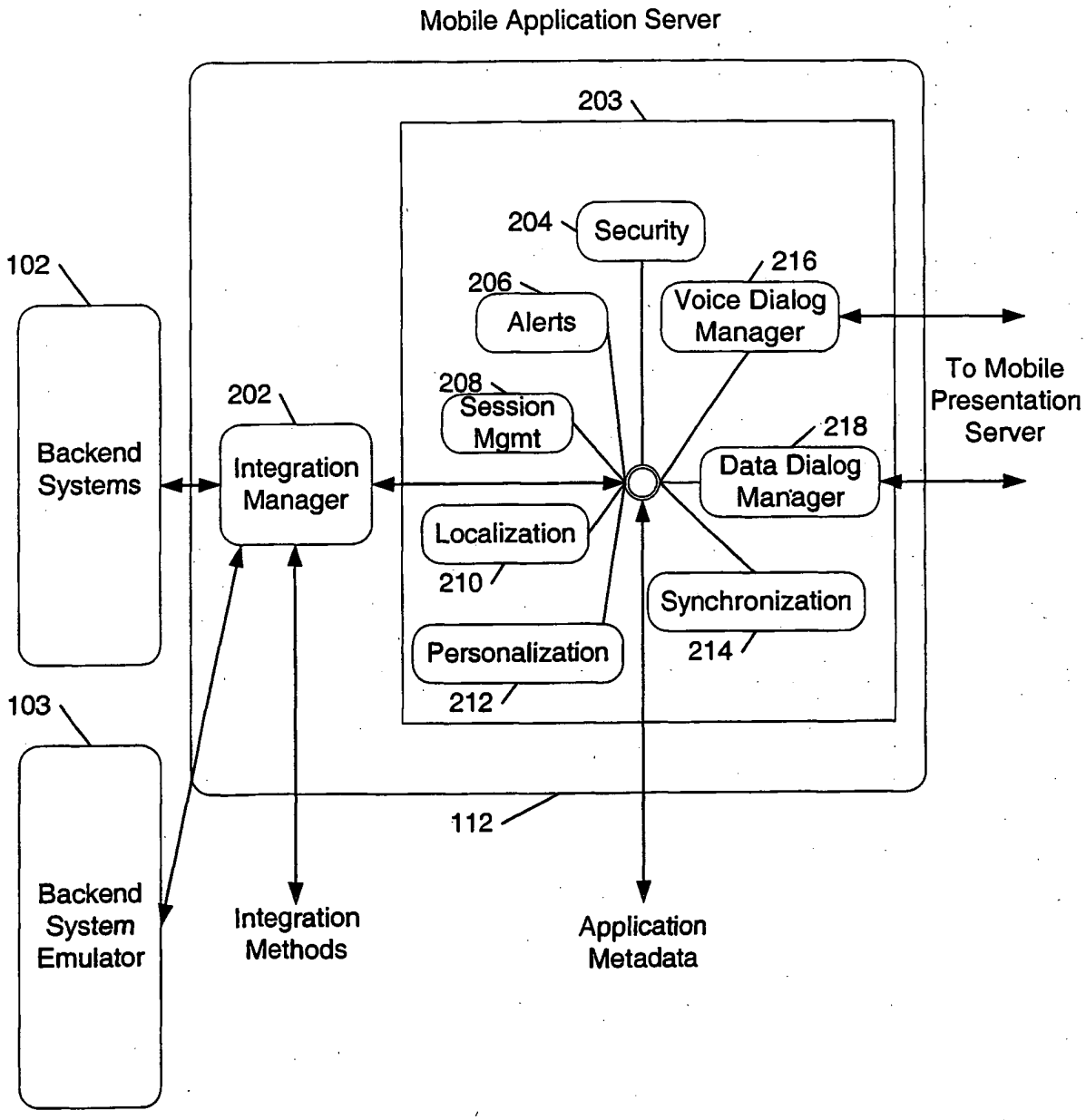

Mobile Application Server
203
204
Security
216
206
Alerts
Voice Dialog Manager
To Mobile Presentation Server
208
Session Mgmt
218
102
Backend Systems
202
Integration Manager
Data Dialog Manager
Localization
210
Synchronization
214
Personalization
212
103
112
Backend System Emulator
Integration Methods
Application Metadata

FIG. 2

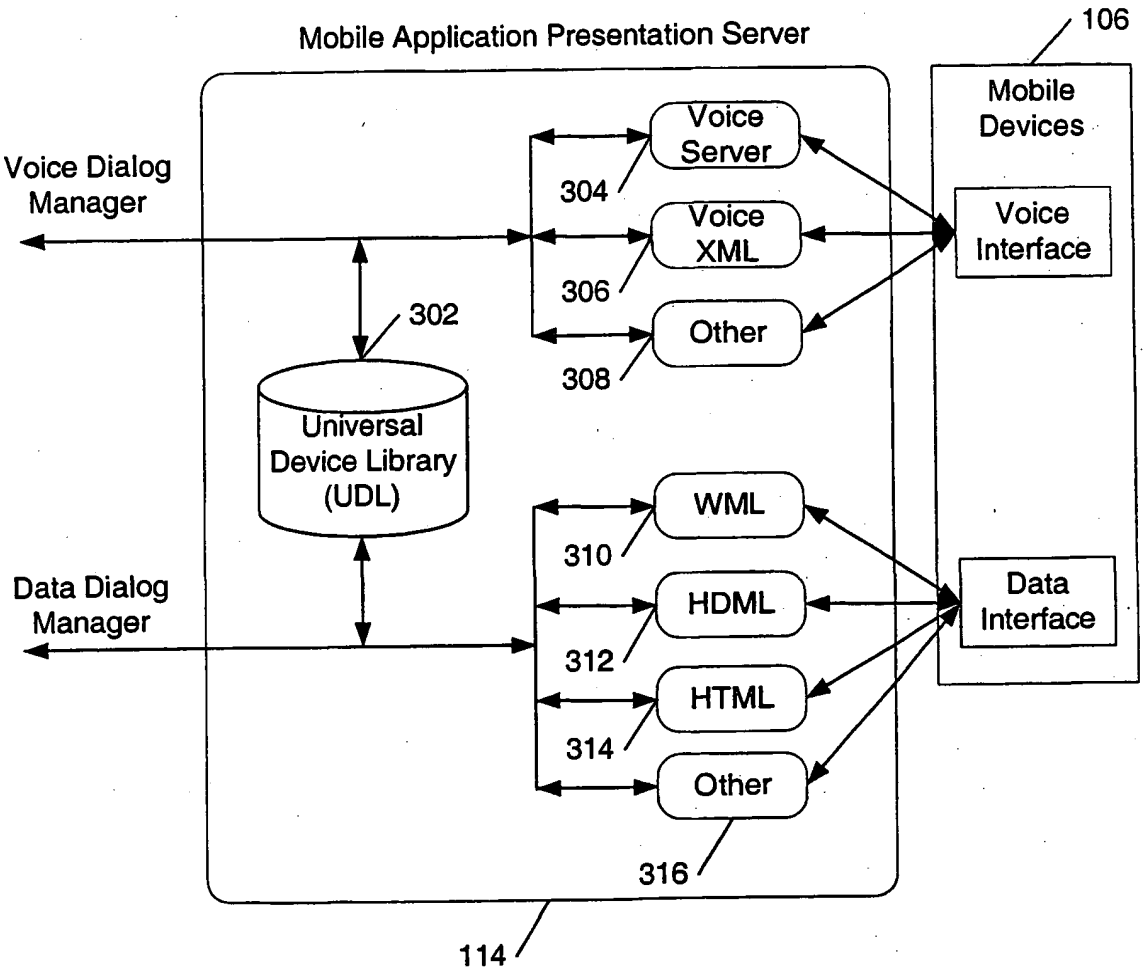

Mobile Application Presentation Server
106
Mobile Devices
Voice Dialog Manager
Voice Server
304
Voice XML
306
Other
308
Voice Interface
302
Universal Device Library (UDL)
WML
310
HDML
312
HTML
314
Other
316
Data Dialog Manager
Data Interface
114

FIG. 3

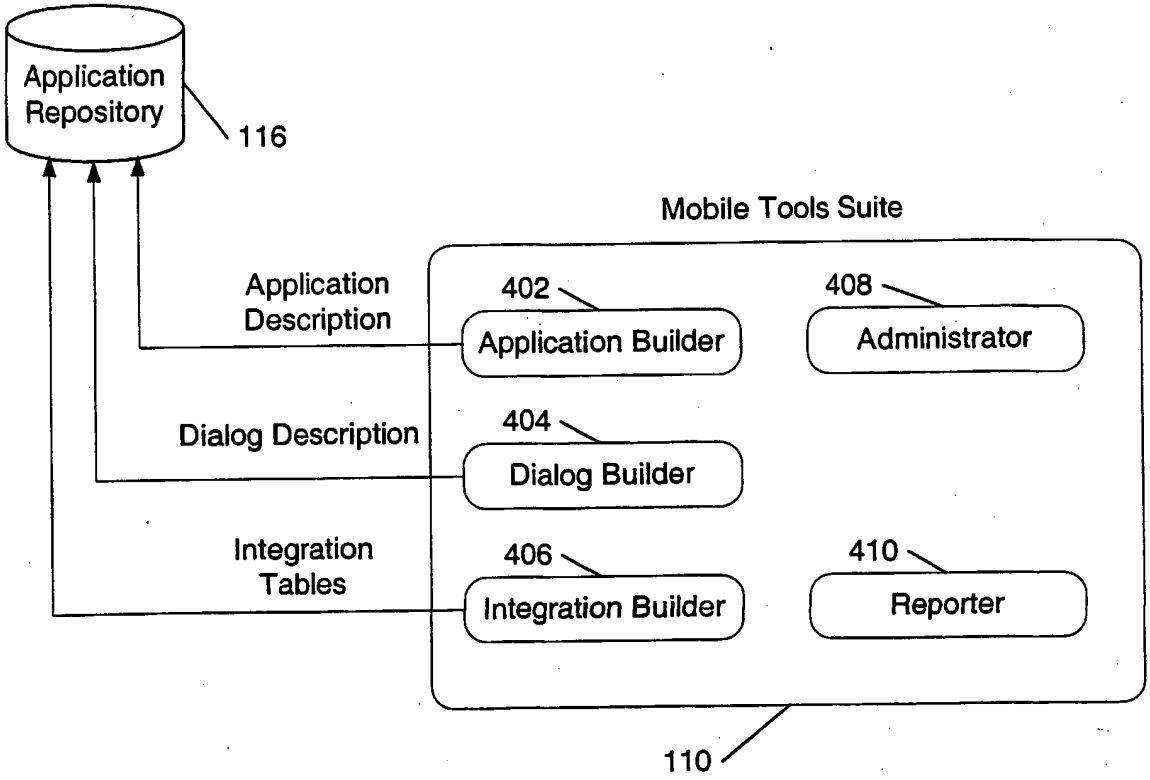

Application Repository
116
Mobile Tools Suite
Application Description
402
Application Builder
408
Administrator
Dialog Description
404
Dialog Builder
Integration Tables
406
Integration Builder
410
Reporter
110

FIG. 4

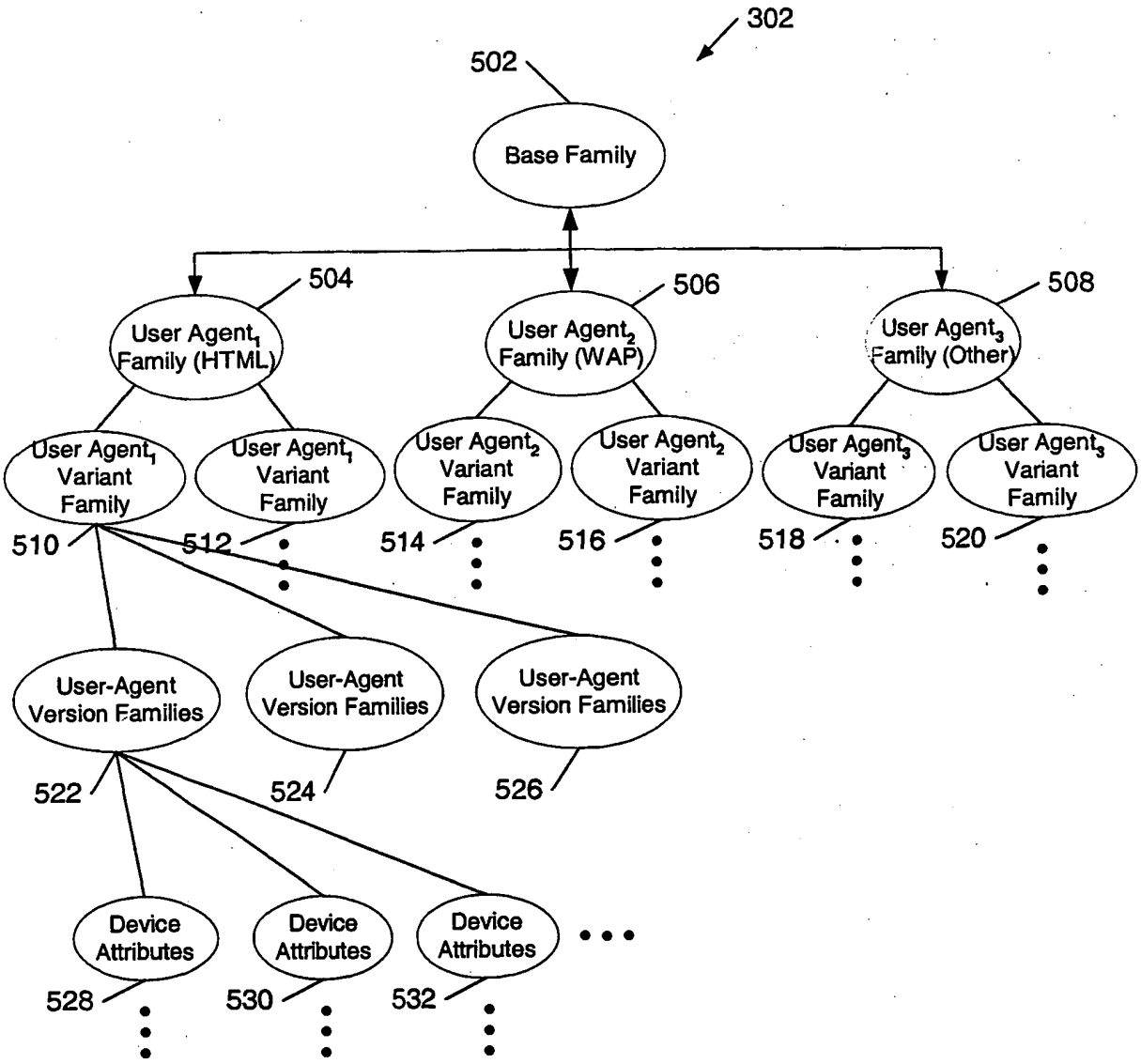

302
502
Base Family
504
506
508
User Agent1 Family (HTML)
User Agent2 Family (WAP)
User Agent3 Family (Other)
User Agent1 Variant Family
User Agent1 Variant Family
User Agent2 Variant Family
User Agent2 Variant Family
User Agent3 Variant Family
User Agent3 Variant Family
510
512
514
516
518
520
User-Agent Version Families
User-Agent Version Families
User-Agent Version Families
522
524
526
Device Attributes
Device Attributes
Device Attributes
528
530
532

FIG. 5

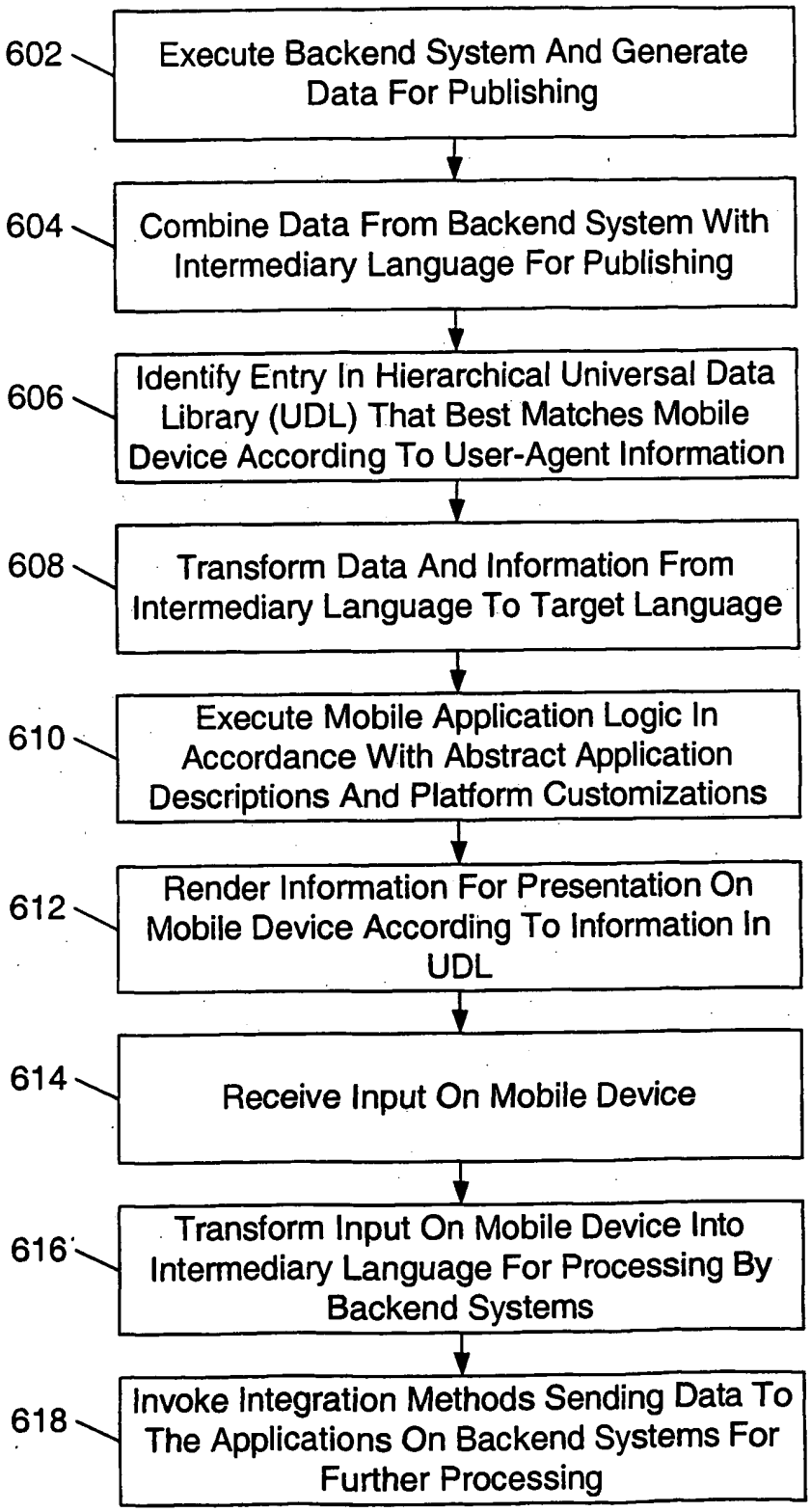

602
Execute Backend System And Generate Data For Publishing
604
Combine Data From Backend System With Intermediary Language For Publishing
606
Identify Entry In Hierarchical Universal Data Library (UDL) That Best Matches Mobile Device According To User-Agent Information
608
Transform Data And Information From Intermediary Language To Target Language
610
Execute Mobile Application Logic In Accordance With Abstract Application Descriptions And Platform Customizations
612
Render Information For Presentation On Mobile Device According To Information In UDL
614
Receive Input On Mobile Device
616
Transform Input On Mobile Device Into Intermediary Language For Processing By Backend Systems
618
Invoke Integration Methods Sending Data To The Applications On Backend Systems For Further Processing

FIG. 6

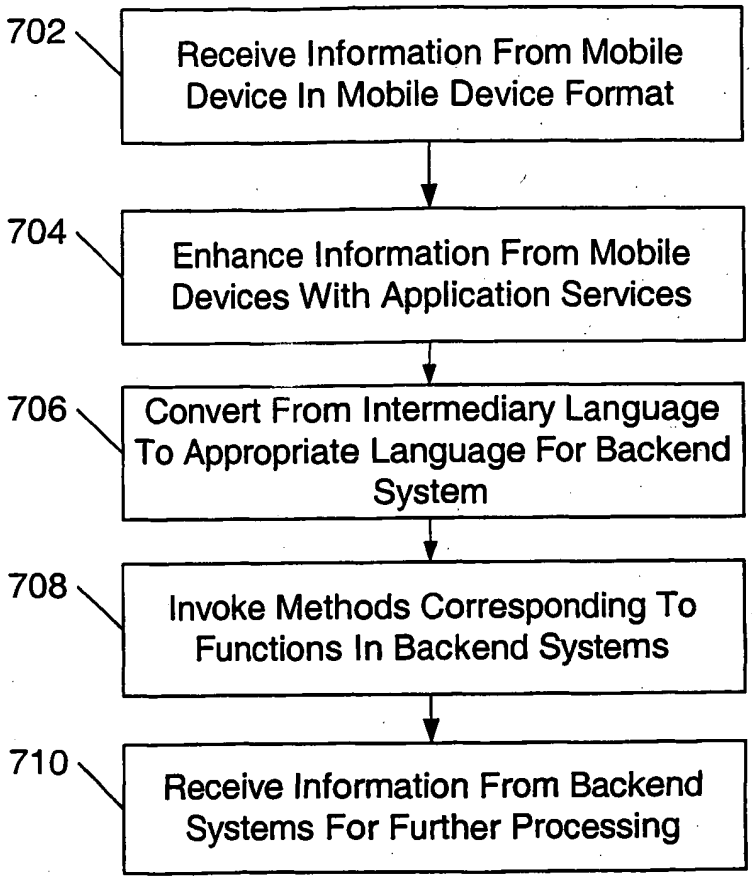

702
Receive Information From Mobile Device In Mobile Device Format
704
Enhance Information From Mobile Devices With Application Services
706
Convert From Intermediary Language To Appropriate Language For Backend System
708
Invoke Methods Corresponding To Functions In Backend Systems
710
Receive Information From Backend Systems For Further Processing

FIG. 7

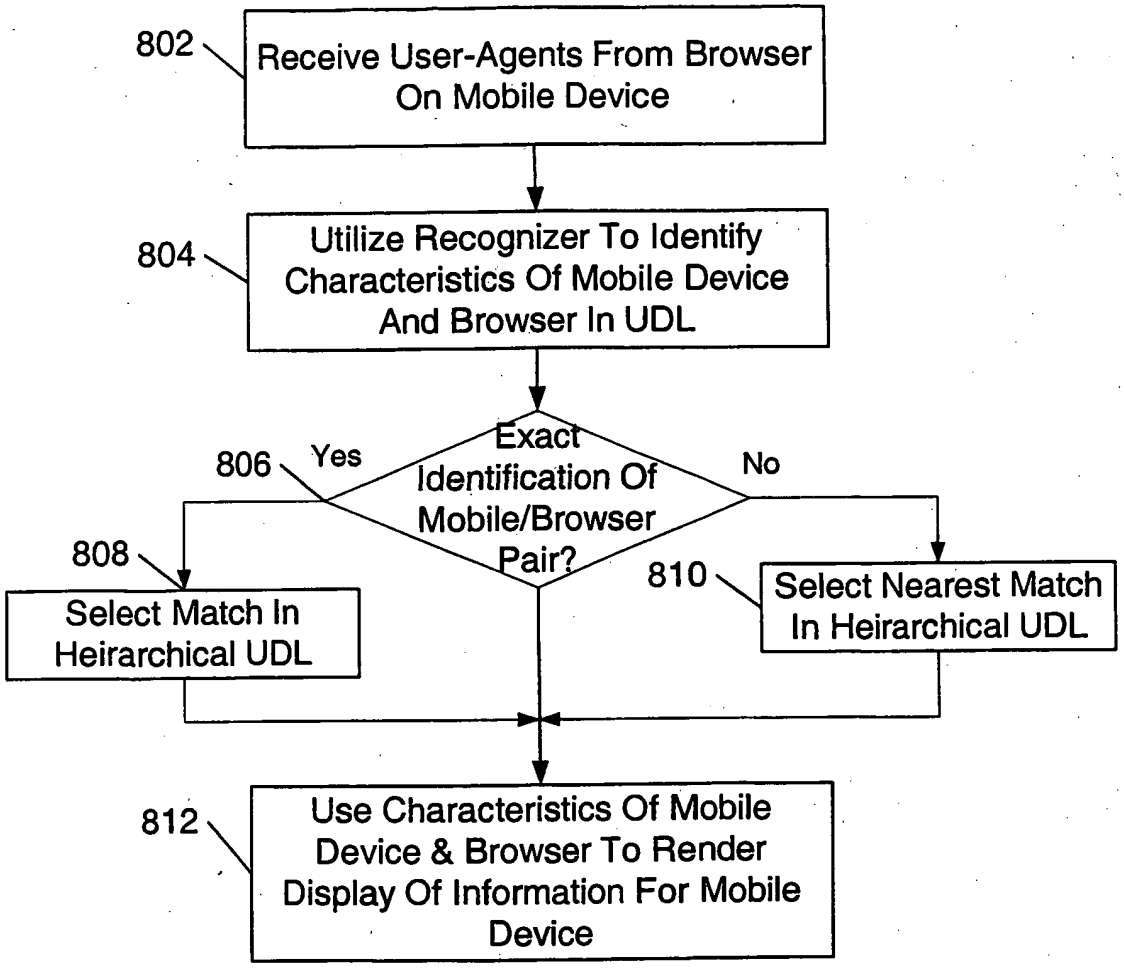

802
Receive User-Agents From Browser On Mobile Device
804
Utilize Recognizer To Identify Characteristics Of Mobile Device And Browser In UDL
806
Yes
Exact Identification Of Mobile/Browser Pair?
No
808
Select Match In Heirarchical UDL
810
Select Nearest Match In Heirarchical UDL
812
Use Characteristics Of Mobile Device & Browser To Render Display Of Information For Mobile Device

FIG. 8

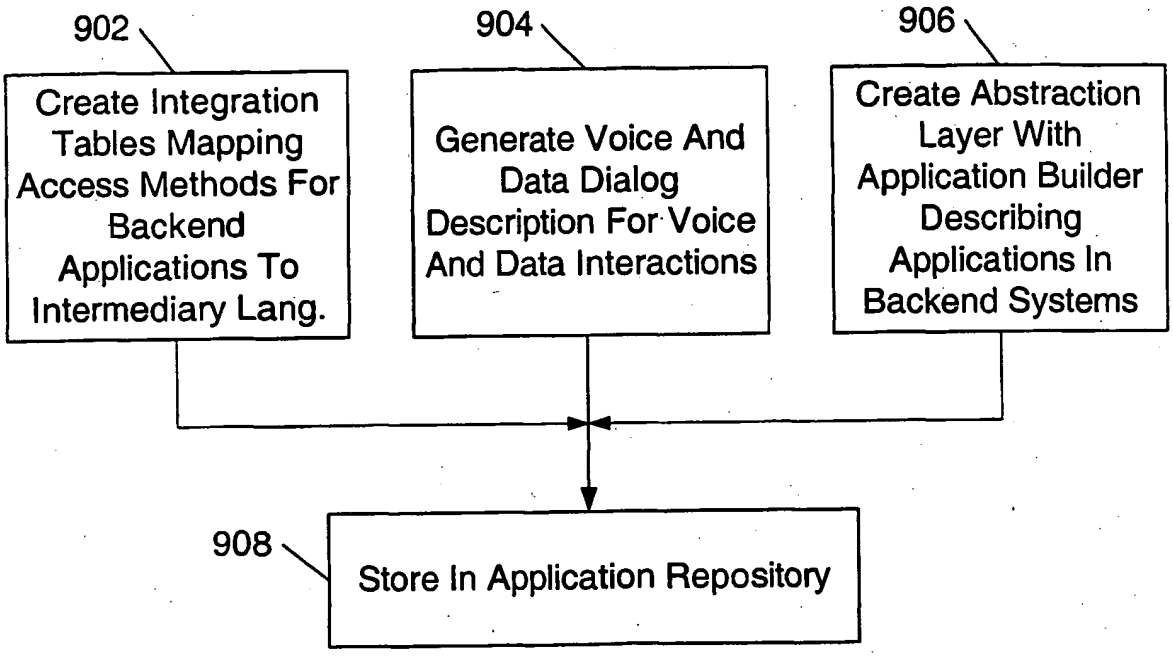

902
Create Integration Tables Mapping Access Methods For Backend Applications To Intermediary Lang.
904
Generate Voice And Data Dialog Description For Voice And Data Interactions
906
Create Abstraction Layer With Application Builder Describing Applications In Backend Systems
908
Store In Application Repository

FIG. 9

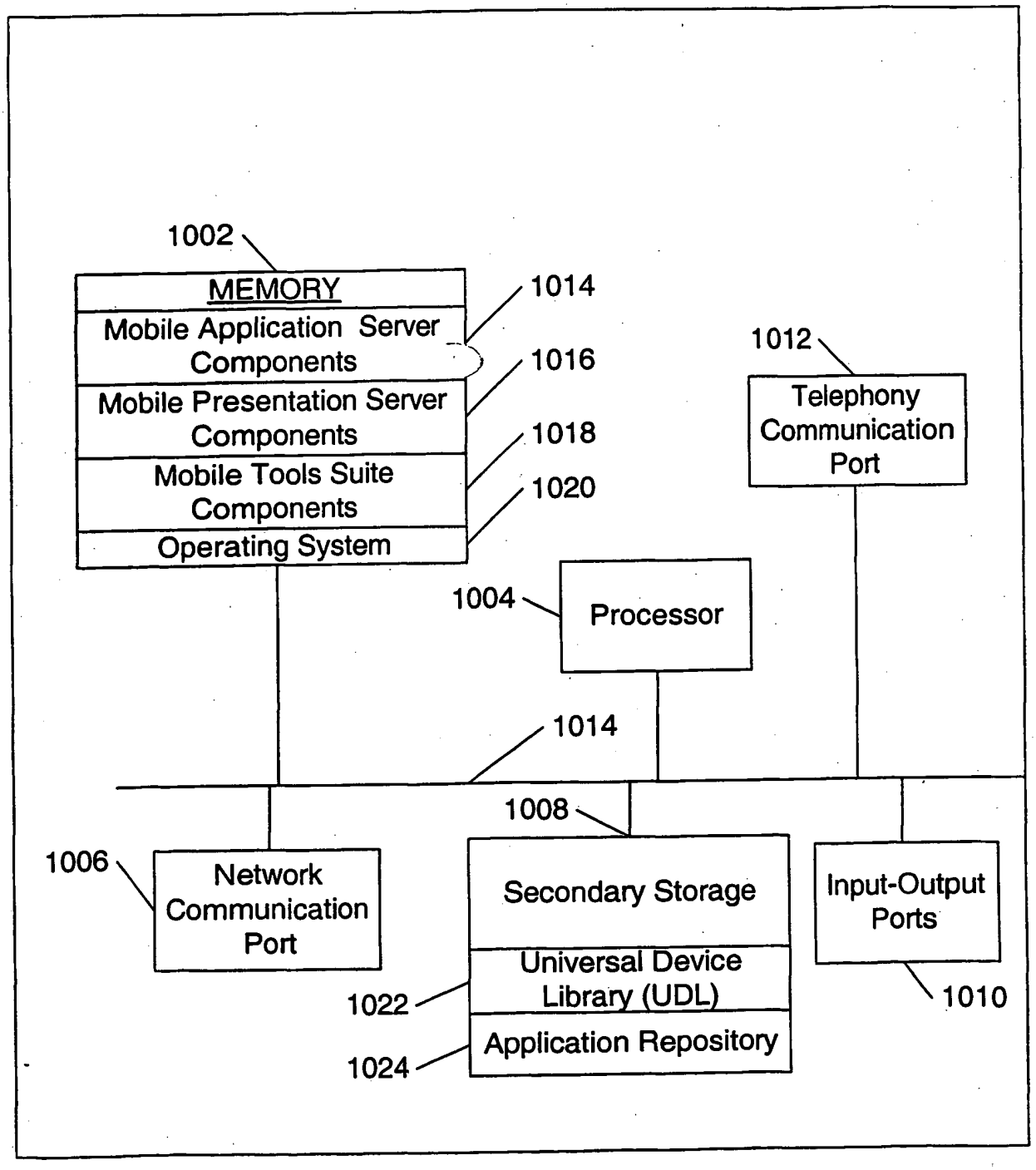

1002
MEMORY
Mobile Application Server Components
Mobile Presentation Server Components
Mobile Tools Suite Components
Operating System
1014
1016
1018
1020
1012
Telephony Communication Port
1004
Processor
1014
1008
1006
Network Communication Port
Secondary Storage
Universal Device Library (UDL)
Application Repository
1022
1024
Input-Output Ports
1010

FIG. 10

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 March 2002 (21.03.2002)

PCT

(10) International Publication Number
WO 02/023857 A3

(51) International Patent Classification[7]: H04L 29/06, 29/08, H04Q 7/32, H04L 12/56, 12/28

(21) International Application Number: PCT/US01/42113

(22) International Filing Date:
10 September 2001 (10.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/231,845 11 September 2000 (11.09.2000) US

(71) Applicant: VIAFONE, INC. [US/US]; 8000 Marina Boulevard, 5th Floor, Brisbane, CA 94005 (US).

(72) Inventors: GRANADE, Francois; 765 Sutter Street, Apt. B, San Francisco, CA 94109 (US). WADDINGTON, Simon; 255 Third Street, Loft 305, Oakland, CA 94607 (US). ROBERTS, Steve; 818 Balboa Lane, Foster City, CA 94404 (US). AUPHAN, Raphael; 604 San Nicolas, Foster City, CA 94404 (US).

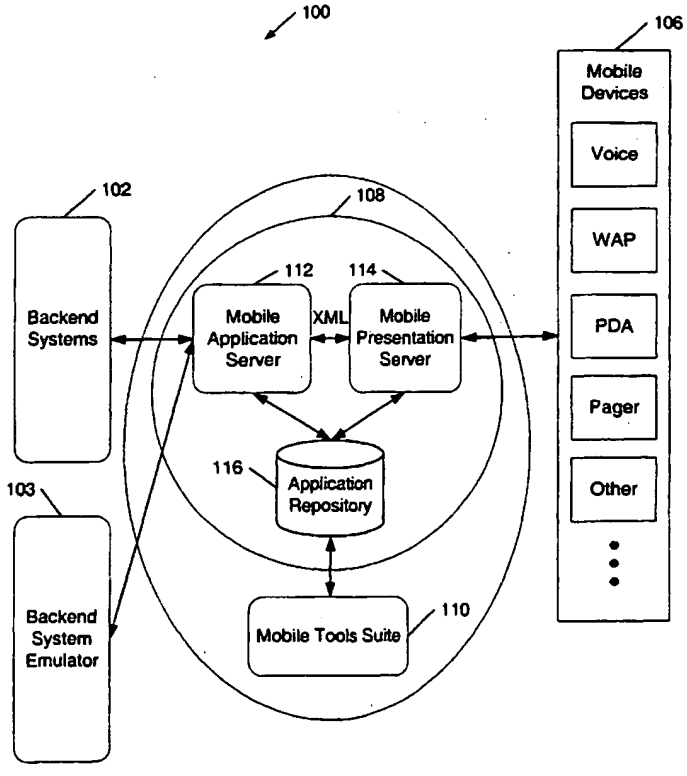
(74) Agent: WIESNER, Leland; Law Office of Leland Wiesner, 1144 Fife Avenue, Palo Alto, CA 94301 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, 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, 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,

[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR INTEGRATING APPLICATIONS AND MOBILE NETWORKS



(57) Abstract: A method and system for integrating an application executing on a backend system with a mobile device that communicates over a network with the application. The integration includes retrieving from a storage area a method corresponding to a function in the application on the backend system, invoking the method corresponding to the function in the application and creating an interface to the application on the backend system. Information received from the application corresponds to the information requested by the mobile device. This information from the application is transformed to a format suitable for presentation on a mobile device by a presentation server and assisted by a hierarchical universal device library description of mobile devices and browsers.

WO 02/023857 A3



CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
with international search report

(88) Date of publication of the international search report:
30 January 2003

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INTERNATIONAL SEARCH REPORT

Int nal Application No
PCT/US 01/42113

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06 H04L29/08 H04Q7/32 H04L12/56 H04L12/28

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04Q

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	MOHAN R ET AL: "Adapting multimedia Internet content for universal access" IEEE TRANSACTIONS ON MULTIMEDIA, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 1, no. 1, March 1999 (1999-03), pages 104-114, XP002159629 ISSN: 1520-9210 * see complete article *	1,3,5,6, 8,11,12, 18,20, 21,27, 29,30, 32,34, 37-39, 41-43

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[X] Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
27 September 2002	07/10/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Geoghegan, C

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INTERNATIONAL SEARCH REPORT

Int ›nal Application No
PCT/US 01/42113

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,Y	WO 01 53994 A (FRISKIT) 26 July 2001 (2001-07-26) page 13, line 3 -page 60, line 30; figures	1,3,5,6, 8,11,12, 18,20, 21,27, 29,30, 32,34, 37-39, 41-43
A	WO 99 66746 A (NOKIA) 23 December 1999 (1999-12-23) page 4, line 7 -page 29, line 32; figures	1-43
P,X	US 2001/016880 A1 (CAI ET AL.) 23 August 2001 (2001-08-23) page 2, paragraph 35 -page 4, paragraph 62	1-4, 6-13, 20-22, 29,30, 32,34, 37,41-43
E	US 2001/049286 A1 (HANSMANN ET AL.) 6 December 2001 (2001-12-06) page 2, paragraph 27 -page 4, paragraph 54; figures	1-12,20, 21,29, 34,41-43
E	WO 01 86882 A (@HAND) 15 November 2001 (2001-11-15) page 8, line 2 -page 38, line 11; figures	1,6,11, 20,29, 34,41-43

1

RNSDOCID: <WO 0223857A3 I >

INTERNATIONAL SEARCH REPORT

Information on patent family members

In ional Application No
PCT/US 01/42113

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0153994 A	26-07-2001	US 6389467 B1	14-05-2002
		WO 0153994 A2	26-07-2001
		US 2002116476 A1	22-08-2002
		AU 3102301 A	31-07-2001
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		WO 9966746 A2	23-12-1999
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		US 2002033843 A1	21-03-2002
		US 2002116698 A1	22-08-2002

Form PCT/ISA/210 (patent family annex) (July 1992)

JAN 28 2005

IFW

Attorney Docket No.: 3399P103 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg, et al.

Serial No.: 10/600,746

Filing Date: 06/19/2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Not Yet Assigned

Group Art Unit: 2681

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Alexandria, VA 22313-1450

REQUEST FOR STATUS

Sir:

Applicant respectfully requests the current status for the above-referenced patent application. Applicant has timely filed all required documents. To date, Applicant has not received an Office Action.

In support of this Request for Status, attached please find a copy of the filing receipt received on December 11, 2003.

In view of the information presented, Applicant hereby respectfully requests the current status for the above-referenced application.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 01-24-2005

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10/600,746	06/19/2003	2681	880	3399P103	14	11	3

CONFIRMATION NO. 5994

UPDATED FILING RECEIPT

OC000000011448941

26529
BLAKELY SOKOLOFF TAYLOR & ZAFMAN/PDC
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025

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Applicant(s)

Rikard M. Kjellberg, Santa Cruz, CA;
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Tomas G. Lund, Menlo Park, CA;
William Chan, San Mateo, CA;
Ramakrishna Chinta, Sunnyvale, CA;
Xinbi Chen, Palo Alto, CA;

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LOS ANGELES

Domestic Priority data as claimed by applicant

This appln claims benefit of 60/393,024 06/28/2002
and claims benefit of 60/392,383 06/28/2002
and claims benefit of 60/393,041 06/28/2002
and claims benefit of 60/392,999 06/28/2002

Foreign Applications

If Required, Foreign Filing License Granted: 09/12/2003

Projected Publication Date: 03/18/2004

Non-Publication Request: No

Early Publication Request: No

ENTERED
DEC 12 2003
STATUS DB-LA

Title

Device capability based discovery, packaging and provisioning of content for wireless mobile devices

Preliminary Class

455

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application for:

Rikard M. Kjellberg

Serial No.: 10/600,746

Filing Date: 06/19/2003

For: DEVICE CAPABILITY BASED DISCOVERY, PACKAGING AND PROVISIONING OF CONTENT FOR WIRELESS MOBILE DEVICES

Examiner: Not Yet Assigned

Group Art Unit: 2681

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Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 together with copies of a European search report for related European patent application no. 03254137.7, dated August 17, 2004 and the documents cited in that report, except for copies not required to be submitted (e.g., copies of U.S. patents and U.S. published patent applications need not be enclosed). It is respectfully requested that the cited documents be considered and that the enclosed copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

USPTO NOV 22 2004 PATENT & TRADEMARK OFFICE

Complete if Known	
Application Number	10/600,746
Filing Date	06/19/2003
First Named Inventor:	Rikard M. Kjellberg
Art Unit	2681
Examiner Name	Not Yet Assigned
Attorney Docket Number	3399P103

Sheet	1	of	2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (If known)		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-	6,161,140	12-12-2000	Moriya	
		US-				
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FOREIGN PATENT DOCUMENTS

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		WO 02/27543 A2	04-04-2002	Volantis Systems Limited		
		EP 0 992 922 A2	04-12-2000	International Business Machines Corporation		

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Substitute for Form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	10/600,746
				Filing Date	06/19/2003
				First Named Inventor:	Rikard M. Kjellberg
				Art Unit	2681
				Examiner Name	Not Yet Assigned
Sheet	2	**of**	2	Attorney Docket Number	3399P103

NON PATENT LITERATURE DOCUMENTS

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		AUSTALLER, GERHARD, et al.: "Gulliver Beans: Generating Device Optimized and Individualized Content for WAP Applications", Proc. Workshop Information Design for Mobile Web Services, [Online] May 15, 2000, pages 1-7, XP-002266242.	
		ELLIPSUS SYSTEMS: "Ellipsus' Mobile Application Provisioning System", White Paper, [Online] September 23, 2001, pages 0-10, XP-002266188.	

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 April 2002 (04.04.2002)

PCT

(10) International Publication Number
WO 02/27543 A2

(51) International Patent Classification[7]: G06F 17/30

(21) International Application Number: PCT/GB01/04235

(22) International Filing Date:
24 September 2001 (24.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0023570.5 26 September 2000 (26.09.2000) GB

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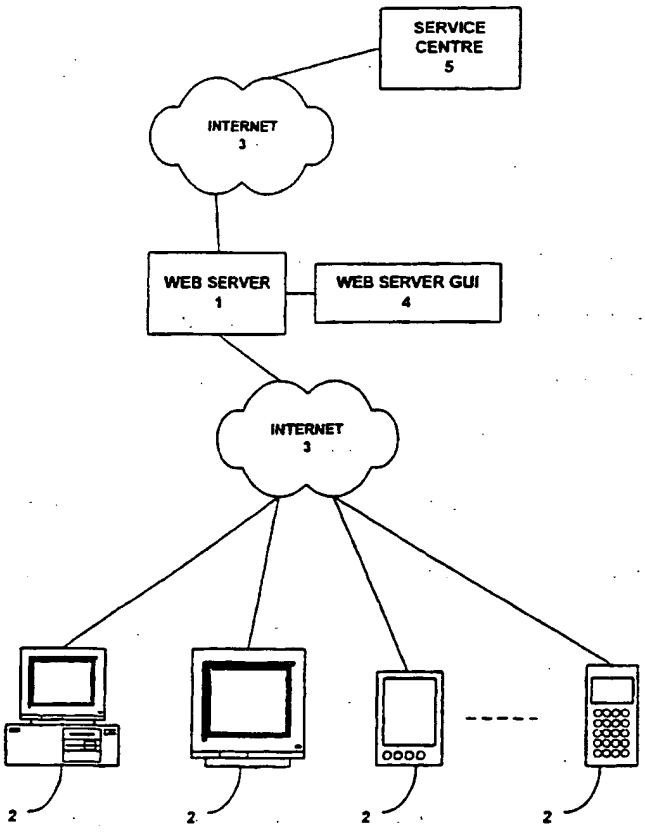
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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, 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

[Continued on next page]

(54) Title: WEB SERVER



(57) Abstract: A web server (1) responds to a request message from a remote user device (2) by dynamically generating web page code capable of being interpreted by the user device. A device type identifier (45) is extracted from the request message and is input to a code generating engine (25) which interprets stored instructions for generating the web page code with reference to selected device dependent information corresponding to the device type identifier. The web page information is stored as a content document comprising a set of instructions written in a script language. The web server generates web pages in an appropriate form for each user device without the need to convert web pages from one form to another.

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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*

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WEB SERVER

This invention relates to web servers and in particular but not exclusively to a web server for responding to request messages received via the internet from remote user devices and to a web server capable of responding with web page code tailored to meet the capabilities of the remote user device.

The use of the internet has recently flourished to the extent where almost every business concern has its own website to provide information and online purchasing facilities. The majority of such websites have in the past been accessed by remote user devices which are PCs (Personal Computers) using one of a relatively small number of available browser applications so that, by and large, the websites were required to output web page code in a single format for viewing at the user device.

More recently, there has been a proliferation in new internet enabled devices such as PDAs (Personal Digital Assistants), mobile telephones with WAP (Wireless Application Protocol) facilities, IDTV (Interactive Digital Television), information kiosks, games, consoles and home appliances. The capabilities of these devices vary considerably from device to device, both in their display function in terms of screen size and colour processing ability, bandwidth and available memory as well as variables associated with communication including

image format, communication protocol and markup language.

In order to enable users of these different devices to access their websites, many businesses have resorted to building separate web servers to serve each device type. This however creates data management problems where a customer may wish to have the option of using different devices to communicate with the merchant using the same account details for example, the merchant then requiring a proliferation of different web server applications to be managed and updated when required with new or additional material.

An alternative approach has been to provide a separate port of a website for access by an alternative type of user device, the separate port obtaining the required web page code by translating the original PC based web page code, typically in HyperText Markup Language (HTML) format, to other device formats such as Wireless Markup Language (WML) used for WAP telephones. Such solutions however generally have failed to deliver optimum presentation to the user of the device. The translating process (often referred to as "transcoding") is difficult to engineer. For example, it is necessary to provide appropriate selection of information which is to be omitted from display in the device having lower capabilities than the PC. This difficulty is compounded when it is necessary to update the original PC web page

code because the transcoding process must also be re-engineered.

It has also been proposed that the protocols used for accessing web page information over the internet should be unified by the adoption of standards in order to overcome problems resulting from remote user devices having different capabilities. The use of Extensible Markup Language (XML) as a format for web page code has been proposed. XML is a mark-up language for defining content and can be used with XSL (Extensible Stylesheets Language) used to transform XML documents with style sheets at the point of presentation. As yet however, such standards have not been adopted and this solution is not seen as optimum for all device types.

The present invention seeks to provide an improved web server with multi-channel capabilities able to serve different types of remote user device.

According to the present invention there is disclosed an apparatus for responding to a request message from a remote user device for web page information by generating web page code representative of one or more web pages to be displayed by the user device and outputting a response message comprising the web page code.

Preferably the apparatus comprises extracting means for extracting from the request message a device type

identifier identifying the remote user device as being one of a set of possible device types having different capabilities.

The apparatus preferably has a processor for operating a code generating engine to generate the web page code, first memory means for storing the web page information as a set of instructions, and second memory means for storing device dependent information for each of the different device types for tailoring the web page code to the capabilities of the device type.

The code generating engine preferably comprises interpreting means for interpreting the instructions with reference to selected device dependent information corresponding to the device type identifier, the code generating means thereby being operable to generate the web page code in a form in which the web page code is tailored to the capabilities of the remote user device.

Preferred embodiments of the present invention will now be described by way of example only and with reference to the accompanying drawings of which:

Figure 1 is a schematic overview of connection between a web server and remote user devices;

Figure 2A is a schematic diagram of the web server of Figure 1;

Figure 2B is a functional diagram for illustrating signal flow in the web server of Figure 2A;

Figure 3 is a schematic diagram of policy tables for use with the web server of Figure 2;

Figure 4 is a schematic diagram illustrating operation of the code generating engine;

Figure 5A illustrates a layout for a PC;

Figure 5B illustrates a layout for a television;

Figure 5C illustrates a layout for a PDA;

Figure 5D illustrates a layout for a WAP telephone;

Figure 5E illustrates layout for a device having a large screen;

Figure 5F illustrates the display of fragments in a device having a small screen;

Figure 5G illustrates a multi-menu structure in a large screen device;

Figure 5H illustrates the relationship between control segments and content segments in the layout of Figure 5G;

Figure 6 illustrates the hierarchy of a device policy table;

Figure 7 illustrates schematically the software provided to the web server;

Figure 8 illustrates schematically the hardware required by the web server;

Figure 9 illustrates schematically the separation of content code and presentation of information for use by the code generating engine;

Figure 10 illustrates schematically a system comprising a production server and a development server;

Figure 11 illustrates the exchange of signals in the system of Figure 10 when a new type of user device is encountered for the first time;

Figure 12 illustrates schematically a server having a cache memory;

Figure 13 is a flowchart illustrating the method of operation of a gateway server of Figure 12;

Figure 14 is a flowchart illustrating operation of a dynamic web page server of Figure 12;

Figure 15 is a schematic diagram illustrating a component logic software module;

Figure 16 is a flowchart illustrating operation of code generation using the component logic software module;

Figure 17 is a diagram illustrating the hierarchy of data objects which are different versions of data referenced by a single component name;

Figure 18 illustrates the hierarchy of text objects with different text code sizes and languages;

Figure 19 illustrates the signal flow in a web server in which pane dissection occurs;

Figure 20 is a flowchart illustrating pane dissection;

Figure 21 illustrates the dissection of a pane into

shards;

Figure 22 illustrates use of a user session memory during form filling;

Figure 23 illustrates the dissection of a pane used in form filling;

Figure 24 illustrates the function of the graphical user interface; and

Figure 25 is a flowchart illustrating a method of file storage.

Figure 1 illustrates a web server 1 connected to remote user devices 2 via the internet 3. The remote user devices are illustrated to be a PC, television, PDA, and a mobile telephone with WAP facility but can include any number of different devices with internet capability. The web server 1 is provided with a web server GUI (Graphical User Interface) 4 enabling an operator of the web server to author documents and generally control and maintain operation of the web server. The web server 1 is also connected via the internet 3 to a service centre 5 which acquires information concerning any new types of user device and provides the web server 1 with consequential software revision when required.

Figure 2A is a simplified schematic diagram of the web server 1 of Figure 1. The web server 1 includes a processor 20 which operates a code generating engine 21 in the form of an application which is run by the

processor on demand in order to generate web page code. The code generating engine 21 in this embodiment is written in the Java programming language and during operation of the web server exists in the working memory of the processor 20 in compiled form as byte codes and is implementable within a Java run time environment.

A memory 22 stores content code 23 which defines web page information in the form of documents written in a mark up language which in the present example is JSP1.1 (Java Server Pages). These documents are typically authored by the operator of the web server 1 using the graphical user interface 4. The memory 22 also stores operational data 24 which includes for example data which may need to be incorporated into web page code generated at run time in response to specific queries originating from the user device 2 and data acquired by monitoring usage of the web server. Data objects referenced by the content code 23 are stored in a database 19. These data objects may include files containing images or text and other forms of data objects which an author may wish to include in the web page code to be generated.

Device dependent information 25 is also stored in memory 22 and consists primarily of policy tables described below. The memory 22 also stores program code 26 which may be accessed by the processor 20 during operation of the server 1 or used to retrieve software

such as the code generating engine 21 at the time of startup. The program code 26 also includes code defining a set of tags used in a mark up language in which the documents are authored as described below.

An interface 27 communicates between a databus 28 serving the processor 20 and memory 22 and external connection to the internet 3 for receiving request messages and transmitting response messages.

A device identification engine 29 is provided for extracting from received messages a device type identifier for identifying the remote user device 2 by type. The device identification engine 29 in the present example is implemented in software by the processor 20. In this example, a request message received via the internet contains a HyperText Transfer Protocol (HTTP) header which includes an ID string declaring the name of the user agent which the originating device has used when generating the request message. The name of the user agent software defines for example the browser version and markup language capability of the device and is used by the device identification engine 29 to identify the originating device using the device type identifier which may for example be stored as a lookup table.

The HTTP header may also yield information contained in a cookie regarding details of the user who has originated the request message. Such cookies may contain

other data used for personalisation of the response made by the web server 1.

Figure 2B is a further illustration of the web server 1 showing functional elements in a manner which illustrates the signal flow. A front end processor 300 provides a communications interface for request messages received from the internet 3 and response messages transmitted to the user device 2 via the internet. The front end processor 300 sends URL information 301 to a web application processor 302 which determines from the URL the appropriate information to be included in a web page requested by the user. The web application processor 302 has access to a database 303 which may be local to the processor or may be at a remote location which is accessible via an appropriate communications link.

The web application processor 302 outputs a document 304 comprising instructions for generating web page code. The document 304 is not itself capable of being interpreted by a browser of a user device and therefore does not constitute "web page code" for the purpose of the present description.

The document 304 is input to the code generating engine 21 which generates web page code with reference to content data structure 305 and the set of policy tables 40. The output of the code generating engine is

a web page code document 306 which is now in a form which is capable of being interpreted by the browser of the user device 2. The web page code document 306 is received by the front end processor 300 and packaged as a response message transmitted via the internet 3 through the user device 2.

To enable the code generating engine 21 to select the appropriate data from the content data structure 305 and to access the appropriate policy tables 40, it also requires the input of a device type identifier 45 which is provided by device identification engine 29 in response to receiving a message header signal 307 from the front end processor 300, this signal comprising information extracted from the message header of the request message received from the user device.

Figure 3 illustrates schematically the policy tables 40 which constitute the device dependent information 25 of Figure 2A.

In the present context, the term "policy" is used to signify information to be utilised by the code generating engine 21 and which can be defined differently for different device types, either out of necessity because of different technical capabilities of different device types or as a result of choice exercised by the author of the content code 23.

The policy tables 40 include a device policy table

30 which contains a number of fields relating to different technical aspects of the device type. By way of example, table 1 below lists a small number of device policies that can be associated with the device type and which each correspond to one field (i.e. row) of the table. Values are illustrated for a single device type (i.e. a single column). The device policy table 30 in practice will include a large number of different fields and values for multiple device types using a hierarchical table structure to represent the table in compact form.

TABLE 1 - Part of Device Policy Table

POLICY	VALUES
Supports GIF format images	true/false
Supports JPEG format images	true/false
Supports MP3 format audio	true/false
Supports WAV format audio	true/false
Can report global position (GPS)	true/false

By accessing the device policy table 30, the code generating engine 21 thereby is able to exercise decision making regarding choice of code generation to suit the technical capabilities of the user device 2. For example, if an image is to be included as an image file in the web page code, it is necessary for the code generating engine 21 to have knowledge of the form of

image data compression available to the user device 2 from which the request message originated. The device policy table 30 includes fields indicating whether GIF or JPEG format images can be decompressed by the device. Similarly, audio files may be compressed in a number of different forms including MP3 format and the device policy table 30 also includes a field indicating whether the device supports MP3.

The protocol policy table 31 is responsible for mapping equivalences between device output protocols, which are generally termed markup languages. Examples are WML, HTML, Handheld Device Markup Language (HDML) and compact HTML (cHTML). Table 2 is an example of six of the fields in the protocol policy table 31 for a single one of the device types.

TABLE 2 - Part of Protocol Policy Table

PROTOCOL	ELEMENT
HTML Version 4.0	<thead>
HTML Version 3.2	<thead>
HTML i-Mode	*no equivalent*
XHTML Basic	<thead>
WML Version 1.1	<thead>
HDML Version 3	*no equivalent*

A style policy table 32 contains a number of fields which define parameters such as font family, font size, font weight and colour of headings, image borders and paragraph background as illustrated in Table 3 which shows part of the style policy table for a single one of the device types. The code generating engine 21 is thereby able to generate code appropriate to the device type, in accordance with a predetermined decision which may for example reflect an agreed style adopted as a general trading style by a particular business entity.

The way in which stylistic information is handled varies between different devices, and indeed between different device output protocols. For some, style information must be included within the generated web page code. For others, style information must be provided in separately generated code, often called a "style sheet".

TABLE 3 - Part of Style Policy Table

POLICY	VALUES
Heading 1 font family	name of a font family, e.g. Times
Heading 1 font size	font size, e.g. 20
Heading 1 font weight	font weight, e.g. bold
Heading 1 colour	colour
Image border colour	colour for the border of images
Paragraph background colour	colour for the background of paragraphs

A themes policy table 33 similarly contains fields relating to decorative embellishments and logos adopted by business entities for their web pages and enables the author of the themes policy to tailor the decorative features and aspects of logo such as size for each of the device types.

A layouts policy table 35 contains fields relating to the layout of elements comprising text, logos, images etc at the point of rendering the image in the user device in order to take account for example of different screen shape and size for different device types.

A dynamic policy table 36 contains fields allowing code for different device types to be tailored according to time varying parameters. As an example, a mobile telephone having WAP facilities may have a bandwidth for

receiving response messages which varies with time according of the strength of signal available via the cellular mobile telephone network used by the telephone to connect to the internet. The dynamic policy may be configured to generate code requiring low bandwidth under low bandwidth conditions and higher bandwidth under better conditions. The amount of image data for example may be regulated in order to control the bandwidth required to carry the response message. Simply by omitting a logo or other image, the speed with which the response message can be downloaded to the device can be maintained under poor signal strength conditions.

A component policy table 37 is also provided the purpose of which is to determine selection of data objects as described below.

Figure 4 illustrates schematically the manner in which the code generating engine 21 makes use of the data in the policy tables 40. At startup, the processor 20 retrieves a startup program from the stored program code 26 and runs the startup program to assimilate the information in the policy tables 40 into a series of Java objects (Java beans) referred to herein as policy objects 41 which are then made available within a run time environment 46 of the code generating engine 21. The run time environment is provided by an appropriate Java Virtual Machine. The policy objects 41 each deal with

specific aspects of code generation and contain logic and data objects configured such that each policy object has knowledge of all of the relevant information available from the policy tables 40 for each device type. One policy object 41 for example may be concerned with image format capability whereas another policy object may be concerned with choice of markup language for the output code. The code generating engine 21 at run time processes a compiled version of a document of the content code 23, the code consisting of a series of instructions 42, each instruction including one of a set of markup tags 43.

In Figure 4, tag 43 is illustrated as being one of a number of custom or smart tags which, as represented schematically in Figure 4, refers when processed to a set of classes 44 which have been written to carry out the required function of the tags. These classes 44 in turn refer to one or more of the policy objects 41 whenever a program decision is to be taken which is dependent upon the device type on the basis of data contained in the policy tables 40.

Examples of custom tags 43 provided in accordance with the present embodiment are summarised in tables 4 and 5. All of the tags utilised in defining the content code 23 are device aware in the sense that they are implemented as JSP custom tags and are associated with

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Java classes which access Java beans (policy objects 41) to make device dependent decisions. The more primitive tags are referred to here as simple in-line tags as shown in Table 4. More complex tags are referred to as major block tags in Table 5. The major tags typically translate into more than one tag in the markup language of the resulting generated code, for example HTML.

TABLE 4

Simple In-Line Tags	
cite	Causes text to be displayed as a citation
code	Formats text suitable for illustrating code samples
em	Causes text to be displayed emphasized
hr	Displays a horizontal rule

TABLE 5

Major Block Tags	
anchor	Link to another canvas, page or section
canvas	Define the layout and theme to be applied to this canvas
h1 to h6	Define headings at 6 different levels
form	Define an input form
textinput (part of form)	Define a text input field for a form
select (part of form)	Define a selection field for a form
option (part of form)	Define an option within a selection field for a form
image	Define an image
logo	Define a logo
menu	Define a menu
menuitem (part of menu)	Define one item within a menu
shopcart	A basic shopping cart
table	Define a table

The device identification engine 29 operated by processor 20 extracts from a header of the received request message from a remote user device 2 information which identifies the device type and outputs a device type identifier 45 which is input to the code generating engine 21 to enable the set of classes 44 to extract the required information from the policy objects 41.

An example of a document is given at Appendix 1 and comprises a set of instructions 42 including tags 43 to constitute the content code 23 in the markup language

operated upon by the code generating engine 21. At line 2 for example, the tag <vt:canvas> is used in defining the theme and layout for the web page to be created. Between the opening and closing canvas tags (occurring at the second line and last line) is a list of components which are also implemented using custom tags 43. The components reference panes in the layout, the term "pane" being used to signify one of a series of (generally) rectangular regions into which a display screen is to be divided when the web page is presented to the user on the user device 2. A collection of panes and their relative positions defines the layout for the page. The components can be used to define where in the rendered page a given component's output will appear, or alternatively to determine whether or not a given component is to be rendered when the web page is displayed for example on a user device having limited screen size. In this way, layouts can be used to limit the amount of information which appears on the display screen of certain device types.

Figure 5A for example illustrates a typical layout of panes 50 for display on a PC and including panes which respectively include a logo, a large colour logo, a site menu, a greeting, first, second and third promotions, and a news ticker providing continuous news information.

The layout corresponding to the same content document when generated for display on a television screen is shown in Figure 5B and consists of a reduced number of panes containing respectively a large colour logo, a greeting, a promotions menu, a site menu and a picture.

Figure 5C illustrates the corresponding rendered screen resulting from code generated based on the same content document when tailored for a PDA. The number of panes is considerably reduced during code generation to meet the limited capabilities of the PDA and includes panes which respectively contain a medium sized black and white logo, a greeting, a promotions menu and a site menu.

Figure 5D illustrates the layout resulting from code generation based on the same document when tailored to a WAP telephone. Instead of a single web page, the content is reduced to a set of fragments, often called decks, each comprising a single pane accessible via a menu deck 50, the set of decks further including single pane decks 51, 52 and 53 for promotions 1, 2 and 3 respectively. "Deck" is a term used in the WAP standards to indicate the units in which information is transmitted to the wireless device.

Appendix 2 illustrates the web page code generated

using the content code of Appendix 1 where the device type corresponds to a PC having a browser using the HTML protocol.

Appendix 3 illustrates the corresponding code generated when output to a device type corresponding to a telephone with WAP capabilities using WML protocol. Appendix 3 contains only one deck of a set of decks contained in the generated code, the user being required to select successive decks in order to view in turn a number of successive displays of the web page information. The fragmentation of the response message code into decks is illustrated in Figure 5D for example.

Appendix 4 illustrates a further deck resulting from the WML code for the WAP telephone, this time the deck corresponding to the menu deck 50 of Figure 5D in that it contains a list of stories which can be viewed in successive decks by the user.

Appendix 5 illustrates the deck created for one of the stories.

In the above example, the code generating engine 21 is capable of processing the same content code 23 to produce radically different web page code output corresponding to different device types. The first device type results in the code of Appendix 2 and the second device type which has lower capabilities results

in the code of Appendices 3, 4 and 5.

Figures 5E and 5F illustrate the manner in which the provision of different layout definitions for two different remote user devices 2 enables the entire content of a web page to be delivered to devices with dissimilar capabilities.

In Figure 5E, the layout for a device having a large screen has the effect of displaying the entire content in a single screen, portions of the content being contained in respective panes A, B, C, D, E and F. When formatted for the device with a small screen, only one of the panes A, B, C, D, E and F is displayed at any given time, the content thereby being fragmented into fragments A, B, C, D, E and F as illustrated in Figure 5F. Fragment A is designated as a root fragment via which the remaining fragments may be accessed using a menu.

For the device with small screen capability, the fragment may need to be re-shaped or the content presented differently so that it may for example be necessary for the user to scroll through text to see the entire contents of a given fragment containing text.

A multi-menu structure may alternatively be utilised as illustrated in Figures 5G and 5H. Instead of defining the layout in terms of panes, the layout is defined in

terms of a series of segments defining areas of the display and designated as either control segments or content segments. In Figure 5G, a control segment 55 contains a menu bar 56 composes of a series of icons which can be user selected.

A content segment 57 defines a further area of the display and itself contains a further content segment 58. Content segment 57 also contains a further control segment 59 which contains a second menu bar 510.

In this example, selection using the first menu bar 56 calls for display within control segment 59 of a selected one of a set of second menu bars 510 as illustrated in Figure 5H. Each of the second menu bars 510 allows selection from a respective set of content items 511.

The example of Figures 5G and 5H illustrates an alternative method of page description in which a montage tag defines page layout in terms of a series of segments which may be content segments or control segments. As shown in this example, it is possible for a content segment to contain further segments including both control and content segments.

Figure 5G corresponds to the web page viewed on a large screen device. When translated to a small screen device, the user might for example see only one segment

at any time, initially viewing the first control segment 55 to allow selection of one of the second menu bars 510, and subsequent selection of one of the content items 511.

The resulting layout of Figure 5G can be implemented using the inline frames feature of HTML.

The above examples of Figures 5A to 5H take two extremes of display capabilities of user devices. For devices of intermediate capabilities, alternative layouts showing perhaps two or three segments or panes may be appropriate. It may also be appropriate to modify the content within each pane or segment according to the capabilities of the device. For example, a PC is generally capable of a higher standard of image presentation including colour and moving images whereas a WAP phone may not have colour facility and may have limited screen resolution and refresh rate. This requires that for each pane or segment the content must be stored in a number of different forms appropriate to different devices.

The policy tables 40 are each arranged to have a hierarchical structure such as the structure illustrated for example in Figure 6 which shows the hierarchy of the device policy table 30. Characteristics of a notional root device type define an upper level 61 of the hierarchy. This root type may be regarded as

representing default values for the device policy table 30. A second layer 62 defines device types which differ from the root device type in a number of features. The device policy table will therefore include entries (columns) for those fields in which the parameters describing the root device type are not inherited. The third layer 63 of the hierarchy includes sub-divisions of the general device types of the first layer, for example a number of different PDA device types are illustrated. Each of these device types will inherit many of the parameters describing the capabilities of the PDA in the first layer but will differ in a number of respects, thereby requiring entries in respective columns of the device policy table for those fields which contain parameters not inherited.

Subsequent layers 64 and 65 of the hierarchy define further sub-divisions of device type.

The device identifier 45 will identify a node in this hierarchical tree and the complete set of attributes relevant to the device type may then be acquired by traversing the tree defined by the hierarchy structure from the node through successive layers to the root device type defined in the upper layer 61, acquiring further inherited attributes at each layer.

An advantage of organising each of the policy tables

40 in such a hierarchical structure is that, when it is required to expand the policy tables 40 to include data for an additional device type, this can be achieved by inserting a new node to the hierarchical tree structure and connecting the new node with a branch from a parent node in an adjacent upper layer. The parent node is selected to be the node from which the device type inherits the most complete set of attributes.

If for example a mobile telephone is already represented in the policy tables 40 and a new model of the mobile telephone becomes available, any change in the capabilities of the new model which require changes to policy can be represented by a minimal amount of data, corresponding to a new entry in each policy table containing values only in those fields for which attributes are not inherited from the existing model of mobile telephone represented by an existing node in the hierarchy.

Information for updating the policy tables 40 to include additional device types may be provided by the service centre 5 shown in Figure 1 and transmitted to the web server 1 for example over the internet 3. The device dependent information 25 including the policy tables 40 may then be updated by operation of data manager 190, a software module of the web server 1 represented

schematically in Figure 2. Generally this procedure may be undertaken during normal operation of the web server 1 and operation of the code generating engine 21. In response to the policy tables 40 being updated, the policy objects 41 automatically update themselves while managing their current use in the operating environment 46 of the code generating engine 21. This activity is regulated so as not to disrupt any web page code currently being generated by the code generating engine 21.

Figure 7 illustrates an example of software provided to the web server in a preferred embodiment. The software includes the set of policy tables 40 and a set of tags 70, including both tag definitions which provide the necessary information to enable authoring of content and code for implementing the tags i.e. the program code which runs when each tag is used in the operating environment of the code generating engine 21.

The code generating engine 21 and device identification engine 29 are among the items provided to the web server. Also provided is a reporting engine 71. The reporting engine is operated by the processor 20 to perform tasks such as measuring usage of the web site. This information may be used to demonstrate, for example, for the purpose of advertising, the extent to which the

site is used and also to enable personalised marketing to be targeted to users of the site. As an example, a database of users may be utilised to tailor a response to a request message from a particular user such that a response message includes an additional page containing a special offer on a product registered as being of interest to a particular user.

The software further includes an integration engine 72 for communicating with routine activities such as invoicing and purchase ordering that can arise in response to use of the website by users of the remote user devices 2.

The software further includes an operations manager 73 for managing the overall system to control operation, to allow errors to be detected and to allow resources to be controlled accordingly.

Also provided is a program 74 for the creation of the policy objects at startup as described above with reference to Figure 4.

The device identification engine 29 is also provided, as described above.

Also, a web application 75 processes the received URL request to identify the requested web page and select the appropriate document of content code 23 for import to the code generating engine 21.

Figure 8 illustrates schematically a typical hardware required for implementing the present invention in a small to moderate sized web server. A personal computer 80 having facilities for receiving programs such as those summarised in Figure 7 from a portable storage medium 81 is connected via a firewall 82 to a router 83. The router 83 is connected via a high bandwidth leased line 84 to an internet service provider 85 for connection with the internet 3.

Programs and data required for operating the web server 1 may be communicated from the service centre 5 in the form of the portable storage medium 81 or alternatively as signals 86 communicated via a network such as the internet 3.

As illustrated schematically in Figure 9, the above described web server and software configuration allows content code 23 to be stored separately from presentation information 90 so that, when a request message 91 is received by the system, the code generating engine 21 is able to generate dynamically a response message 92 containing newly generated web page code representing the combination of content code and presentation information. A particular advantage of this arrangement is that it is relatively easy to alter presentation information such as style, and themes including logos for example, simply

by updating the presentation information 90. Major re-engineering of the authored code is thereby avoided. Separate storage may involve location in separate files on the same hard disk or in physically separate memory devices.

To update the presentation information 90, it may simply be necessary to change data contained in the style policy table 32, the themes policy table 33 or the layouts policy table 35.

Figure 10 illustrates schematically a preferred embodiment in which the web server 1 is adapted to operate in a business environment for a medium to large scale business. The web server 1 comprises a production server 100 responsible for the production of web page information in response to request messages from remote user devices 2 and the outputting of response messages comprising the web page code. As such, the production server 100 performs the functions described above as being performed by the web server 1 of preceding figures. Here the web server 1 also comprises a development server 101 which is responsible for interaction between the web server and the service centre 5 and for periodically updating the production server 100 with new software.

Each of the production server 100 and development server 101 comprises a respective processor cluster with

substantially greater computing power than the personal computer 80 described above.

The development server 101 may be regarded as a series of processors performing development and staging processes enabling several levels of tests to be applied to new software before downloading the new software to the production server 100.

It is necessary for the software operated by the production server 100 to be updated periodically to take account of the evolution of new types of remote user device 2 and also to incorporate new content to be delivered as web pages.

As represented in Figure 10, the service centre 5 maintains a central reference database 102 from which data such as updated policy tables is periodically communicated to the development server 101. This communication of data occurs using the Internet 3, an XML syntax being used to structure data transmitted using HTTP protocol. As illustrated in Figure 10, the development server 101 periodically requests an update of the policy tables 40 by outputting a request message 103 and receives the requested data in a response message 104.

The development server 101 on receiving a response message 104 is used to conduct tests on the new data and

may be used to make local adjustments for example to add appropriate new layouts.

After testing and modification, new policy tables are communicated from the development server 101 to the production server 100 via appropriate firewalls.

When updating databases in the production and development servers it is not generally necessary to transmit the entire contents of the database, instead relying upon editing commands constituting the transmitted data in HTTP protocol accompanied by metadata in the XML syntax.

Also illustrated in Figure 10 is a probe site 105, the function of which will be described below, and which represents a server accessible via the Internet 3 and having a URL. The physical location of the probe site 105 is shown in the present example to be separate from the location of the web server 1.

Figure 11 illustrates schematically the manner in which the production server 100, probe site 105 and service centre 5 interact in response to an encounter for the first time with a remote user device 2 of a new type. The new type of device 2 may for example be the latest version of a mobile telephone using WAP and including features which are upgraded with respect to those of previous models by a given manufacturer, having for

example different display capabilities such as an increased size and the ability to display colour images.

The user of the new device 2 wishing to access the web site provided by the web server 1 actuates browser software within the device to generate a request message 110 which is output via the Internet 3 to the URL of the production server 100.

The production server 100 receives the request message 110 and inputs the message to the device identification engine 29 shown in Figure 2 in an attempt to extract a device type identifier from the ID string contained in the HTTP header of the request message. The device identification engine 29 however determines that the request message 110 contains an unknown identification stream. The production server 100 however needs a device type identifier to enable the appropriate policy tables to be accessed, the device ID 45 being an essential input to the code generating engine 21 as illustrated in Figure 4.

The production server 100 responds to this determination by the device identification engine 29 by generating a redirect message 111 which is transmitted to the new device 2 and causes the device to redirect the request message 110 to the URL of the probe site 105. In consequence, a new request message 112 is output by

the device 2 and transmitted to the probe site 105.

The probe site 105 analyses the identification string contained in the request message 112 and is able to extract some basic information as to the communication protocols and capabilities of the device 2. This limited information is sufficient to enable the probe site 105 to generate a probe 113 in the form of an agent which can be processed by the browser of the device 2 and constitutes software which can be run by the processor of the device.

The probe 113 is transmitted to the device 2 in a further message 114 and on receiving this message the browser of the device displays a standard response web page to the user while processing the probe in background.

The probe 113 causes the device 2 to generate a further request message 115 which is addressed to the probe site 105 and which contains more detailed information of the capabilities and protocols associated with the device 2, in accordance with the information requested by the probe.

The probe site 105 responds with a further redirect message 116 which is transmitted to the device 2 and instructs the device to redirect the request message 110 to the production server 100. The device 2 follows this

redirection and outputs a further request message 117.

At the same time as outputting the redirect message 116, the probe site 105 sends a notification message 118 to the service centre 5 to inform the service centre of the existence of the new device 2 and to pass on the information retrieved in message 115 by the use of the probe 113.

The service centre 5 stores the received information for later use and processes the information to generate a temporary update message 119 which is transmitted to the production server 100 and contains a device identifier to enable the code generating engine 21 to generate the web page code as requested by the user of the device 2. The web page code is then transmitted to the user in a final response message 120.

The temporary update message 119 generated by the service centre 5 provides the production server 100 with the nearest appropriate existing device type identifier. Consequently, the web page code generated may not be perfectly suited to the new device 2 but will generally be capable of being interpreted and displayed by the device, for example using default settings of the browser.

The service centre 5 is then required to update the central reference database 102 with appropriate

information including revised policy tables. This information may then be included in the next update communicated to the development server 101 for ultimately being used to update the database of the production server 100.

In this way, the above system is capable of continually reacting and adjusting to the evolution of new devices accessing web sites via the Internet, without necessarily being provided with advance notice by the manufacturers of the new devices or the direct provision by them of detailed technical data. Optionally, the service centre 5 may request such data by contacting the manufacturer, but this need not be obligatory to obtain satisfactory operation.

Figure 12 illustrates an embodiment in which the web server 1 is provided with a cache memory 120. A gateway server 121 acts as a gateway interfacing with the internet 3 to receive request messages from remote user devices 2 and to respond by sending the requested web page code 122 either by requesting the dynamic generation of the web page code from a dynamic word page server 123 or, if the requested web page code already exists as a static web page in the cache memory 120, retrieving the web page code from cache memory.

The dynamic web page server 123 functions to

dynamically generate the web page code in the manner described above using the device type identifier 45 extracted from the received URL request and the stored content code 23 corresponding to the URL.

Figure 13 illustrates schematically the steps carried out by the processor of the gateway server 121. At step 130, the gateway server receives the URL request and extracts the device type ID 45 and identifies the document of the content code 23 which contains the instructions necessary for generating the required web page code.

At step 131, the gateway server 121 queries whether the web page code already exists as a static web page in the cache memory 120 for this device type ID and URL and, if available, retrieves at step 132 the web page code.

If not available from cache memory 120, the gateway server 121 requests at step 133 from the dynamic web page server 123 the generation of the web page code and transmits the device type ID and URL details.

Accordingly, at step 134 the gateway server 121 receives the newly generated web page code.

At step 135, the gateway server 121 outputs the web page code to the remote user device 2 via the internet 3.

Figure 14 illustrates schematically the steps

performed under the control of the processor of the dynamic web page server. At step 140, the dynamic web page server receives the request for generation of the web page code and also receives the device type identifier information and information derived from the URL required to identify the document of content code 23. The required content code 23 is retrieved from memory and is processed in the run time environment 46 of the code generating engine 21 to produce the required web page code at step 142.

At step 143, the dynamic web page server 123 determines from the content code 23 whether the resulting web page code is flagged as being suitable for being stored in cache memory 120 and, if so, determines from the content code the period for which the cache memory version is to remain valid. This information at step 144 is used to create metadata which is added to the file containing the web page code and which at step 145 is output to the cache memory 120 to be stored for the validity period.

At step 146, the dynamic web page server 123 outputs the web page code to the gateway server 121 to be received at step 134 as described above.

When authoring the content code 23, the author therefore has the option of adding extra attributes to

canvas tags to define whether or not the resulting page can be cached and how long it can remain valid in cache memory. The cache memory 120 writes new cached pages into memory in the manner which overrides any stored pages for which the validity has expired.

In Figure 12, a set of pages of content code 23 is represented schematically together with respective cache memory control data 124 for each page, the control data being set by the author of the page to determine the above instructions for caching in memory 120.

The generation of code by the code generating engine 21 has been described above with reference for example to appendix 1 which shows instructions used for creating content code 23 for generating an example web page. Typically, as in this example, the execution of the content code 23 by the code generating engine 21 will require content to be retrieved from date storage. Data objects such as image files are therefore imported for inclusion in the web page code which is to be output by the code generating engine 21.

The author of the web page may author a component to refer by name to a data object to be imported. Different versions of the data object are stored in a data structure which is hierarchical and such that different hierarchical levels correspond to different

capabilities of remote user devices 2. The author of the content code 23 may define for each object the appropriate version to be utilised for each device type ID 45 by entering data in a in component policy table 37 as illustrated in Figure 3. The component policy table may then follow the hierarchy of Figure 6A to enable the data object version to be defined for each possible device type ID. This approach is referred to hereafter as defining data objects in terms of targeted content since it is the author of the code which targets the particular version of the data object to be used for each remote user device 2.

Alternatively, a number of versions of data object may be provided in a hierarchy with characteristics of each version of the data object being described in associated metadata for each version. Automatic selection of the appropriate version may then be made using a component logic software module 150 as illustrated schematically in Figure 15.

The component logic software module 150 selects the appropriate version on the basis of the data object metadata, layout considerations defined by the layout policy table 35 and information about the device provided by the device policy table 30. This approach to selection of the data object version will be referred

to below as untargeted content selection.

The code generating engine 21 may operate using either one of targeted content or untargeted content selection. Alternatively and preferably, the code generating engine 21 is capable of selectively making use of both targeted content and untargeted content selection, thereby providing the author with the freedom when authoring the content code 23 to either define data object versions or leave selection to be automatically processed using the component logic software module 150.

Figure 16 illustrates schematically the manner in which both targeted and untargeted content may be utilised. At step 160, content code 23 is input to the code generating engine 21 together with the device type ID 45 and at step 161 the processing of the code is started.

At each instance of a component of the content code 23 requiring a data object to be imported, the code generating engine 21 attempts at step 162 to import an author defined version of the data object. If it is determined at step 163 that such an author defined version exists and it is successfully imported, processing continues, determining at step 164 whether any further data objects remain to be imported.

If however at step 163 it is not possible to successfully import any author defined version, processing continues with step 165 which requires operation of the component logic software module to identify the appropriate object version. At step 165 the selected data object version is then imported and the code generating process continues. When it is determined at step 164 that no further data objects are to be imported, the remaining processing to generate the web page code is completed at step 167 and at step 168 the completed web page code is output.

Figure 17 illustrates schematically the manner in which data objects stored in the database 19 are stored in a hierarchical data structure to allow the component logic software module 150 to automatically select the appropriate data object version.

If for example the author designs a web page in which a video clip is to be displayed at a defined area of the screen of a user device in the form of a personal computer, the video clip is stored in the database 19 as a video data object 170 and an associated component name 171 is devised to enable the code generating engine 21 to reference the video data object 170 by name. The video data object 170 is characterised by metadata 172 stored in association with the data object and contains

data fields sufficient for the component logic software module 150 to make a determination as to whether a given user device 2 as defined by device type identifier 45 is capable of receiving and displaying the video clip from the data object.

The author may also store, as shown in Figure 17, different versions of the video data object suitable for use by different device types, each accompanied by respective metadata.

The author also stores in the database a photographic image data object 173 with associated metadata 174. Similarly, the author may store a set of related photographic image data objects 173 having attributes appropriate to different device types and accompanied by respective metadata. If the component logic software module 150 determines from the metadata 172 that none of the video data objects can be displayed by a user device for which the web page code is currently being prepared, the photographic image represents a fall back position enabling a static photographic image to be rendered in place of the video clip. The photographic image will therefore generally display related subject matter and may for example comprise a still taken from the video clip.

The author may also enter into the database a graphic image data object 175 with associated metadata 176. Similarly, the author may enter a set of related graphic image data objects with respective metadata, suited to different device types. The graphic image constitutes a further fall back position for use if an appropriate version of photographic image is not available.

The author may also enter additional fall back positions such as simple text objects 177 with associated metadata 178. The text data object 177 represents a final fall back for situations where the component logic software module 150 determines that even the graphic image 175 cannot be rendered by the user device 2.

The data objects 170, 173, 175 and 177 are stored in the database 19 in a hierarchical data structure as illustrated schematically in Figure 17 in which different levels of the hierarchy correspond to levels of user device capability. The text data object 177 is in this example a root level of the hierarchy representing the lowest level of capability of the user device 2 and therefore representing the ultimate fall back position.

If for example the user device 2 is identified by device type identifier 45 as being a personal computer, the component logic software module 150 will select data

object 170. If the user device 2 is identified as being a pocket PC without the ability to render video clips, but having the ability to render photographic images, the component logic software module 150 will select data object 173. If the user device 2 is identified as being a mobile telephone with WAP facilities, the module 150 will select the graphic image data object 175. If however the user device 2 is identified as being a conventional mobile telephone without WAP facilities then text data object 177 will be selected.

The hierarchical data structure applies to other types of data object to enable appropriate data objects to be selected, as for example in the case of the web page code defining a link of some sort. The link may comprise an HTML link, a WML link, an email link or simply a telephone number for autodialled connection in the case of the user device 2 being a mobile telephone.

A further example of data objects which can be accessed using the same component name is that of script components such as JavaScript and WML Script where the same content may be written in the appropriate script for use in different devices. The author may therefore write data objects in the variety of required script languages for storage in the hierarchical structure of Figure 17 and retrieval in response to component name. As in the

previous examples, selection may be made on the basis of the metadata accompanying each data object on the basis of the capabilities of the remote user device 2, as determined by using the device ID 45 with reference to the device policy table.

The use of the above hierarchical data structures provides an efficient method of asset management for the system where the assets comprise the collection of data objects which are capable of being delivered in web page code form by the system.

Figure 18 illustrates the manner in which data in the form of text may be stored in a hierarchical data structure to enable different versions of the text to be retrieved to suit the capabilities of the user device 2 and the preferences of the user. The full text in English of a document object is stored in box GB TEXT 1, suitable for example for display on the screen of a PC. A reduced version of the text which has been edited by the author is stored as data object GB TEXT 2, suitable for display on a palm held computer of reduced screen size. A smaller still version of edited text is stored in data object GB TEXT 3, suitable for display in a hand held device of limited memory and finally GB TEXT 4 contains a minimal text version for display in a mobile telephone.

BNSDOCID: <WO_____0227543A2_I_>

Each of these text versions are in the English language. Corresponding text objects in the French language are contained in FR TEXT 1, FR TEXT 2, FR TEXT 3 and FR TEXT 4. Similarly, data objects containing text in the German language are contained in DE TEXT 1, DE TEXT 2, DE TEXT 3 and DE TEXT 4.

The data objects are addressed by component name 171 and a language identifier 180 which in this example indicates whether the English, French or German text version is required.

The language identifier is input to the code generating engine in addition to the device ID 45 and typically is extracted from the body of the request message generated by the browser of the remote user device 2 in response to input of a user preference by the user. Each of the text data objects such as GB TEXT 1 has associated metadata 181 indicating the relevant parameters of the object, including in particular the size of code representing the text. A decision may thereby be made on the basis of the size of the code indicated by the metadata 181 as to whether a given object is appropriate for retrieval for a given remote user terminal. The optimum data object may thereby be selected by traversing the hierarchical tree structure of Figure 18 until the appropriate data object is

located.

Figure 19 illustrates a further embodiment in which a pane dissector 190 is provided to modify the output produced by the code generating engine 21. Such an arrangement is advantageous in preventing the transmission of a response message containing an amount of code which is greater than the available memory capacity of the remote user device 2. For small memory devices such as mobile telephones, overloading the available capacity can cause the microprocessor of the device to crash or enter a lock situation. Although the author of the content to be provided in response to queries from such devices may take note of the limited memory capacity of the device, it is in practice difficult to predict with certainty the actual amount of code which will be output from the code generating engine 21 so that a solution is to additionally place a device such as the pane dissector 190 downstream of the code generating engine 21 to trap the outgoing code and measure the code amount.

If the code amount exceeds the indicated available data capacity of the user device 2, the dissector 190 is arranged to automatically divide or dissect the document into a number of fragments, referred to herein as shards.

As illustrated in Figure 19, the pane dissector 190

receives the device type identifier 45 from the device identification engine 29 and addresses the device policy table in order to determine from the device type identifier the available memory capacity of the user device 2.

If division of the pane is appropriate, a first one of the resulting shards is output by front end processor 190 and the remaining shards are stored in a buffer memory 191. The front end processor 190 may then respond to subsequent requests from the user device 2 by supplying in turn the remaining shards in respective response messages.

Figure 20 illustrates schematically the process of dissecting a pane, the term pane in this context being used to indicate a web page intended to be transmitted to a remote user device 2.

At step 200, the code representing the pane is generated by the code generating engine 21, based on the device type identifier 45 and the nature of the request message received via the internet 3.

At step 201, the code output from the code generating engine 21 is received and measured by the pane dissector 190 and at step 202 the pane dissector accesses the device policy table to look up the data capacity of the remote user device 2.

At step 203, the pane dissector 190 determines whether or not the amount of code is equal to or less than the data capacity of the remote user terminal 2 and, if so, at step 204 outputs the code without performing any dissecting step.

If however the amount of code is greater than the available data capacity, the dissector at step 205 dissects the code into a number of shards, each shard having an amount of code less than the available data capacity. At step 206 the shards of the divided pane are stored in buffer memory 191. At step 207 one of the shards is output to the server for inclusion in a response message to the remote user device 2.

Figure 21 illustrates a pane 210 from which regions A, B, C, D, E and F are dissected to form shards 211 to 216, each of which is separately stored in the buffer memory 191 and may be transmitted in separate response messages to the remote user device 2.

Figure 22 illustrates the additional use of a memory referred to below as a user session memory 220 for storing information defining a user session under circumstances where the messages between the server and user device 2 are fragmented to take account of the limited data capacity of the user device.

A typical example of when such an arrangement is

appropriate is when a form filling exercise is to be completed in a user session. For high capacity devices such as personal computers, it is commonplace for a form to be provided in a single screen to the user and for the form to contain multiple fields for completion by the user.

For example, in Figure 23 form 230 defines multiple data fields 231. For a device 2 of limited capacity, it may be necessary to fragment the form into a number of fragments 232 to 237 which contain respectively portions A, B, C, D, E and F of the form 230.

During a user session, the form 230 is dissected into the fragments 232 to 237 and the corresponding code for each fragment stored in buffer 191. Initially only fragment 232 is transmitted to the user device 2 and the user responds with a response message which is processed by the server 1. The response corresponding to data fields contained in region A of the form are stored in the user session memory 220. The next fragment 233 is transmitted to the user device and the corresponding response stored in the user session memory. This process is repeated until the final fragment 237 is transmitted. The response to this fragment F of the form includes actuation of a submit button 238. If actuation of the submit button 238 is contained in the final response

message, the information required in the user session memory 220 is complete and the complete set of data from the form filling exercise is passed to a data processing application 239.

The manner in which the form is divided into regions A, B, C, D, E and F is defined by the author as part of the layout policy.

The code transmitted to the user device 2 typically also includes script defining instructions for operating the browser of the remote user device 2 to perform validation and verification of data entered by the user during form filling. The script is generated by the code generating engine 21 based on the tags written by the author who includes a definition of validation rules to be applied to the data entered by the user during form filling.

If for example a data field is indicated as being a numerical field, numerical value limits may be applied for validation purposes.

The manner in which the script code is generated by the code generating engine 21 depends upon the version of script language appropriate to the remote user device 2, as indicated by the protocol policy.

In a further example, a user device 2 is of a type

with limiting processing power such as a mobile telephone in which validation rules are applied by software existing in the processor or SIM card of the device. In this instance, the code generating engine 21 is not required to generate script for transmission to the device to perform the validation steps since it is sufficient to provide validation parameters in a format dictated by the existing software within the user device.

When responding to a remote user device 2 which uses a protocol supporting style sheets, the author may specify that a style sheet is to be generated by the code generating engine 21. The style sheet may be shared across multiple pages. For those devices where the available protocol does not support style sheets, additional code is generated by the code generating engine 21 to create a visual effect in the resulting displayed pages which emulates the style sheet definition defined by the author.

For example, HTML 4 browsers can apply style sheets to received HTML whereas HTML 3 browsers cannot. It is therefore necessary for HTML 3 browsers to receive additional HTML code adding font, colour and other attributes in order to achieve the same effect as provided by the style sheet.

The author is required to define the style sheet information and the code generating engine 21 will, if necessary, automatically generate the additional code required if style sheets are not supported.

Some user devices do not provide visual display, as for example those devices designed for use by visually impaired users. Such devices are typically served by a service provider which hosts a voice browser on a computer of the service provider, thereby converting HTTP received code into communications signals delivering voice messages. Such a service provider could therefore act as an intermediary between the server 1 and the remote user device 2 of the above embodiments. The output web page code could then advantageously be output by the code generating engine in voiceXML.

Figure 24 illustrates one of the functions of the graphical user interface 4 utilised when storing files created during web page authoring. A common situation arises where the same background image and text are to be incorporated into web pages downloaded to a number of different device types requiring different formats. A data converter 241 is provided in accordance with a further embodiment of the present invention to assist the author in the task of genrating appropriate files. As shown in Figure 24, an authoring suite 240 is provided

with a data converter 241 for converting a data file output by the authoring suite into a set of files which are stored by action of a file manager 242 in the data structure.

Figure 25 illustrates the steps in the method of operating the elements of Figure 24. At step 250, the data converter 241 receives from the authoring suite 240 a file containing data which is to be stored as a data object. As an example, this data file comprises an image in GIF format.

At step 251, the data converter 241 determines the type of data (i.e. whether image, text or other data type) and refers to the device policy table 30 to determine a list of different data formats which may be required during operation of the code generating engine 21, according to the value of the device type identifier 45.

At step 253, the data converter 241 generates for each of these formats in the list a converted file having the appropriate format and associated metadata. At step 243, the file manager 242 stores the files in the data structure.

This arrangement enables the author to enter text and graphic parameters only once, the data converter and file manager then undertaking the task of generating sets

of files in different formats for storage and subsequent use as data objects.

The above described embodiments have referred to implementation using JAVA, by way of example. Alternatives to JAVA may be used in implementing the present invention and the references to JAVA, JAVA beans and JAVA virtual machine are not to be read as limiting the scope of the invention.

The present invention can be implemented by a computer program operated on a computer in the context of a web server. An aspect of the present invention thus provides a storage medium storing processor implementable instructions for controlling a processor to carry out the method as hereinbefore described.

Further the computer program can be obtained in electronic form for example by downloading the code over a network such as the internet. In accordance with another aspect of the present invention there is provided an electrical signal carrying processor implementable instructions for controlling a processor to carry out the method as hereinbefore described.

The present invention has applications to networks other than the internet including private networks and further public networks.

The policy tables, custom tags and the code

generating engine may be supplied as software products either separately or in combination as a software kit and constitute further aspect of the present invention, whether embodied in storage medium or electrical signal form.

The device names referred to in Figure 6 include in layers 63, 64 and 65 the names of device types which are hereby acknowledged as being Trade Marks.

Appendix 1 - Canvas Authored for the Volantis Product

```
<%@ include file="Volantis.jsp" %>

<vt:canvas layoutName="eportal" themeName = "theme1>

<vt:anchor href="TestPortal.jsp" pane="logo1" image="stars"/>

<vt:logo pane="logo2" src="volantis" alt="volantis"/>

<vt:welcome pane="welcome"/>

<vt:h2 pane="shop">Shop for Cool Stuff at <a href="shopcart.jsp">Shop
Volantis</a></vt:h2>

<vt:Headline pane="headlines" show="2" />

<vt:Content pane="cpynews"/>

</vt:canvas>
```

Appendix 2 - Resulting Page Sent to a Personal Computer Using HTML

```
<html>
 <head>
 <link REL=STYLESHEET HREF="css/JSP-Styles.css"
 TYPE="text/css">
 <script language="JavaScript">
 <!--
 //--></script>
 </head>
 <body>
 <table border=0 cellpadding=0 columns=2><tr>
 <td align=center valign=top>
 <table border=0 cellpadding=0 columns=1>
 <tr><td align=center valign=top>
 <table border=0 cellpadding=0 columns=1>
 <tr><td align=center valign=top>
 <table border=0 cellpadding=0 columns=2><tr>
 <td align=center valign=top>
 <table border=0 cellpadding=0><tr>
 <td>
 <a href="TestPortal.jsp" >
 <img src="images/stars0.jpg"/>
 </a>
 </td></tr></table>
 </td>
 <td align=center valign=top>
 <table border=0 cellpadding=0><tr>
 <td>
 <img src="images/volantis0.jpg" alt="volantis">
 </td></tr></table>
 </td>
 </tr></table>
 </td></tr>
 <tr><td align=center valign=top>
 <table border=0 cellpadding=0><tr>
 <td>
 <hr><b>Welcome to Volantis, Rhys
 Lewis</b>
 . You can set up your news preferences
```

```
<a href=e_setupnewsdevice.adp>here</a>
<br><hr>
</td></tr></table>
</td></tr>
<tr><td align=center valign=top>
<table border=0 cellpadding=0><tr>
<td>
<h2>Shop for Cool Stuff at <a href="shopcart.jsp">Shop Volantis</a></h2>
</td></tr></table>
</td></tr>
</table
</td></tr>
<tr><td align=center valign=top>
<table border=0 cellpadding=0 columns=2><tr>
<td align=center valign=top>
<table border=0 cellpadding=0><tr>
<td>
<table align=right border=0>
  <tr><td><table  borderwidth=1  bordercolor=cyan><tr><th  class=headline
align=left>XML and metadata news</th></tr>
<tr><td><a
href=clickthru.jsp?cat=278&url=http://c.moreover.com/click/here.pl?x8102028>Thin
kersGroup.com Completes Beta Test of Web-To-Wireless Application</a></td></tr>
<tr><td class=sub>07 Jul 2000 08:05AM</td></tr>
<tr><td><a
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gives your XML some style</a></td></tr>
<tr><td class=sub>07 Jul 2000 06:59AM</td></tr>
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align=left>Wireless sector news</th></tr>
<tr><td><a
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C&W team up to offer mobile internet services</a></td></tr>
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 href=clickthru.jsp?cat=277&url=http://c.moreover.com/click/here.pl?x8102269>NASDAQ
Outlook; Qualcomm To Finish Physics Lesson Soon, Then Could Double</a></td></tr>
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<tr><td><table borderwidth=1 bordercolor=cyan><tr><th class=headline align=left>Top technology stories</th></tr>

<tr><td>PRIMUS Telecommunications and Inktomi Forge Strategic Alliance To Build Global Infrastructure for Streaming Media</td></tr>

<tr><td class=sub>07 Jul 2000 08:05AM</td></tr>

<tr><td>Jesse Berst's Anchordesk: The Long Wait for Web Phones</td></tr>

<tr><td class=sub>07 Jul 2000 06:19AM</td></tr>

</table

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<td align=center valign=top>

<table border=0 cellpadding=0><tr>

<td>

<table width=100% align=top>

<tr><td colspan=2><h2>Informix Upgrades Java Database</h2></td></tr>

<tr><td width=30% valign=top align=left><img src=database.gif border=0></td>

<td width=70%> Informix (NASDAQ: IFMX) says it has upgraded its Cloudscape Java-based database to support Windows CE and Pocket PC. In addition to adding platforms, Cloudscape 3.5 has added greater security.

Cloudscape 3.5 consists of the Cloudscape database management system, Cloudsync for data and application synchronization and Cloudconnector, a server framework for Internet connections to the Cloudscape DBMS.

The company is demonstrating the update at the JavaOne conference this week in San Francisco. It will be commercially available in July 2000. Server pricing starts at $1,999. </td></tr>

<tr><td colspan=2><h2>AT&T Wireless, Nortel to Trial GPRS</h2></td></tr>

<tr><td width=30% valign=top align=left><img src=wireless.gif border=0></td>

<td width=70%> AT&T Wireless Services (NYSE: AWE) and Nortel Networks (NYSE/TSE: NT) say they will start testing broader-band General Packet Radio Service (GPRS) in the U.S. this summer and are working toward the eventual delivery of faster third-generation (3G) service.

The GPRS tests will begin in several unnamed major U.S. cities this summer, the companies said in an announcement. The companies are working together to eventually introduce full 3G TDMA- EDGE technology.

"These trials using GPRS core network solutions from Nortel Networks are a significant step in the development of TDMA-EDGE and underscore the rapid progress

industry is making", said Roderick Nelson, chief technology officer, AT&T Wireless Services. The eventual goal is to offer broadband wireless coverage to the company's customers anywhere in the world, he added.

The companies didn't provide specifics about when the GPRS service will be commercially available.

</td></tr>

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<tr><td align=center valign=top>

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<td align=Left valign=Center>

<table border=0 cellpadding=0><tr>

<td>

</td></tr></table>

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</tr></table>

</body></html>

Appendix 3 - Resulting Page Sent to an Internet-Enabled Mobile Phone

```
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"http://www.wapforum.org/DTD/wml_1.1.xml">
<wml><card>
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<td>
<p>
<a href="TestPortal.jsp">
<img src="images/stars10.bmp"/>
</a>
</p>
</td>
<td>
<b>volantis</b>
</td>
</tr></table>
<p><em><a href="list1tmp1475618599.wml">Company News</a></em></p>
<p><em><a href="list1tmp1484083075.wml">Headline News</a></em></p>
<p><a href="LoginForm.jsp">Please log in</a></p>
</card></wml>
```

Appendix 4 - The Deck Generated Automatically to Hold the Company News

```
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<wml><card>
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<p><em><a href="list2tmp299142288.wml">AT&amp;amp;T Wireless, Nortel to Trial GPRS</a></em></p>
</card></wml>
```

Appendix 5 - The Deck Generated Automatically to Hold the Story About AT&T

<?xml version="1.0"?><!DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML 1.1//EN""httpd://www.wapforum.org/DTD/wml_1.1.xml">

<wml><card>

AT&T Wireless, Nortel to Trial GPRS AT&T Wireless Services (NYSE: AWE) and Nortel Networks (NYSE/TSE: NT) say they will start testing broader-band General Packet Radio Service (GPRS) in the U.S. this summer and are working toward the eventual delivery of faster third-generation (3G) service.

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The companies didn't provide specifics about when the GPRS service will be commercially available.

</card></wml>

CLAIMS:

1. Apparatus for responding to a request message from a remote user device for web page information by generating web page code capable of being interpreted by the user device for displaying one or more web pages and for outputting a response message comprising the web page code, the apparatus comprising:

extracting means for extracting from the request message information determining a device type identifier identifying the remote user device as being one of a set of possible device types having different capabilities;

a processor for operating a code generating engine to generate the web page code;

first memory means for storing the web page information as a content document comprising a set of instructions written in a script language for generating the web page code; and

second memory means for storing device dependent information for each of the set of different device types;

wherein the code generating engine comprises interpreting means for interpreting the instructions with reference to selected device dependent information corresponding to the device type identifier, the code generating engine thereby being operable to generate the web page code in a form in which the web page code is

tailored to the remote user device.

2. Apparatus as claimed in claim 1, wherein the script language comprises a first mark up language.

3. Apparatus as claimed in claim 2, wherein the content document comprises content code defining information to be displayed and predefined tags for controlling the presentation of the information to be displayed;

wherein the interpreting means is operable to interpret each tag with reference to the selected device dependent information.

4. Apparatus as claimed in claim 3, wherein the device dependent information is stored as a set of tables and wherein the device dependent information is assimilated in a set of objects accessible to the tags in a run time environment of the code generating engine.

5. Apparatus as claimed in claim 4, wherein the run time environment comprises a JAVA virtual machine and the set of objects comprise JAVA beans.

6. Apparatus as claimed in any of claims 4 and 5, wherein the tables are in hierarchical form defining a hierarchical tree in which nodes correspond to respective

device types in successive hierarchical layers.

7. Apparatus as claimed in claim 6, wherein each device type node is represented by respective entries in each of the tables to define those attributes of the device type which differ from attributes of a parent node from which the device type node branches.

8. Apparatus as claimed in any of claims 4 to 7, wherein the set of tables comprises a device policy table defining technical attributes of each device type.

9. Apparatus as claimed in any of claims 4 to 8, wherein the set of tables comprises a protocol policy table defining the format of the web page code generated by the code generating engine.

10. Apparatus as claimed in any preceding claim wherein the web page code is generated in a second mark up language.

11. Apparatus as claimed in claim 10, comprising means for selecting the second mark up language in accordance with the selected device dependent information in the protocol policy table from a number of mark up languages comprising at least HTML and WML.

12. Apparatus as claimed in any of claims 4 to 11, wherein the set of tables comprises a style policy table defining the style of presentation of the web page information.

13. Apparatus as claimed in claim 12, wherein the style policy table defines attributes including at least one of:

(a) font attributes;

(b) colour; and

(c) background.

14. Apparatus as claimed in any of claims 4 to 13, wherein the set of tables comprises a themes policy table defining at least one of

(a) decorative features; and

(b) a logo.

15. Apparatus as claimed in any of claims 4 to 14, wherein the set of tables comprises a layout policy table defining for each device type the layout of the web page information with respect to a display area of each device type.

16. Apparatus as claimed in claim 15, wherein the layout policy table defines the layout with reference to a set

of panes comprising portions of the display area and containing respective portions of the web page information.

17. Apparatus as claimed in claim 16, wherein the layout police determines for each device type the number and configuration of panes.

18. Apparatus as claimed in claim 17 wherein, for a device type having minimal screen area, the layout policy determines the configuration of pages to be a set of decks comprising single panes for use in displaying the web page information by displaying the decks successively.

19. Apparatus as claimed in any of claims 4 to 18, wherein the content code comprises at least one component name identifying a respective data component, and wherein the apparatus comprises a data structure in which at least one data component exists as a set of data objects defining multiple versions of the data component where the data objects have different data properties suited to different remote user devices.

20. Apparatus as claimed in claim 19, comprising means for selecting a data object from the set of data objects

identified by a component name for inclusion in the web page code on the basis of the device type identifier.

21. Apparatus as claimed in claim 20, wherein the selecting means comprises a component policy table for looking up a predetermined selection of data object.

22. Apparatus as claimed in claim 20, wherein the selection means is operable to determine the technical attributes of the remote user device and to select the data object by comparing the technical attributes with data properties of each data object.

23. Apparatus as claimed in claim 22, wherein the selection means is operable to determine the technical attributes by referring to a device policy table.

24. Apparatus as claimed in any of claims 22 and 23, wherein the data objects are stored in a data structure in which metadata is stored in association with each data object and wherein the data properties of each data object are defined by respective metadata.

25. Apparatus as claimed in any of claims 16 to 18, comprising a graphical user interface for receiving user input and document authoring means responsive to the

graphical user interface for creating documents of the web page generating instructions.

26. Apparatus as claimed in claim 25, wherein the authoring means comprises means for receiving data, and data conversion means for converting the data into a set of data objects each containing a respective version of the data suited to technical attributes of a respective device type.

27. Apparatus as claimed in claim 26, wherein the set of data objects further comprises multiple versions corresponding to a set of available user preferences.

28. Apparatus as claimed in claim 27, comprising means for determining a user preference from the request message and wherein the selecting means is further operable to select the data object according to the user preference.

29. Apparatus as claimed in claim 28, wherein the multiple versions comprise versions in each of a set of languages and wherein the user preference comprises a preferred language.

30. Apparatus as claimed in any preceding claim,

comprising:

code measuring means for measuring the amount of code representative of a page generated by the code generating engine;

determining means for determining whether the technical attributes of the user device include sufficient data capacity to accommodate the measured amount of code, and means responsive to a negative determination for dividing the code into two or more portions of code such that each portion is representative of a respective portion of the page and comprises an amount of code within the data capacity of the user device.

31. Apparatus as claimed in claim 30 when dependent from claim 8, wherein the determining means is operable to determine the technical attributes by referring to the device policy table.

32. Apparatus as claimed in any of claims 30 and 31, comprising a buffer memory for storing the portions of code for subsequent transmission to the user device.

33. Apparatus as claimed in claim 32, comprising a session memory for storing client data received in successive messages from the user device in response to

successive transmissions of the respective portions of code representing portions of the pane, and means for combining as a single data object client data for a completed session in which client data is received responsive to all of the portions of the pane.

34. Apparatus as claimed in claim 33, wherein the pane defines a form and wherein the portions of the pane comprise respective data fields of the form.

35. Apparatus as claimed in any of claims 4 to 18, wherein the set of tables comprises a dynamic policy table defining code generating attributes which are determined according to the values of time varying parameters.

36. Apparatus as claimed in claim 35, wherein the code generating attributes define image content of the web page code and the time varying parameter is the bandwidth available for communication with the device.

37. Apparatus as claimed in any preceding claim, comprising a cache memory operable to store a copy of web page code output in a response message; and

means for outputting web page code from the stored copy in response to receiving a further request message

for the same web page information.

38. Apparatus as claimed in claim 37, wherein the cache memory is operable to selectively store web page code depending upon whether a requirement for cache memory storage is defined in the content document from which the web page code is generated.

39. Apparatus as claimed in claim 38, wherein the requirement for cache memory storage is set by operation of a tag inserted in the content document.

40. Apparatus as claimed in claim 39, wherein the tag further defines a duration of validity of the copy of web page code stored in cache memory.

41. Apparatus as claimed in any preceding claim, wherein the extracting means is operable to extract identification information from a header of the request message and to determine the device type identifier by referring to a table of device type identifiers for which device dependent information is stored in the second memory means.

42. Apparatus as claimed in claim 41, wherein the extracting means is operable to determine from the table,

for the identification information obtained from the header, whether a corresponding device type identifier is available and, if not, to generate an indication that the user device is unrecognised.

43. Apparatus as claimed in claim 42, comprising probe means responsive to the indication that the user device is unrecognised to send a probe agent to the user device for extracting device information, and means for receiving a response message containing the device information from the user device.

44. Apparatus as claimed in claim 43, comprising means for comparing the received device information with stored device dependent information for known devices and means for determining a device type identifier corresponding to a best match between the device dependent information for known devices and the device information for the unrecognised device.

45. Apparatus as claimed in claim 44, wherein the code generating engine is operable to generate web page code using the device type identifier of the known device determined to be a best match to the unrecognised device.

46. Apparatus as claimed in any preceding claim, further

comprising:

receiving means for receiving the request message via a network to which the apparatus is connected in use; and

output means for outputting the response message comprising the web page code to the user device via the network to which the apparatus is connected in use.

47. Apparatus as claimed in any preceding claim, comprising means for selecting the web page information from the first memory means according to the content of the request message and means for inputting the web page information and the device type identifier to the code generating engine.

48. A method of responding to a request message from a remote user device for web page information by generating web page code capable of being interpreted by the user device for displaying one or more web pages and for outputting a response message comprising the web page code, the method comprising:

extracting from the request message information determining a device type identifier identifying the remote user device as being one of a set of possible device types having different capabilities;

operating a code generating engine to generate the

web page code;

storing the web page information in a first memory means as a content document comprising a set of instructions written in a script language for generating the web page code; and

storing device dependent information for each of the set of different device types in a second memory means;

wherein the code generating engine interprets the instructions with reference to selected device dependent information corresponding to the device type identifier, the code generating engine thereby generating the web page code in a form in which the web page code is tailored to the remote user device.

49. A method as claimed in claim 48, wherein the script language comprises a first mark up language.

50. A method as claimed in claim 49, wherein the content document comprises content code defining information to be displayed and predefined tags for controlling the presentation of the information to be displayed;

wherein the interpreting means interprets each tag with reference to the selected device dependent information.

51. A method as claimed in claim 50, wherein the device dependent information is stored as a set of tables and wherein the device dependent information is assimilated in a set of objects accessible to the tags in a run time environment of the code generating engine.

52. A method as claimed in claim 51, wherein the run time environment comprises a JAVA virtual machine and the set of objects comprise JAVA beans.

53. A method as claimed in any of claims 51 and 52, wherein the tables are in hierarchical form defining a hierarchical tree in which nodes correspond to respective device types in successive hierarchical layers.

54. A method as claimed in claim 53, wherein each device type node is represented by respective entries in each of the tables to define those attributes of the device type which differ from attributes of a parent node from which the device type node branches.

55. A method as claimed in any of claims 51 to 54, wherein the set of tables comprises a device policy table defining technical attributes of each device type.

56. A method as claimed in any of claims 51 to 55,

wherein the set of tables comprises a protocol policy table defining the format of the web page code generated by the code generating engine.

57. A method as claimed in any of claims 48 to 56 wherein the web page code is generated in a second mark up language.

58. A method as claimed in claim 57, comprising means for selecting the second mark up language in accordance with the selected device dependent information in the protocol policy table from a number of mark up languages comprising at least HTML and WML.

59. A method as claimed in any of claims 51 to 58, wherein the set of tables comprises a style policy table defining the style of presentation of the web page information.

60. A method as claimed in claim 59, wherein the style policy table defines attributes including at least one of:

(a) font attributes;

(b) colour; and

(c) background.

61. A method as claimed in any of claims 51 to 60, wherein the set of tables comprises a themes policy table defining at least one of

(a) decorative features; and

(b) a logo.

62. A method as claimed in any of claims 51 to 61, wherein the set of tables comprises a layout policy table defining for each device type the layout of the web page information with respect to a display area of each device type.

63. A method as claimed in claim 62, wherein the layout policy table defines the layout with reference to a set of panes comprising portions of the display area and containing respective portions of the web page information.

64. A method as claimed in claim 63, wherein the layout policy determines for each device type the number and configuration of panes.

65. A method as claimed in claim 64 wherein, for a device type having minimal screen area, the layout policy determines the configuration of pages to be a set of decks comprising single panes for use in displaying the

web page information by displaying the decks successively.

66. A method as claimed in any of claims 51 to 65, wherein the content code comprises at least one component name identifying a respective data component, and wherein the method comprises accessing a data structure in which at least one data component exists as a set of data objects defining multiple versions of the data component where the data objects have different data properties suited to different remote user devices.

67. A method as claimed in claim 66, comprising a step of selecting a data object from the set of data objects identified by a component name for inclusion in the web page code on the basis of the device type identifier.

68. A method as claimed in claim 67, wherein the selecting step comprises accessing a component policy table for looking up a predetermined selection of data object.

69. A method as claimed in claim 67, wherein the selection step determines the technical attributes of the remote user device and selects the data object by comparing the technical attributes with data properties

of each data object.

70. A method as claimed in claim 69, wherein the selection step determines the technical attributes by referring to a device policy table.

71. A method as claimed in any of claims 69 and 70, wherein the data objects are stored in a data structure in which metadata is stored in association with each data object and wherein the data properties of each data object are defined by respective metadata.

72. A method as claimed in any of claims 63 to 65, comprising receiving user input via a graphical user interface and operating a document authoring means responsive to the graphical user interface for creating documents of the web page generating instructions.

73. A method as claimed in claim 72, comprising the steps of receiving data, and converting the data into a set of data objects each containing a respective version of the data suited to technical attributes of a respective device type.

74. A method as claimed in claim 73, wherein the set of data objects further comprises multiple versions

corresponding to a set of available user preferences.

75. A method as claimed in claim 74, comprising means for determining a user preference from the request message and wherein the selecting means is further operable to select the data object according to the user preference.

76. A method as claimed in claim 75, wherein the multiple versions comprise versions in each of a set of languages and wherein the user preference comprises a preferred language.

77. A method as claimed in any of claims 48 to 76, comprising the steps of:

measuring the amount of code representative of a page generated by the code generating engine;

determining whether the technical attributes of the user device include sufficient data capacity to accommodate the measured amount of code, and, in response to a negative determination, dividing the code into two or more portions of code such that each portion is representative of a respective portion of the page and comprises an amount of code within the data capacity of the user device.

78. A method as claimed in claim 77 when dependent from claim 55, wherein the determining step determines the technical attributes by referring to the device policy table.

79. A method as claimed in any of claims 77 and 78, comprising storing the portions of code in a buffer memory for subsequent transmission to the user device.

80. A method as claimed in claim 79, comprising storing in a session memory client data received in successive messages from the user device in response to successive transmissions of the respective portions of code representing portions of the page, and combining as a single data object client data for a completed session in which client data is received responsive to all of the portions of the page.

81. A method as claimed in claim 80, wherein the page defines a form and wherein the portions of the page comprise respective data fields of the form.

82. A method as claimed in any of claims 51 to 65, wherein the set of tables comprises a dynamic policy table defining code generating attributes which are determined according to the values of time varying

parameters.

83. A method as claimed in claim 82, wherein the code generating attributes define image content of the web page code and the time varying parameter is the bandwidth available for communication with the device.

84. A method as claimed in any of claims 48 to 83, comprising storing in a cache memory a copy of web page code output in a response message; and

outputting web page code from the stored copy in response to receiving a further request message for the same web page information.

85. A method as claimed in claim 84, wherein the cache memory selectively stores web page code depending upon whether a requirement for cache memory storage is defined in the content document from which the web page code is generated.

86. A method as claimed in claim 85, wherein the requirement for cache memory storage is set by operation of a tag inserted in the content document.

87. A method as claimed in claim 86, wherein the tag further defines a duration of validity of the copy of web

page code stored in cache memory.

88. A method as claimed in any of claims 48 to 87, wherein the extracting step extracts identification information from a header of the request message and determines the device type identifier by referring to a table of device type identifiers for which device dependent information is stored in the second memory means.

89. A method as claimed in claim 88, wherein the extracting step determines from the table, for the identification information obtained from the header, a corresponding device type identifier is available and, if not, generates an indication that the user device is unrecognised.

90. A method as claimed in claim 89, comprising actuating a probe means in response to the indication that the user device is unrecognised to send a probe agent to the user device for extracting device information, and receiving a response message containing the device information from the user device.

91. A method as claimed in claim 90, comprising comparing the received device information with stored

device dependent information for known devices and determining a device type identifier corresponding to a best match between the device dependent information for known devices and the device information for the unrecognised device.

92. A method as claimed in claim 91, wherein the code generating engine generates web page code using the device type identifier of the known device determined to be a best match to the unrecognised device.

93. A method as claimed in any of claims 48 to 92, further comprising:

receiving the request message via a network; and

outputting the response message comprising the web page code to the user device via the network.

94. A method as claimed in any of claims 48 to 93, comprising selecting the web page information from the first memory means according to the content of the request message and inputting the web page information and the device type identifier to the code generating engine.

95. A method of responding to a request message from a remote user device for web page information by generating

web page code capable of being interpreted by the user device for displaying one or more web pages and for outputting a response message comprising the web page code, the method comprising:

determining a device type identifier identifying the remote user device as being one of a set of possible device types having different capabilities;

operating a code generating engine to generate the web page code;

storing the web page information in a first memory means as a content document comprising a set of instructions for generating the web page code; and

storing device dependent information for each of the set of different device types in a second memory means;

wherein the content code comprises at least one component name identifying a respective data component for inclusion in the web page code, and comprising the step of accessing a data structure in which the data component exists as a set of data objects defining multiple versions of the data component where the data objects have different data properties suited to different remote user devices; and

selecting a data object from the set of data objects identified by a component name for inclusion in the web page code on the basis of the device type identifier.

96. A method as claimed in claim 95, wherein the selecting step comprises accessing a component policy table for looking up a predetermined selection of data object.

97. A method as claimed in claim 95, wherein the selection step determines the technical attributes of the remote user device on the basis of the device type identifier and selects the data object by comparing the technical attributes with data properties of each data object.

98. A method as claimed in claim 97, wherein the selection step determines the technical attributes by referring to a device policy table.

99. A method as claimed in any of claims 97 and 98, wherein the data objects are stored in a hierarchical data structure in which metadata is stored in association with each data object and wherein the data properties of each data object are defined by respective metadata.

100. A method as claimed in claim 26, wherein the set of data objects further comprises multiple versions corresponding to a set of available user preferences; and further comprising:

determining a user preference from the request message whereby the selecting step selects the data object according to the user preference.

101. A method as claimed in claim 100, wherein the multiple versions comprise versions in each of a set of languages and wherein the user preference comprises a preferred language.

102. A data structure in which data objects are accessible in a hierarchy on which different hierarchical levels contain different versions of a data component corresponding to respective levels of technical capabilities of user devices to which the data objects are to be provided.

103. A method of processing data for storage in readiness for being output to one of a number of possible user devices having different technical capabilities, the method comprising:

receiving a data element;

generating a set of data objects from the data element such that each data object comprises a respective version of data contained in the data element, and storing the set of data objects in a hierarchical data structure in which different levels correspond to

respective technical capabilities of user devices.

104. Apparatus for responding to a request message from a remote user device for web page information by generating web page code capable of being interpreted by the user device for displaying one or more web pages and for outputting a response message comprising the web page code, the apparatus comprising:

extracting means for extracting from the request message information determining a device type identifier identifying the remote user device as being one of a set of possible device types having different capabilities;

a processor for operating a code generating engine to generate the web page code;

the code generating engine being operable in response to the device type identifier using device dependent information to generate the web page code in a form in which the web page code is tailored to the remote user device;

wherein the extracting means is operable to extract identification information from a header of the request message and to determine the device type identifier by referring to a table of device type identifiers;

the apparatus further comprising probe means responsive to the indication that the user device is unrecognised to send a probe agent to the user device for

extracting device information, and means for receiving a response message containing the device information from the user device.

105. Apparatus as claimed in claim 104, comprising means for comparing the received device information with stored device dependent information for known devices and means for determining a device type identifier corresponding to a best match between the device dependent information for known devices and the device information for the unrecognised device.

106. Apparatus as claimed in claim 105, wherein the code generating engine is operable to generate web page code using the device type identifier of the known device determined to be a best match to the unrecognised device.

107. A method of responding to a request message from a remote user device for web page information by generating web page code capable of being interpreted by the user device for displaying one or more web pages and for outputting a response message comprising the web page code, the method comprising:

extracting from the request message information determining a device type identifier identifying the remote user device as being one of a set of possible

device types having different capabilities;

operating a code generating engine to generate the web page code;

the code generating engine being operated in response to the device type identifier using device dependent information to generate the web page code in a form in which the web page code is tailored to the remote user device;

wherein the extracting step extracts identification information from a header of the request message and determines the device type identifier by referring to a table of device type identifiers;

the method further comprising actuating a probe means responsive to the indication that the user device is unrecognised to send a probe agent to the user device for extracting device information, and receiving a response message containing the device information from the user device.

108. A method as claimed in claim 107, comprising comparing the received device information with stored device dependent information for known devices and determining a device type identifier corresponding to a best match between the device dependent information for known devices and the device information for the unrecognised device.

109. A method as claimed in claim 108, wherein the code generating engine is generates web page code using the device type identifier of the known device determined to be a best match to the unrecognised device.

110. A computer program comprising processor implementable instructions for controlling a processor for carrying out the method of any one of claims 48 to 101, 103, and 107 to 109.

111. A storage medium storing processor implementable instructions for controlling a processor to carry out the method of any one of claims 48 to 101, 103 and 107 to 109.

112. An electrical signal carrying processor implementable instructions for controlling a processor to carry out the method of any one of claims 48 to 101, 103 and 107 to 109.

113. A code generating engine for use in an apparatus of any of claims 1 to 47.

114. A storage medium storing a set of policy tables for use in a method as claimed in any one of claims 48 to 94.

115. A storage medium storing a set of tags for use in a method as claimed in any one of claims 48 to 94.

Fig 1

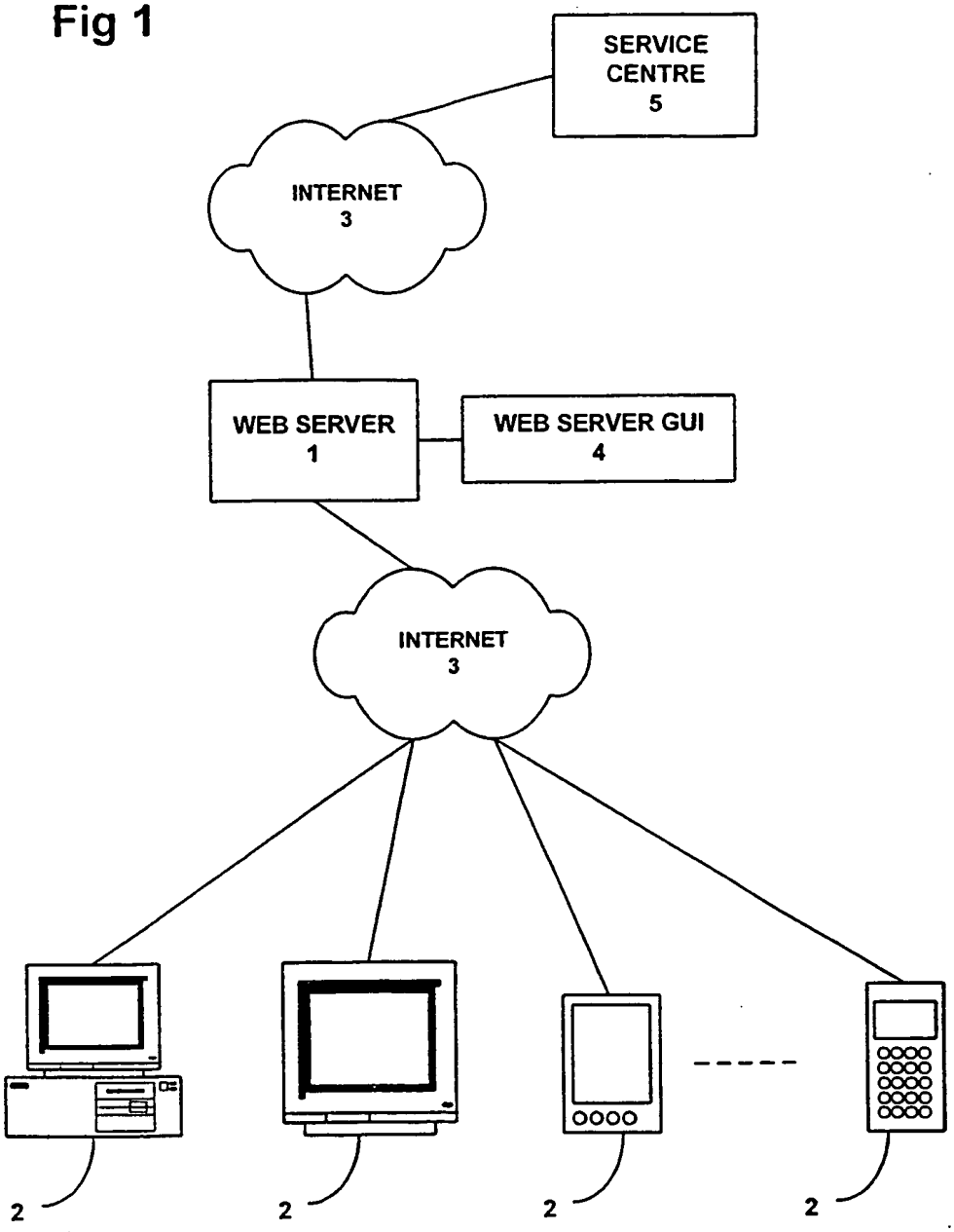

SERVICE CENTRE 5
INTERNET 3
WEB SERVER 1
WEB SERVER GUI 4
INTERNET 3
2
2
2
2

Fig 2A

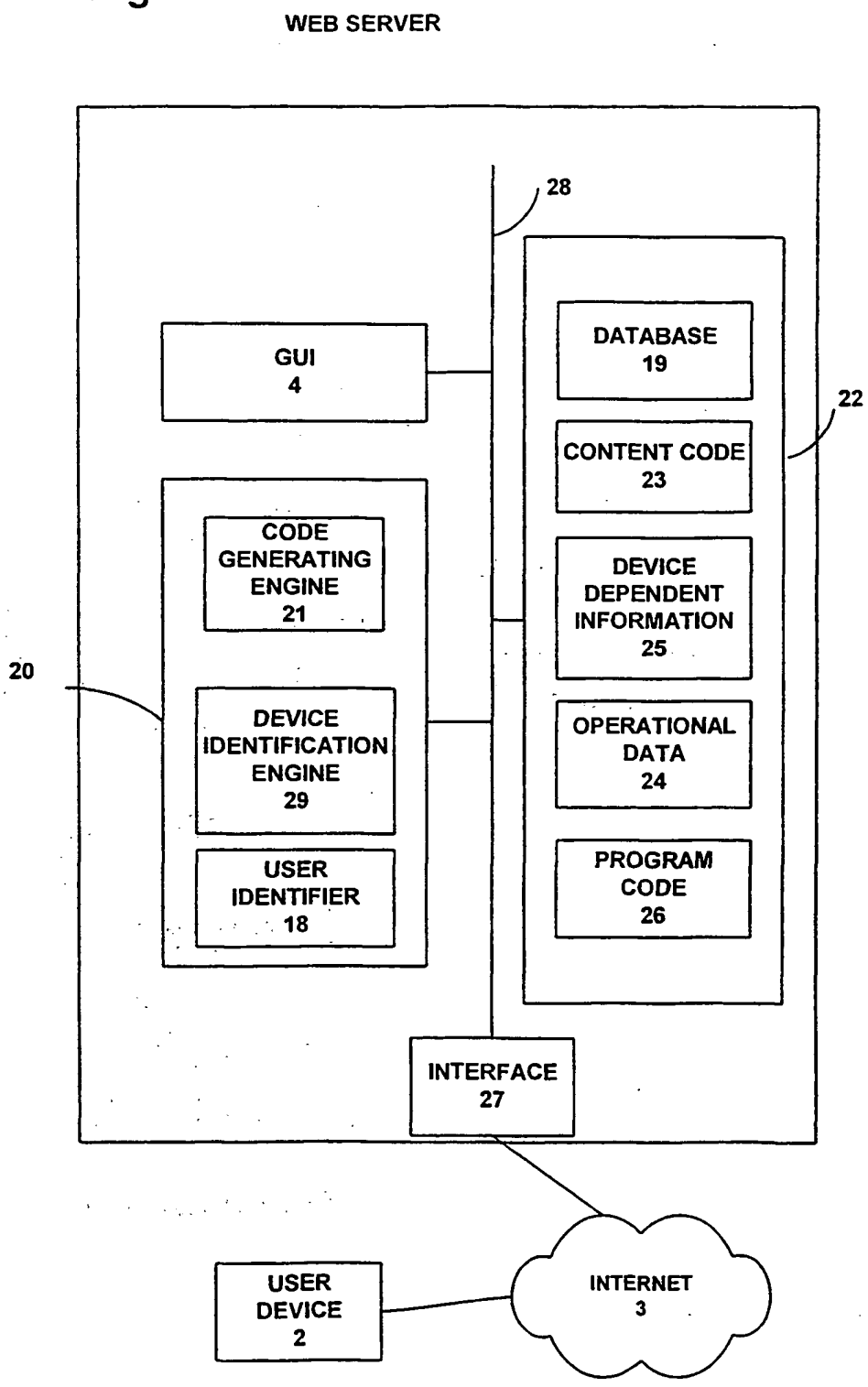

WEB SERVER
28
GUI
4
DATABASE
19
22
CONTENT CODE
23
CODE
GENERATING
ENGINE
21
DEVICE
DEPENDENT
INFORMATION
25
20
DEVICE
IDENTIFICATION
ENGINE
29
OPERATIONAL
DATA
24
USER
IDENTIFIER
18
PROGRAM
CODE
26
INTERFACE
27
USER
DEVICE
2
INTERNET
3

Fig 2B

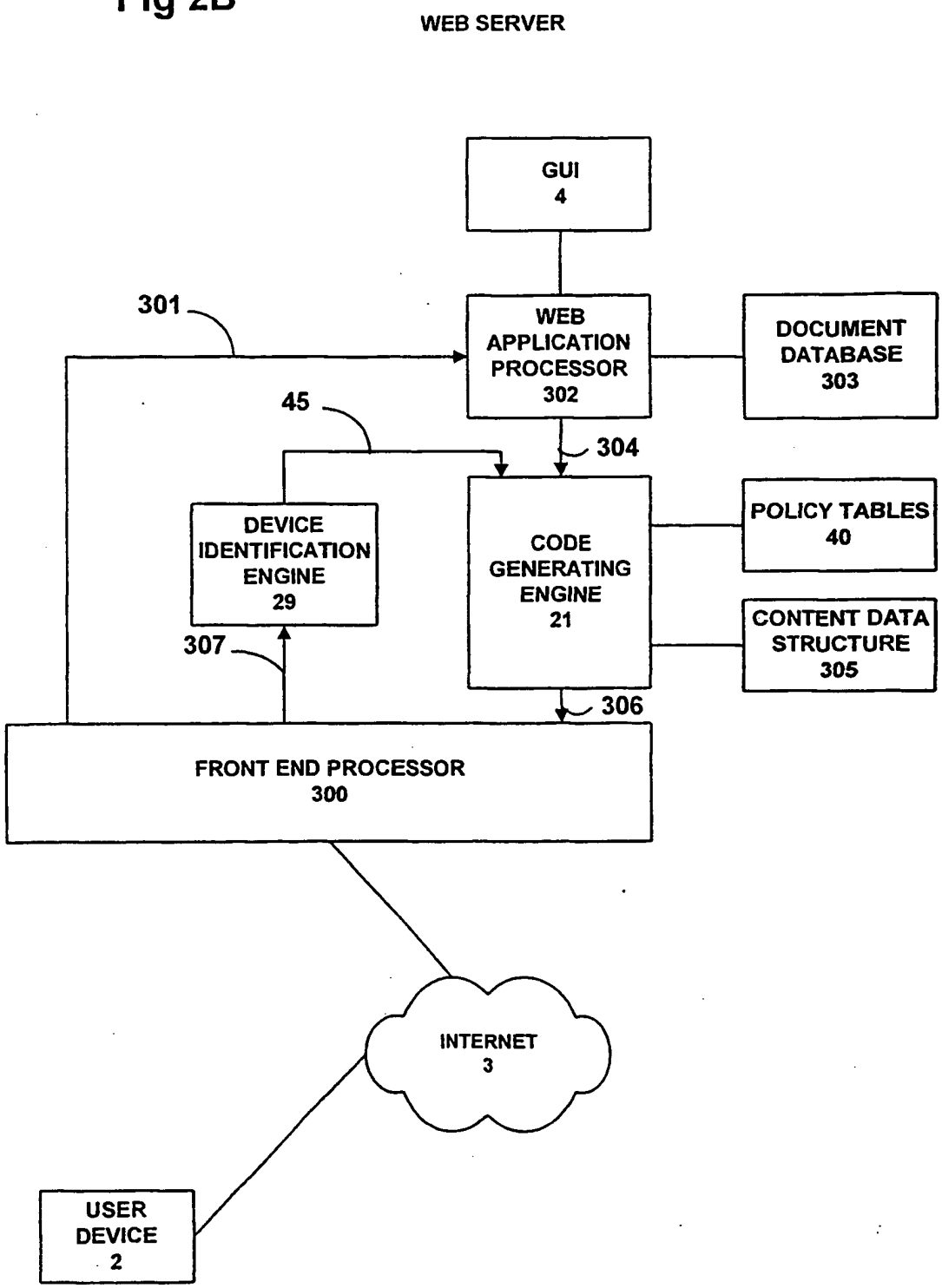

WEB SERVER
GUI
4
301
WEB
APPLICATION
PROCESSOR
302
DOCUMENT
DATABASE
303
45
304
DEVICE
IDENTIFICATION
ENGINE
29
CODE
GENERATING
ENGINE
21
POLICY TABLES
40
CONTENT DATA
STRUCTURE
305
307
306
FRONT END PROCESSOR
300
INTERNET
3
USER
DEVICE
2

Fig 3 POLICY TABLES

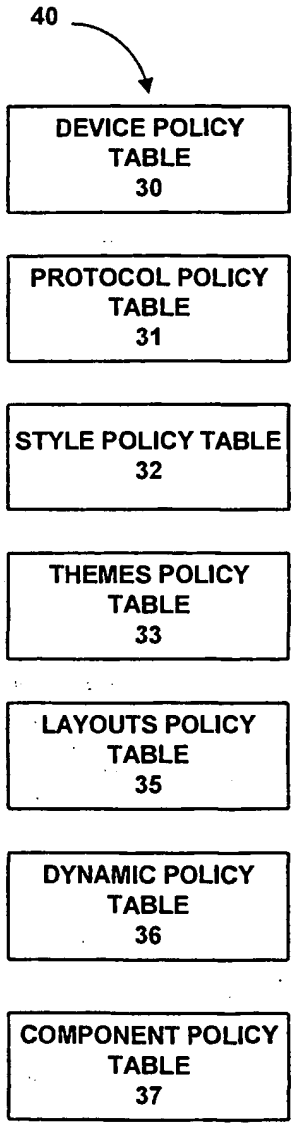


Fig 4 CODE GENERATING ENGINE OPERATION

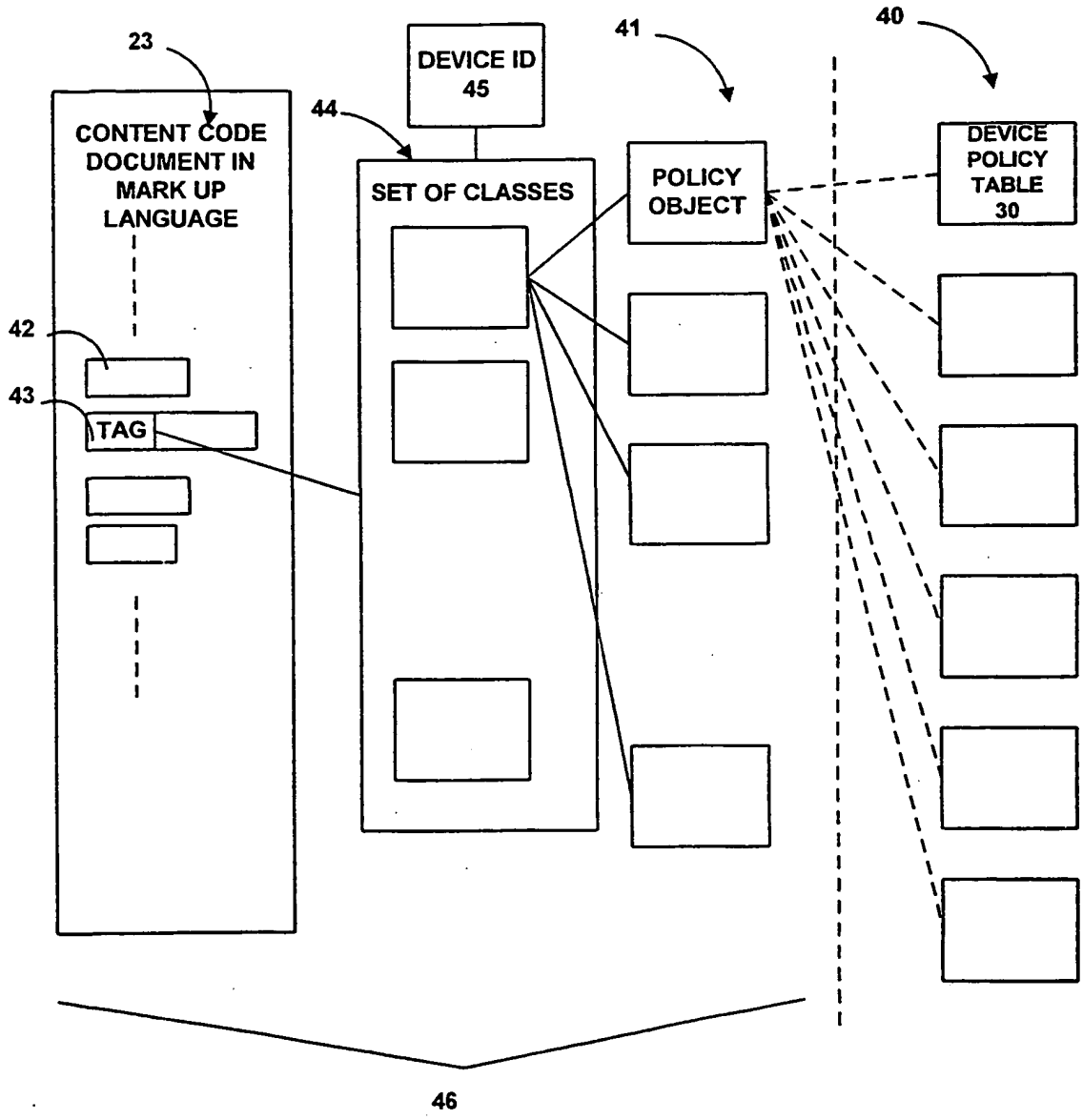


Fig 5A

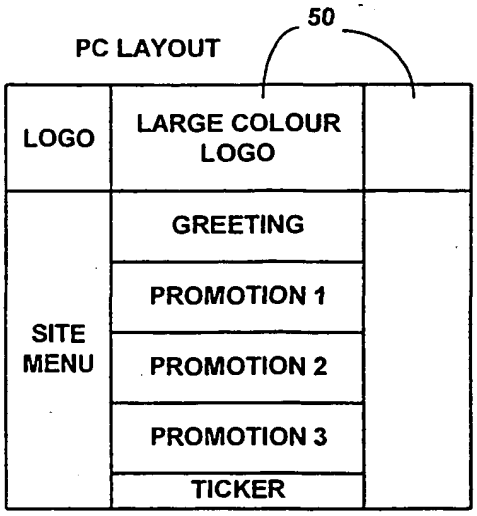


Fig 5B

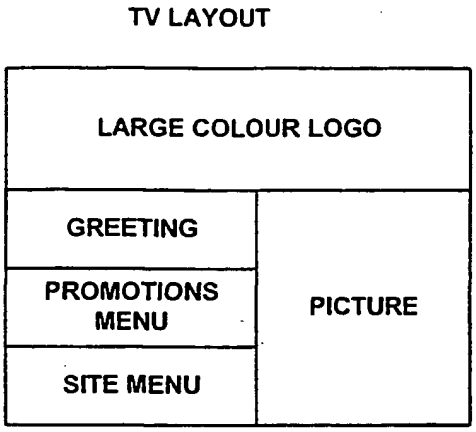


Fig 5C

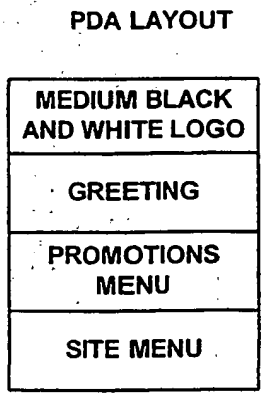


Fig 5D

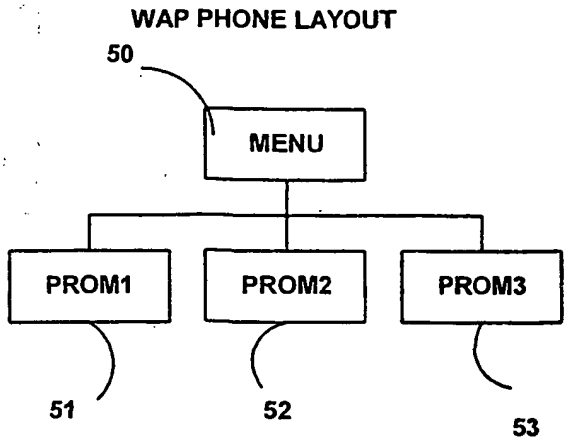
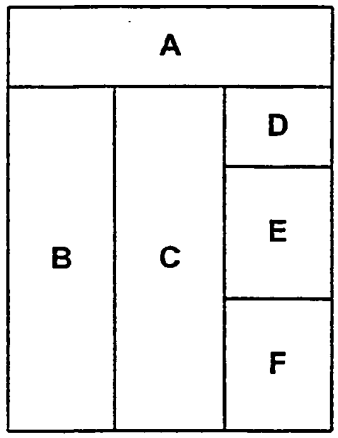


Fig 5E



55

56

Fig 5F

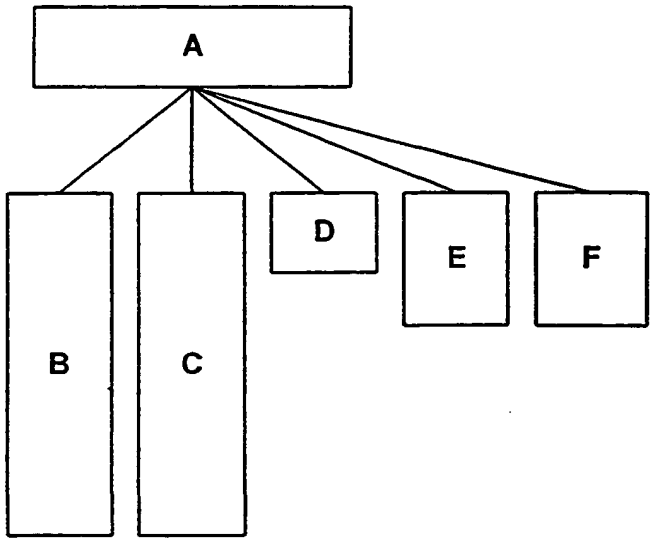


Fig 5G

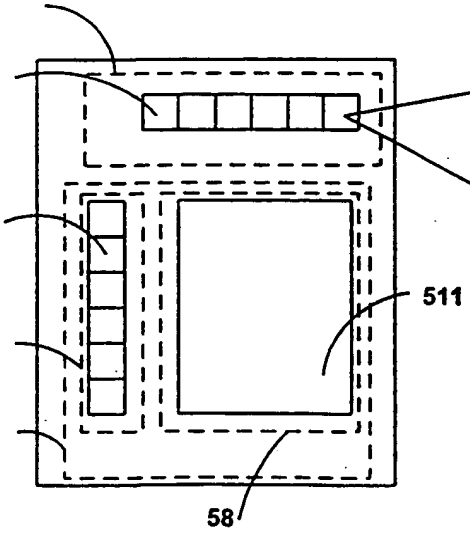


Fig 5H

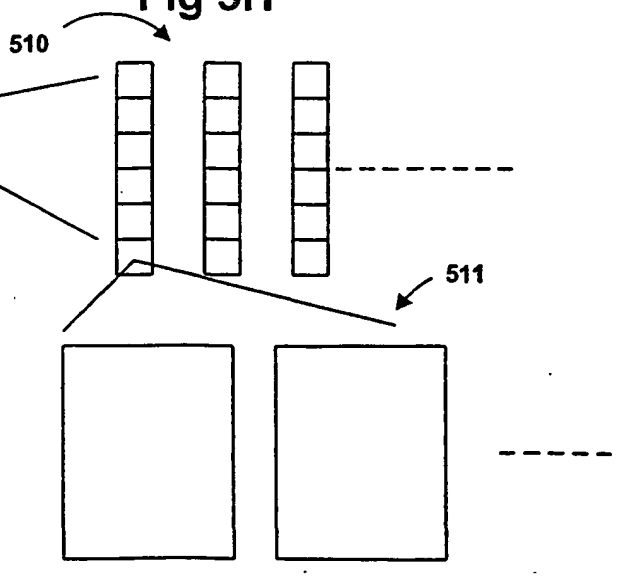


Fig 6

HEIRARCHY OF DEVICE POLICY TABLE

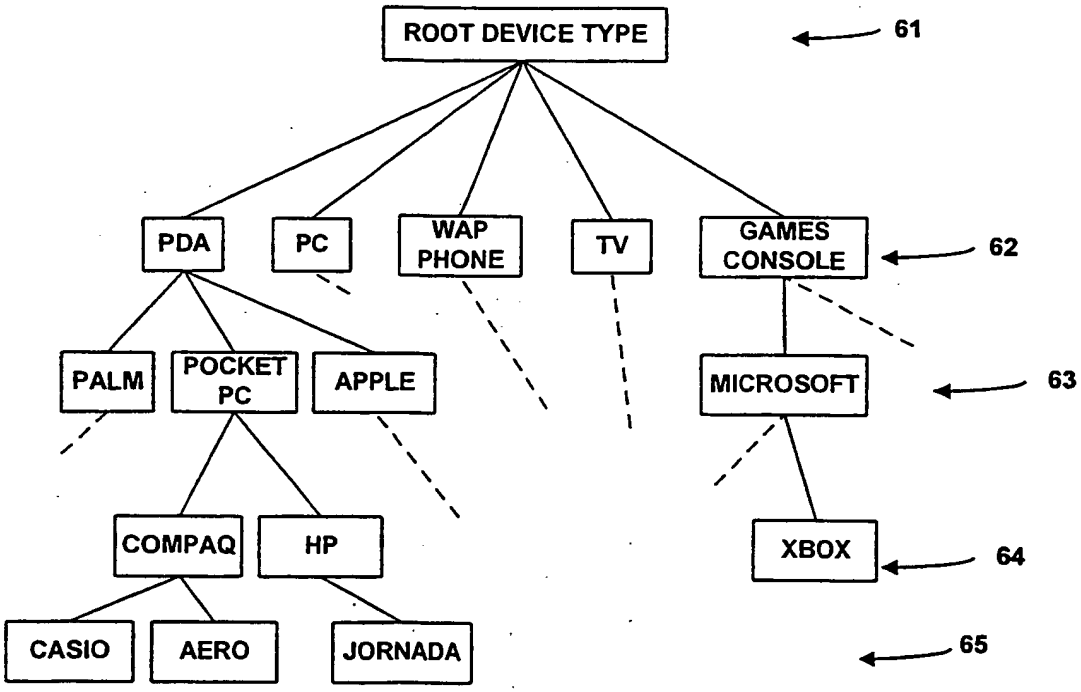


Fig 7

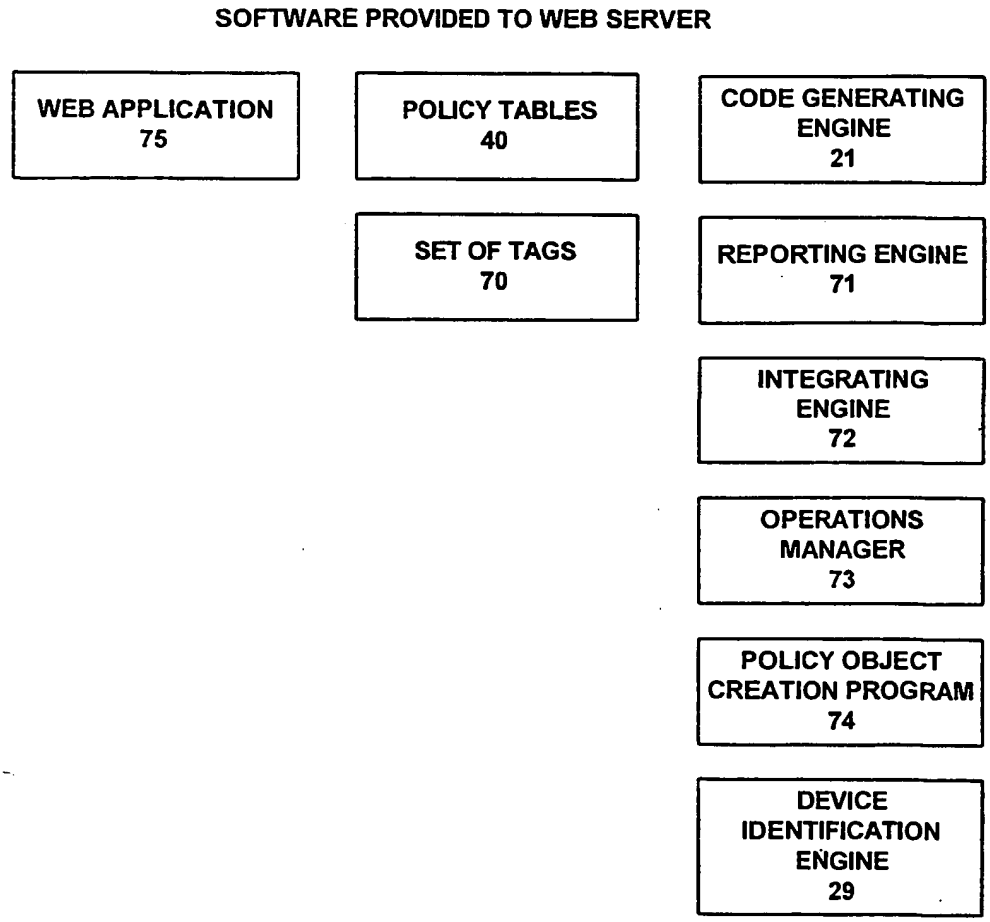

SOFTWARE PROVIDED TO WEB SERVER
WEB APPLICATION 75
POLICY TABLES 40
SET OF TAGS 70
CODE GENERATING ENGINE 21
REPORTING ENGINE 71
INTEGRATING ENGINE 72
OPERATIONS MANAGER 73
POLICY OBJECT CREATION PROGRAM 74
DEVICE IDENTIFICATION ENGINE 29

Fig 8

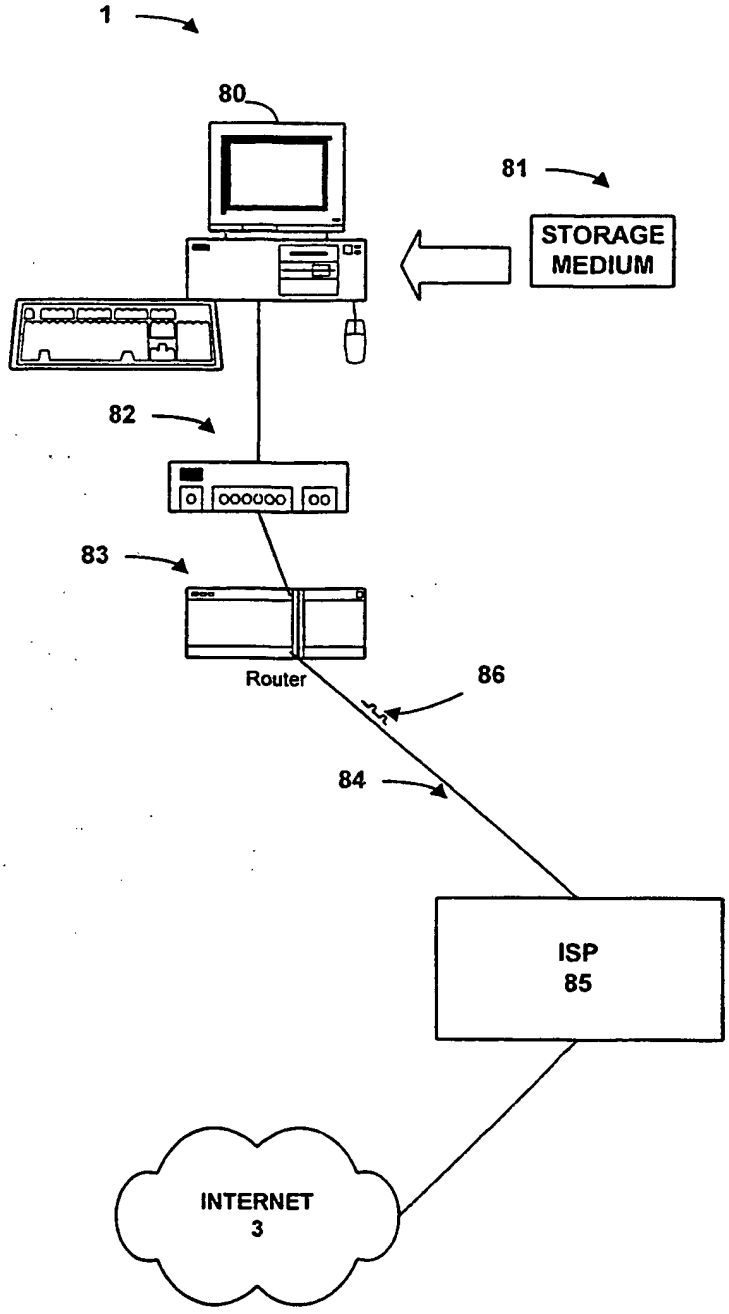


Fig 9

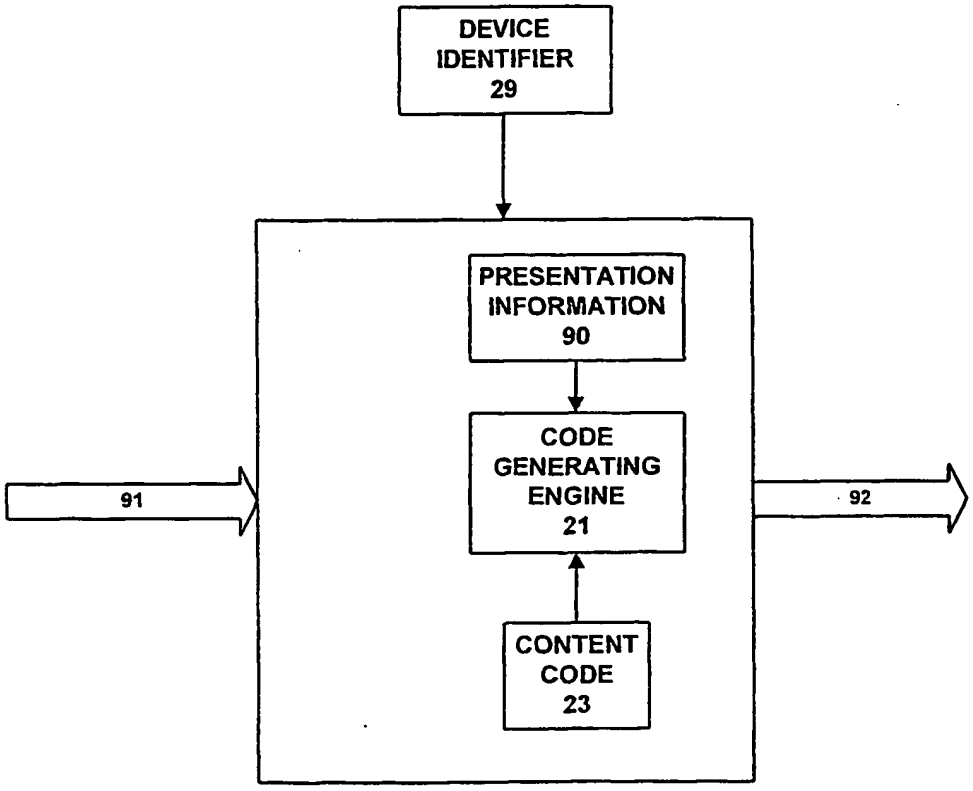

DEVICE IDENTIFIER 29
PRESENTATION INFORMATION 90
CODE GENERATING ENGINE 21
CONTENT CODE 23
91
92

Fig 10

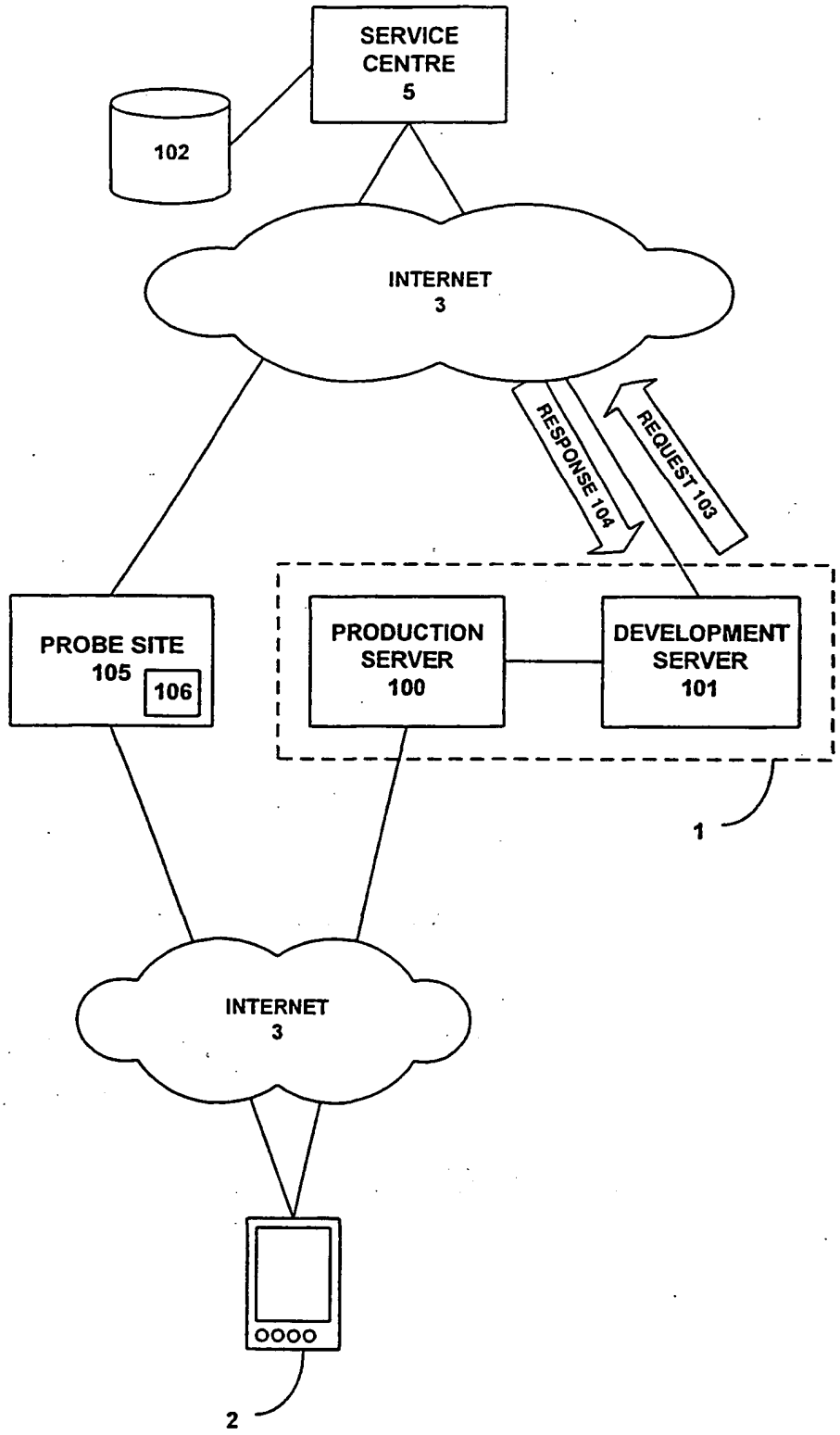

SERVICE CENTRE 5
102
INTERNET 3
RESPONSE 104
REQUEST 103
PROBE SITE 105
106
PRODUCTION SERVER 100
DEVELOPMENT SERVER 101
1
INTERNET 3
2

Fig 11

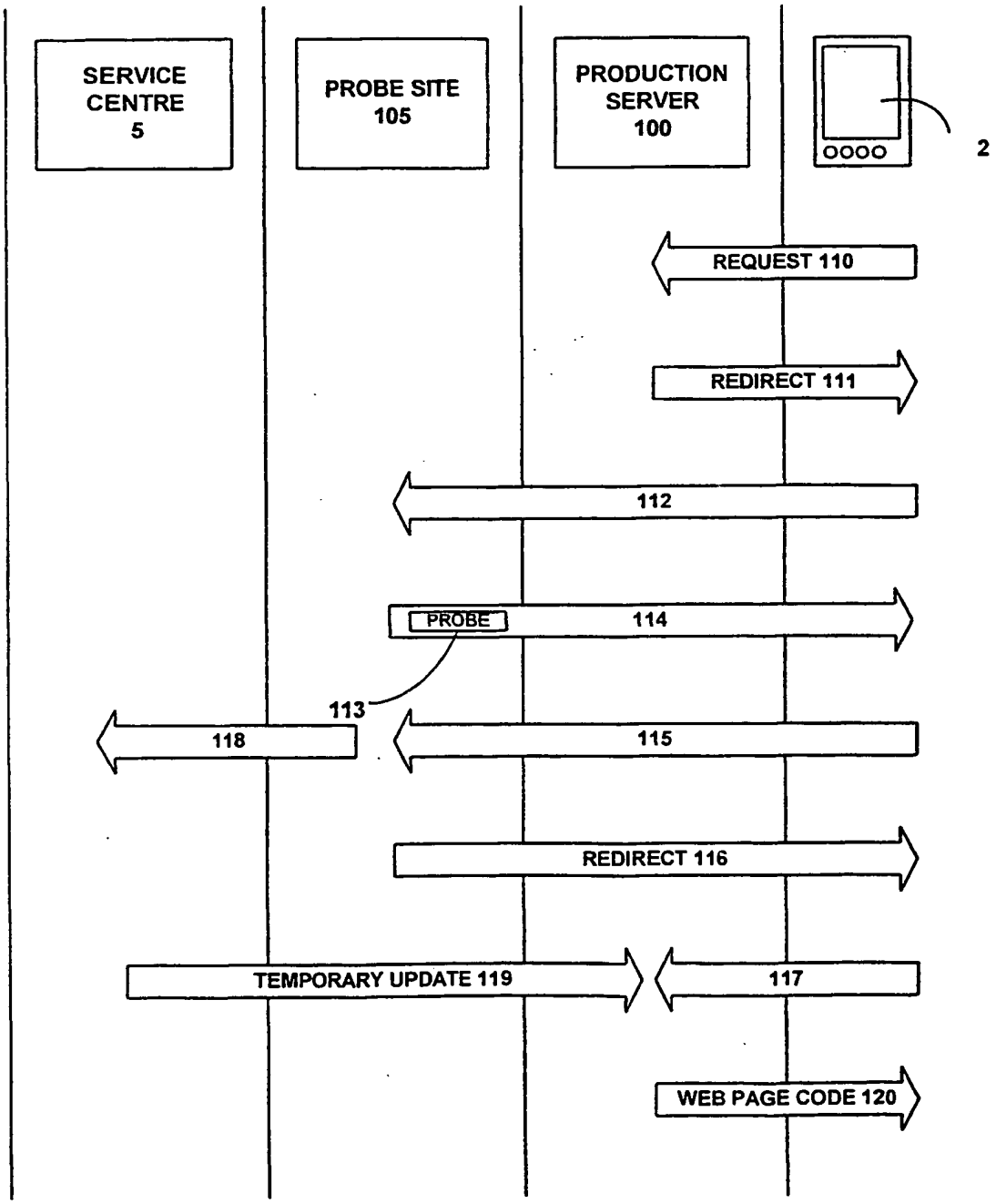

SERVICE CENTRE 5
PROBE SITE 105
PRODUCTION SERVER 100
OOOO
2
REQUEST 110
REDIRECT 111
112
PROBE
114
113
118
115
REDIRECT 116
TEMPORARY UPDATE 119
117
WEB PAGE CODE 120

Fig 12

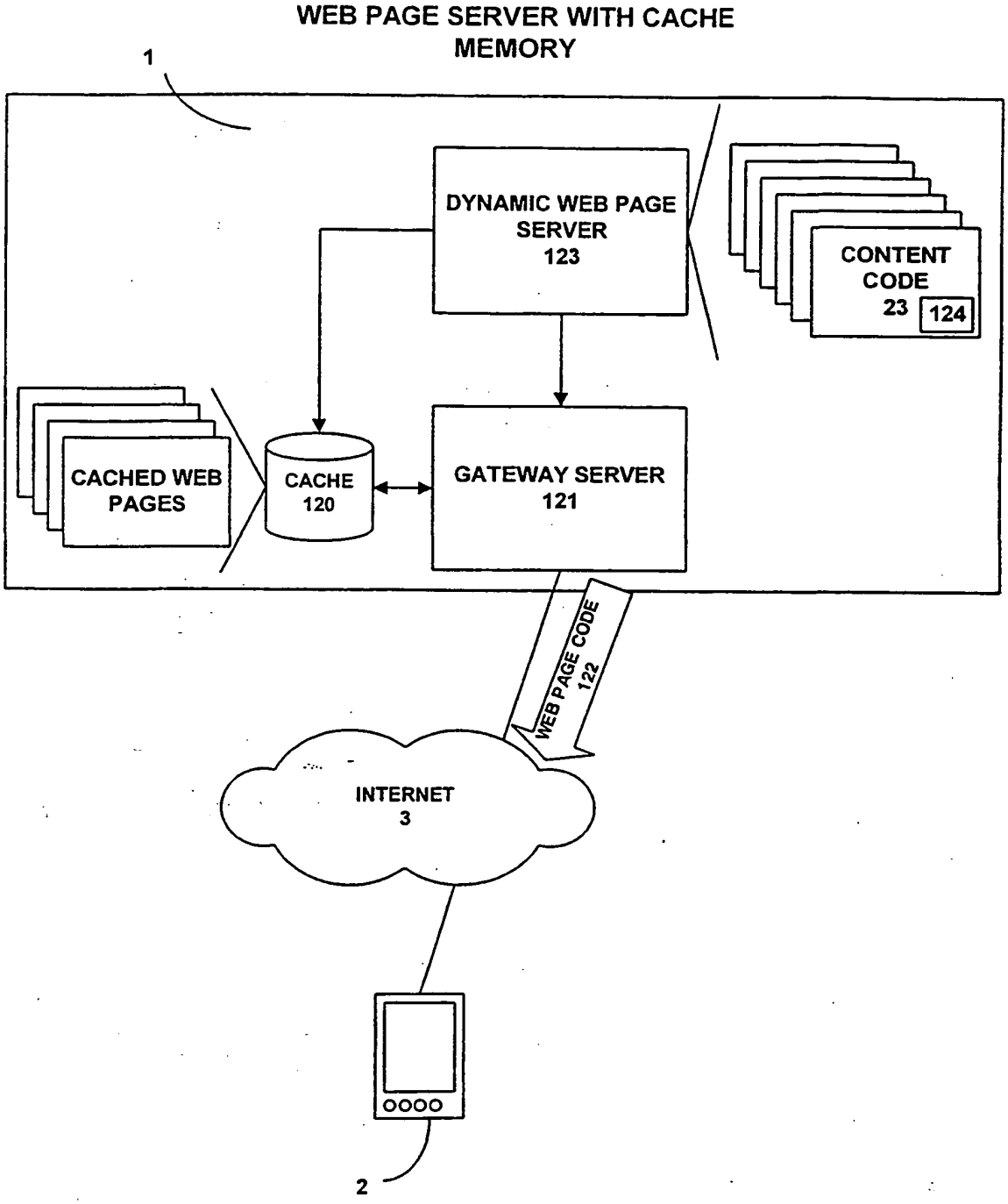

WEB PAGE SERVER WITH CACHE MEMORY
1
DYNAMIC WEB PAGE SERVER 123
CONTENT CODE 23
124
CACHED WEB PAGES
CACHE 120
GATEWAY SERVER 121
WEB PAGE CODE 122
INTERNET 3
2

Fig 13

GATEWAY SERVER PROCESSING

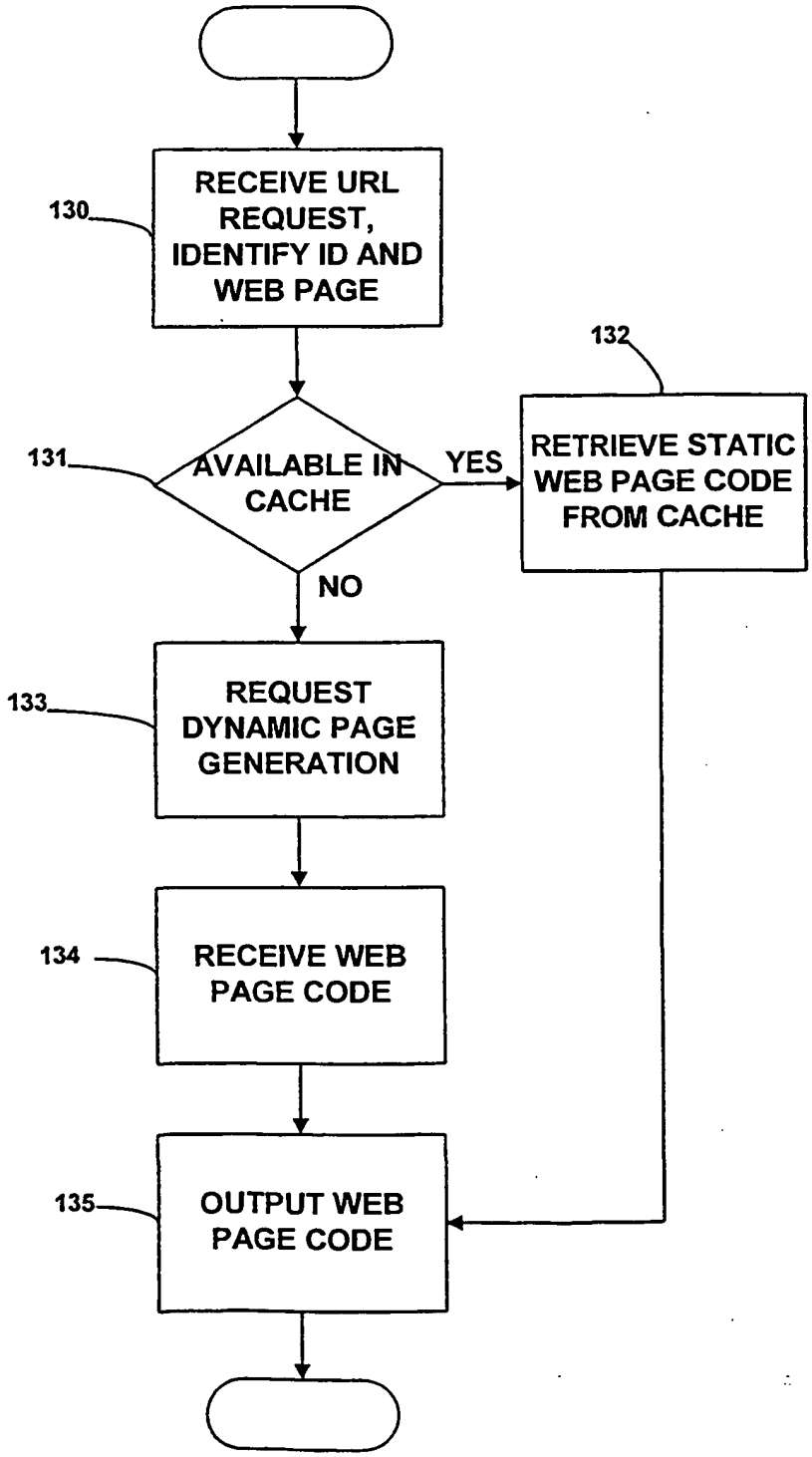


Fig 14

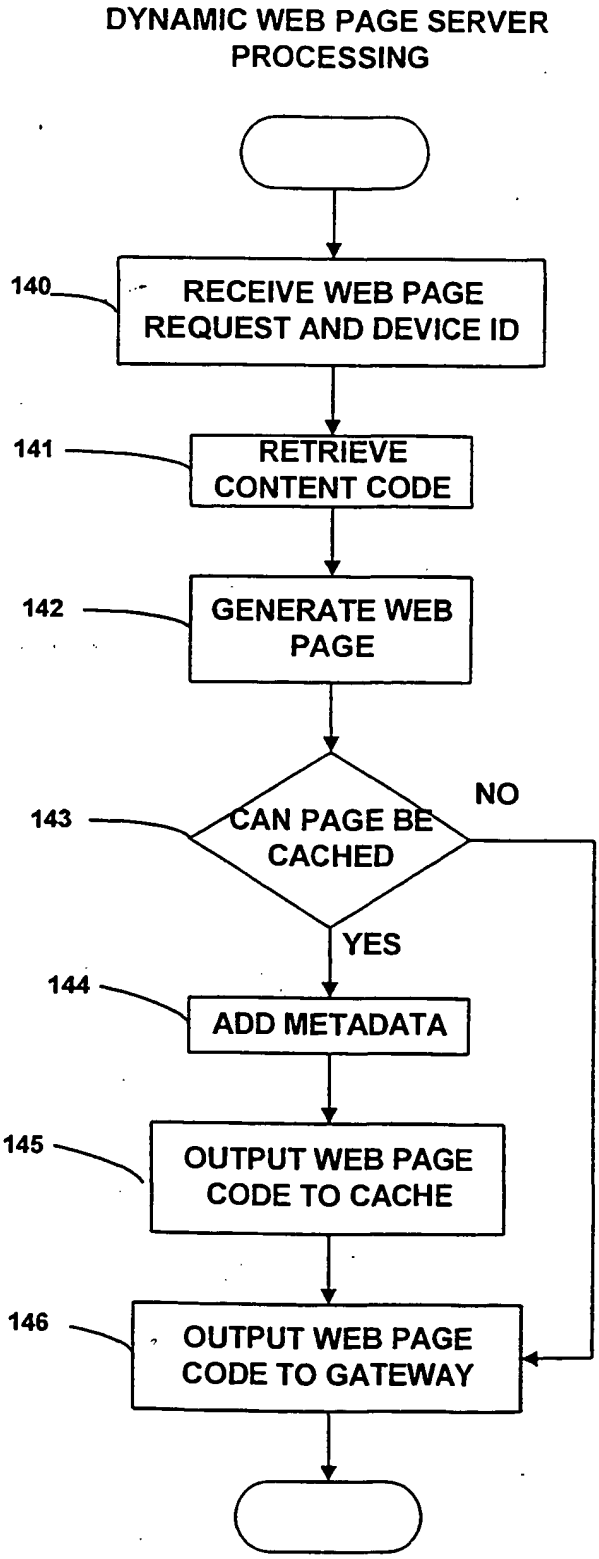

DYNAMIC WEB PAGE SERVER PROCESSING
140
RECEIVE WEB PAGE REQUEST AND DEVICE ID
141
RETRIEVE CONTENT CODE
142
GENERATE WEB PAGE
143
CAN PAGE BE CACHED
NO
YES
144
ADD METADATA
145
OUTPUT WEB PAGE CODE TO CACHE
146
OUTPUT WEB PAGE CODE TO GATEWAY

Fig 15

DATA SELECTION USING A COMPONENT LOGIC SOFTWARE MODULE

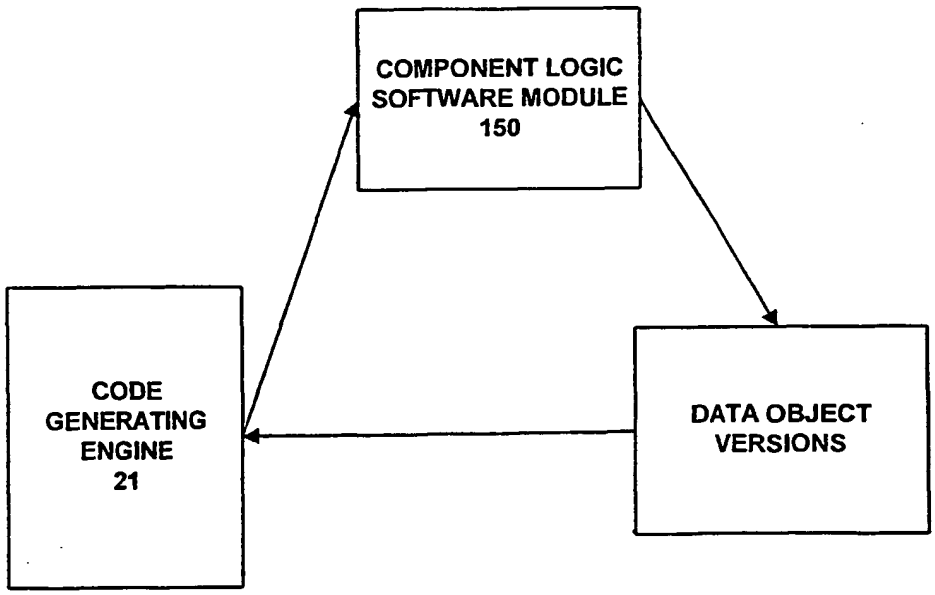


Fig 16

ACCESSING DATA DURING CODE GENERATION

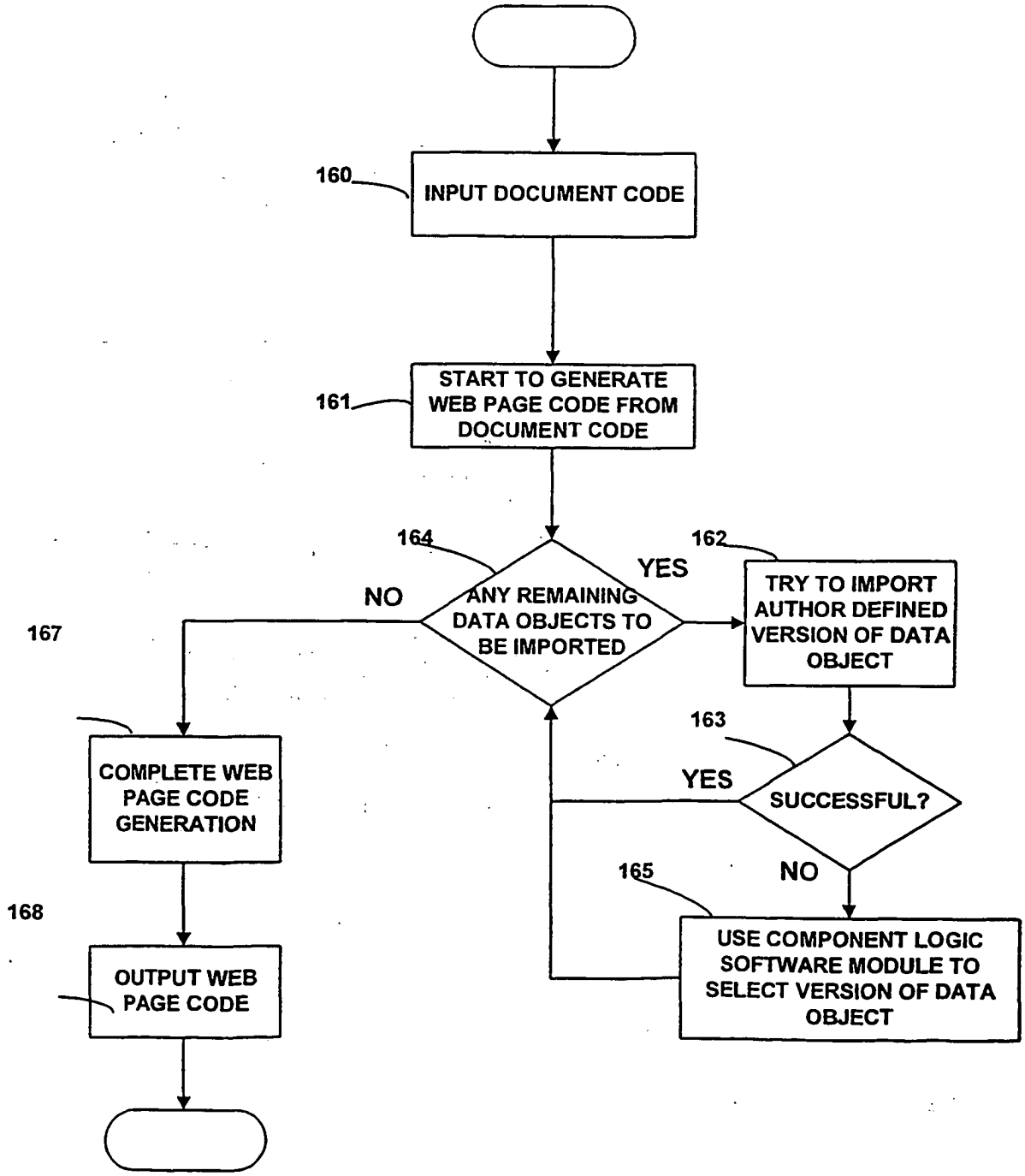


Fig 17

HEIRARCHY OF DATA OBJECTS WHICH ARE DIFFERENT VERSIONS OF DATA REFERENCED BY A SINGLE COMPONENT NAME

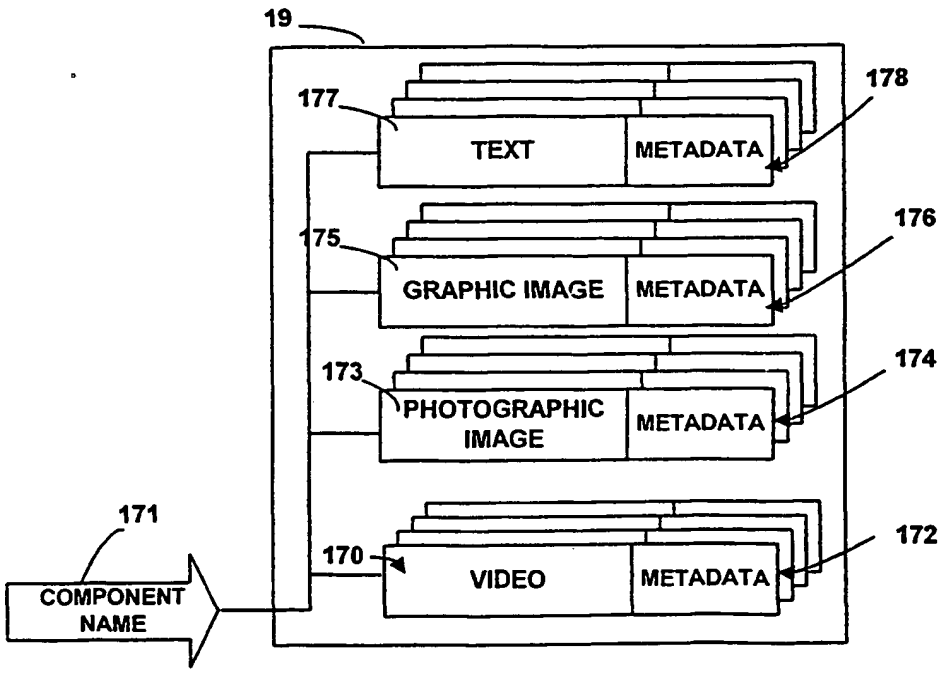


Fig 18

HEIRARCHY OF TEXT OBJECTS WHICH ARE DIFFERENT VERSIONS OF DATA REFERENCED BY A SINGLE COMPONENT NAME AND BY A LANGUAGE ID

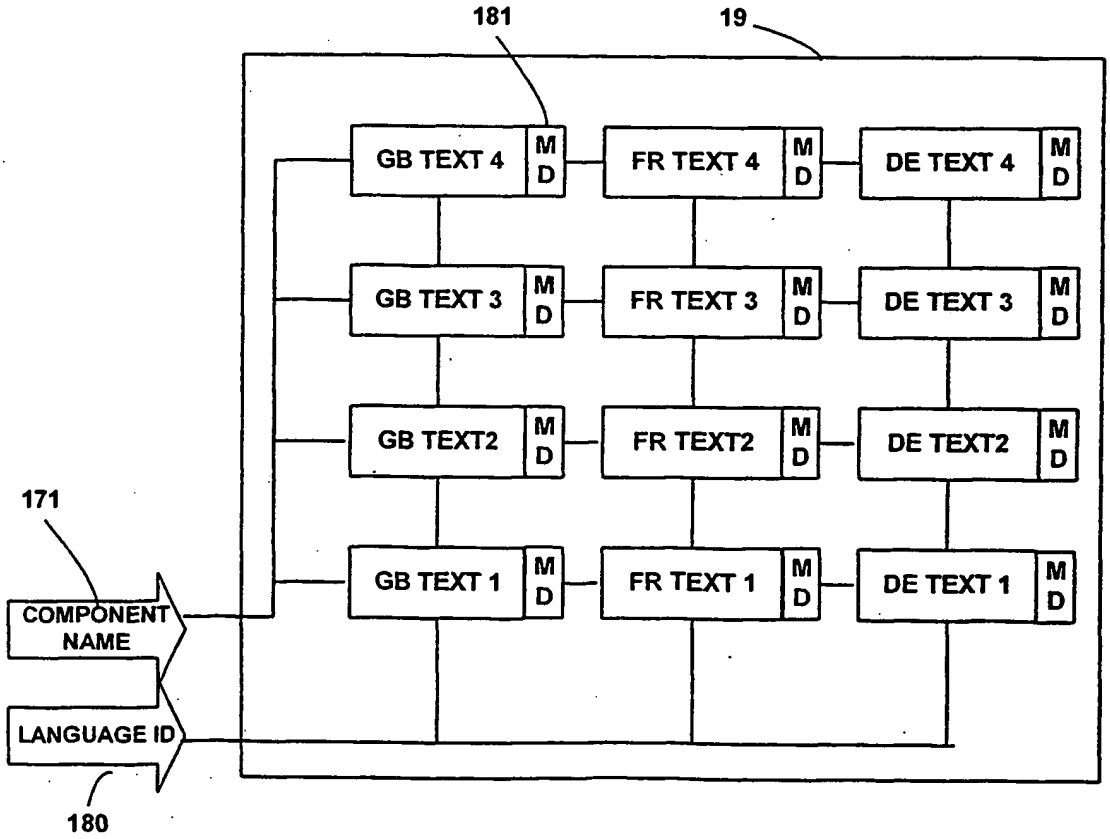


Fig 19

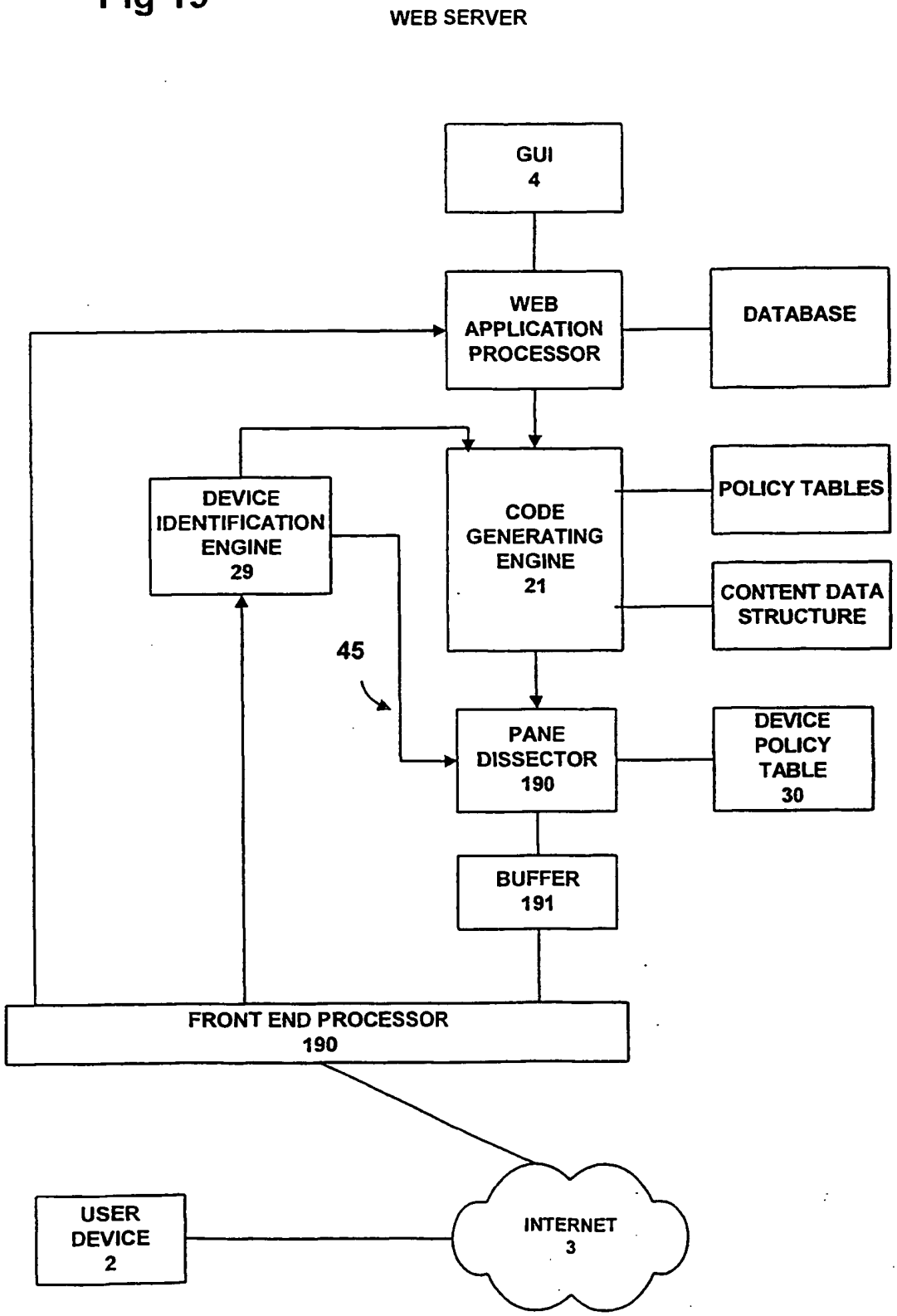

WEB SERVER
GUI
4
WEB APPLICATION PROCESSOR
DATABASE
DEVICE IDENTIFICATION ENGINE
29
CODE GENERATING ENGINE
21
POLICY TABLES
CONTENT DATA STRUCTURE
45
PANE DISSECTOR
190
DEVICE POLICY TABLE
30
BUFFER
191
FRONT END PROCESSOR
190
USER DEVICE
2
INTERNET
3

Fig 20

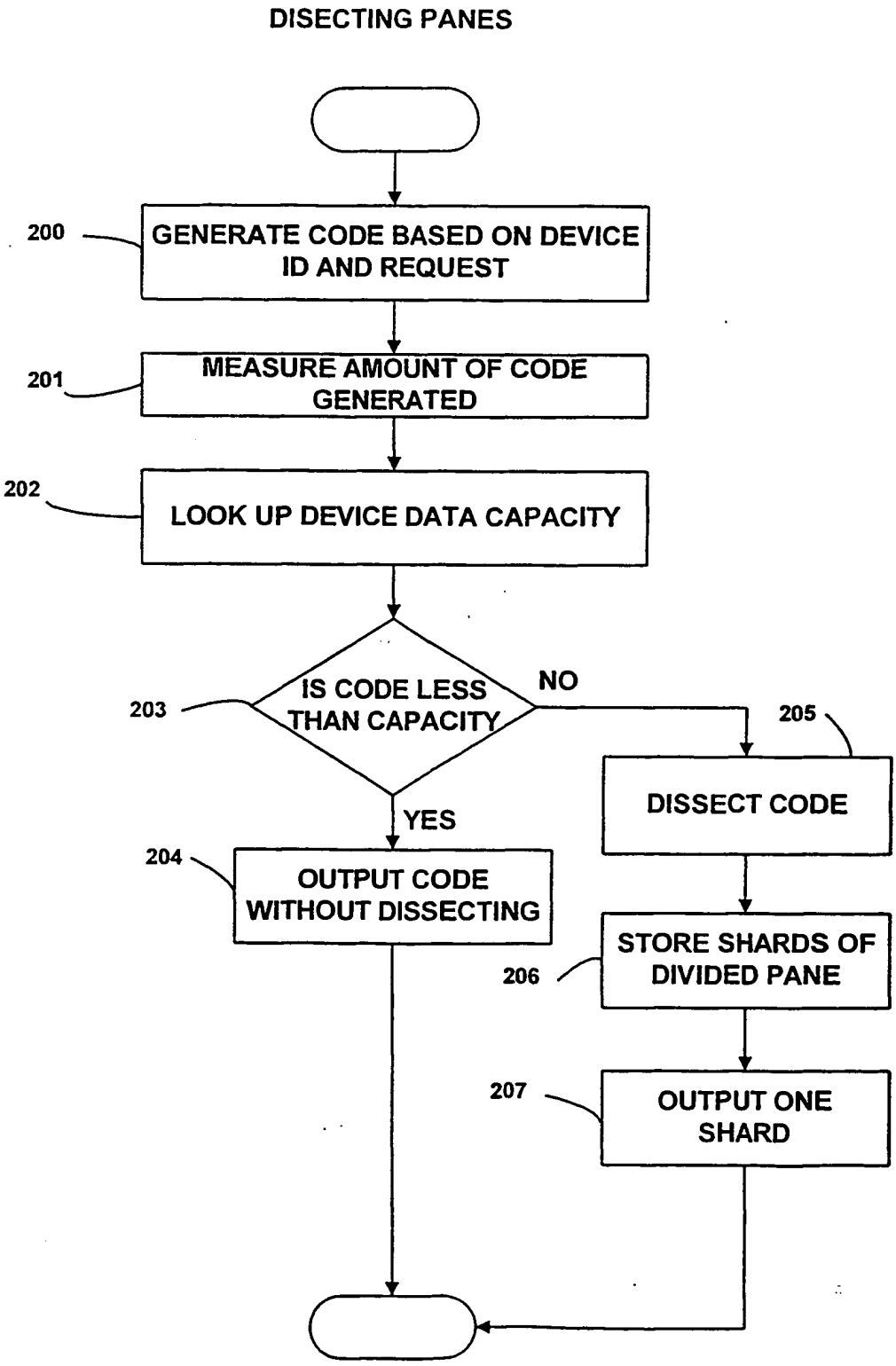

DISECTING PANES
200
GENERATE CODE BASED ON DEVICE ID AND REQUEST
201
MEASURE AMOUNT OF CODE GENERATED
202
LOOK UP DEVICE DATA CAPACITY
203
IS CODE LESS THAN CAPACITY
NO
YES
205
DISSECT CODE
204
OUTPUT CODE WITHOUT DISSECTING
206
STORE SHARDS OF DIVIDED PANE
207
OUTPUT ONE SHARD

Fig 21

DISSECTING PANES

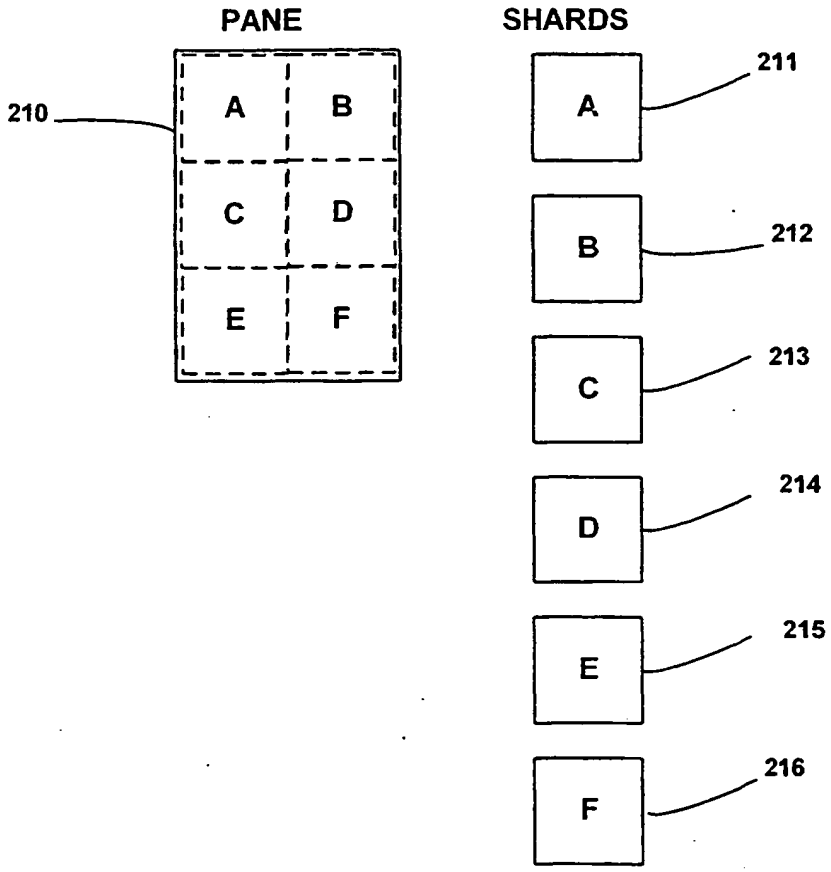


Fig 22 SESSION MEMORY

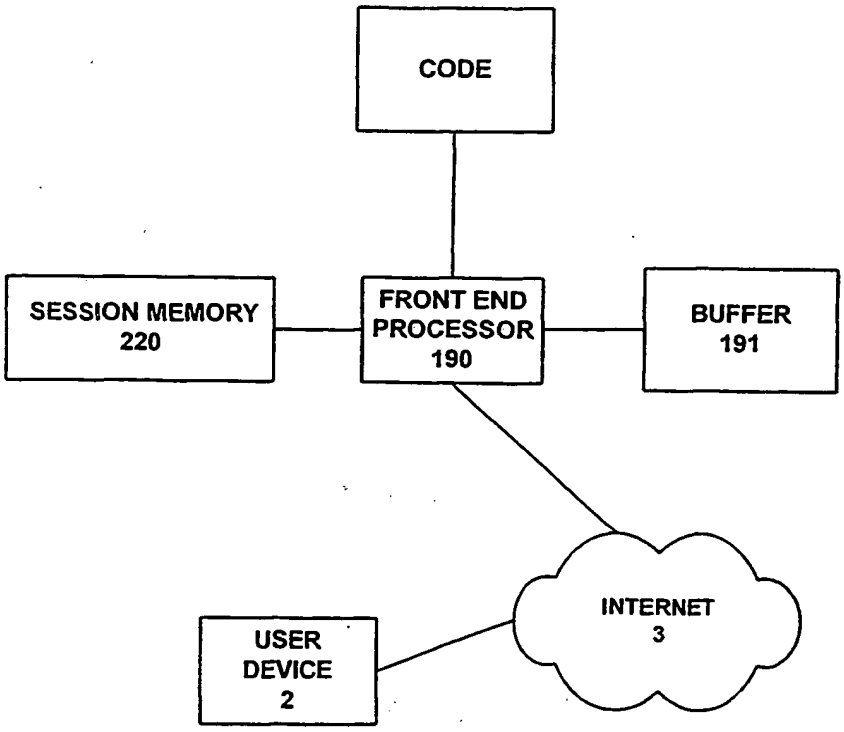


Fig 23

DISECTING FORMS

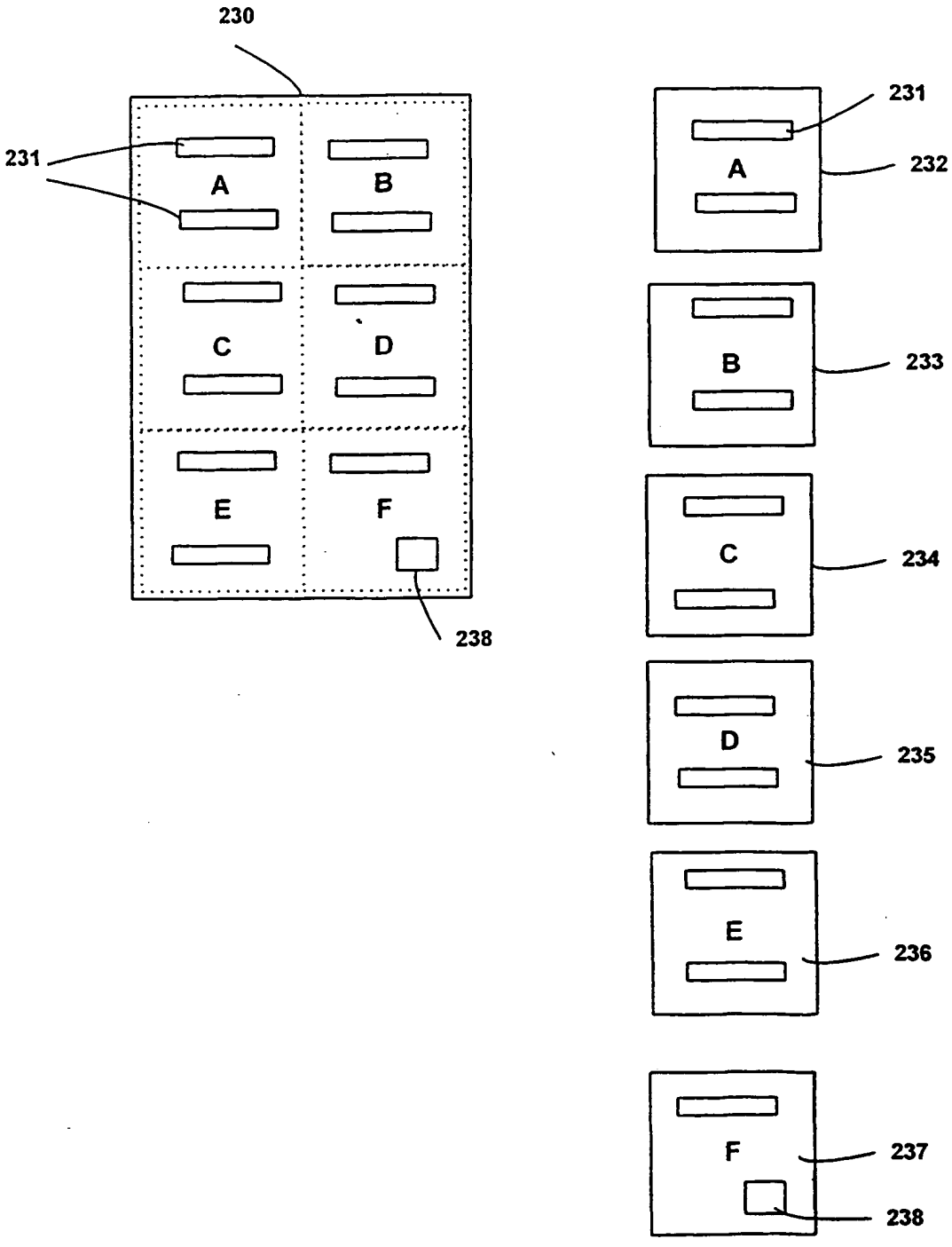


Fig 24

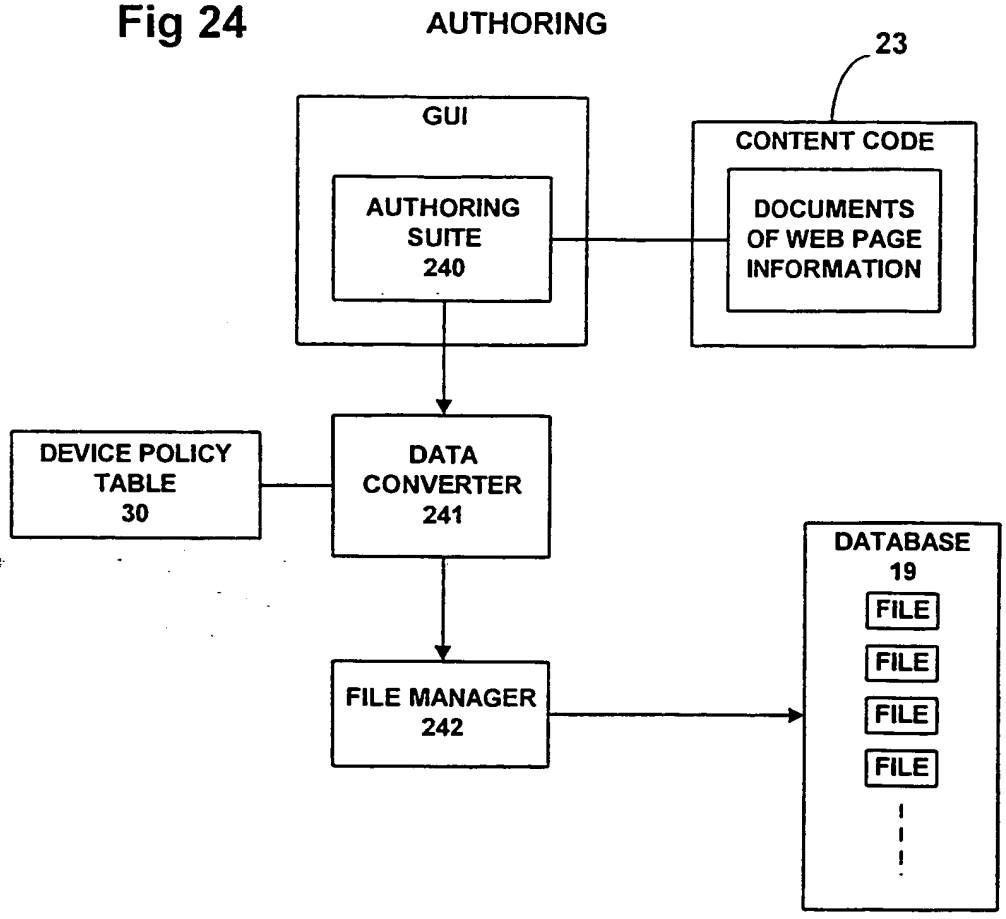
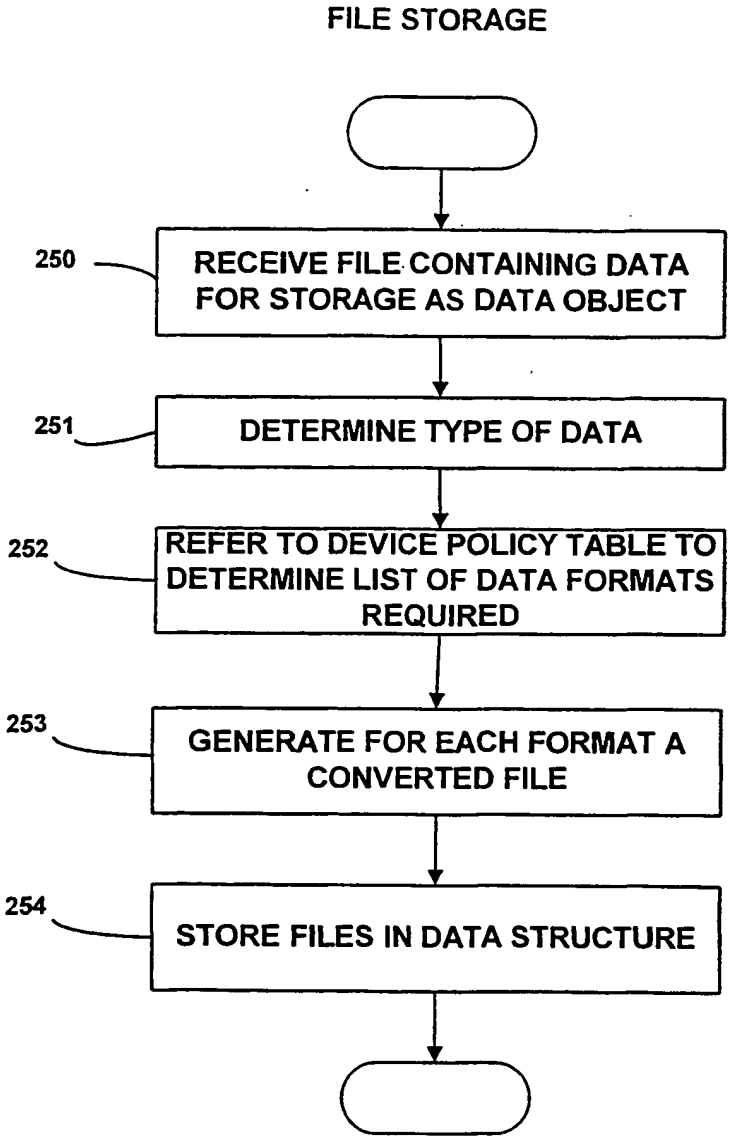

AUTHORING
23
GUI
AUTHORING SUITE 240
CONTENT CODE
DOCUMENTS OF WEB PAGE INFORMATION
DEVICE POLICY TABLE 30
DATA CONVERTER 241
FILE MANAGER 242
DATABASE 19
FILE
FILE
FILE
FILE

Fig 25


FILE STORAGE
250
RECEIVE FILE CONTAINING DATA FOR STORAGE AS DATA OBJECT
251
DETERMINE TYPE OF DATA
252
REFER TO DEVICE POLICY TABLE TO DETERMINE LIST OF DATA FORMATS REQUIRED
253
GENERATE FOR EACH FORMAT A CONVERTED FILE
254
STORE FILES IN DATA STRUCTURE

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 April 2002 (04.04.2002)

PCT

(10) International Publication Number
WO 02/027543 A3

(51) International Patent Classification[7]: H04L 29/06

(21) International Application Number: PCT/GB01/04235

(22) International Filing Date:
24 September 2001 (24.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0023570.5 26 September 2000 (26.09.2000) GB

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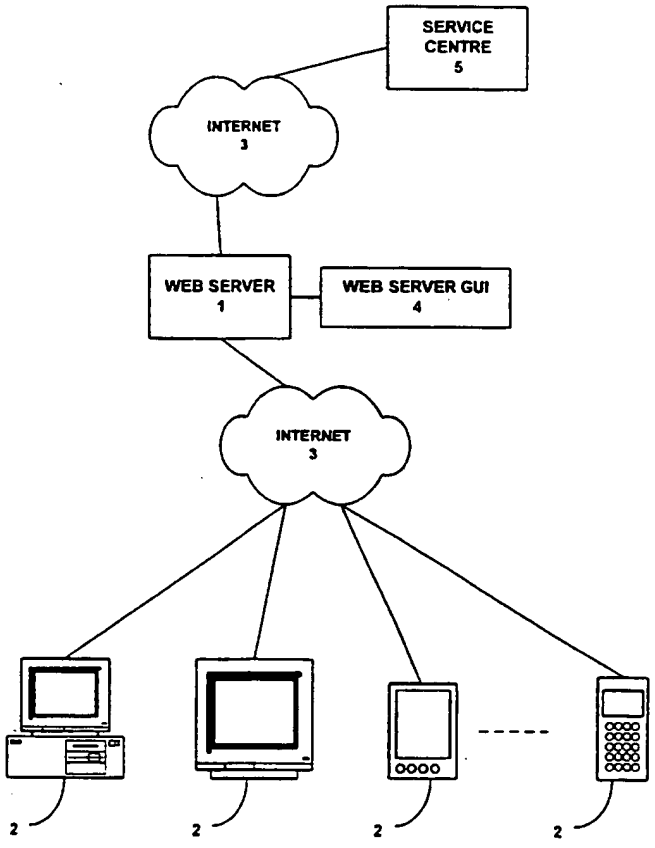
(74) Agents: **BERESFORD, Keith, Denis, Lewis** et al.; Beresford & Co, 2-5 Warwick Court, High Holborn, London WC1R 5DH (GB).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, 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, PH, 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

[Continued on next page]

(54) Title: NETWORK SERVER



(57) Abstract: A web server (1) responds to a request message from a remote user device (2) by dynamically generating web page code capable of being interpreted by the user device. A device type identifier (45) is extracted from the request message and is input to a code generating engine (25) which interprets stored instructions for generating the web page code with reference to selected device dependent information corresponding to the device type identifier. The web page information is stored as a content document comprising a set of instructions written in a script language. The web server generates web pages in an appropriate form for each user device without the need to convert web pages from one form to another.

WO 02/027543 A3

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:
— *with international search report*

(88) Date of publication of the international search report:
14 November 2002

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 01/04235

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L G06F

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99 57657 A (LEXTRON SYSTEMS INC) 11 November 1999 (1999-11-11) abstract page 11, line 2 -page 13, line 16 page 14, line 25 -page 19, line 5 figures 3,4	1-115
A	SHIMADA T ET AL: "Interactive scaling control mechanism for World-Wide Web systems" COMPUTER NETWORKS AND ISDN SYSTEMS, NORTH HOLLAND PUBLISHING. AMSTERDAM, NL, vol. 29, no. 8-13, 1 September 1997 (1997-09-01), pages 1467-1477, XP004095341 ISSN: 0169-7552 the whole document	1-115

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[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
5 August 2002	14/08/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Canosa Aresté, C

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FOX A ET AL: "Reducing WWW latency and bandwidth requirements by real-time distillation" COMPUTER NETWORKS AND ISDN SYSTEMS, NORTH HOLLAND PUBLISHING. AMSTERDAM, NL, vol. 28, no. 11, 1 May 1996 (1996-05-01), pages 1445-1456, XP004018241 ISSN: 0169-7552 the whole document ---	1-115
A	BICKMORE T W ET AL: "Digestor: device-independent access to the World Wide Web" COMPUTER NETWORKS AND ISDN SYSTEMS, NORTH HOLLAND PUBLISHING. AMSTERDAM, NL, vol. 29, no. 8-13, 1 September 1997 (1997-09-01), pages 1075-1082, XP004095305 ISSN: 0169-7552 the whole document -----	1-115

BNSDOCID: <WO_____0227543A3_I_>

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 01/04235

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BNSDOCID: <WO_____0227543A3_I_>

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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 992 922 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.04.2000 Bulletin 2000/15

(51) Int Cl.7: **G06F 17/30**

(21) Application number: **99307580.3**

(22) Date of filing: **24.09.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **29.01.1999 US 236622**
02.10.1998 US 102944 P

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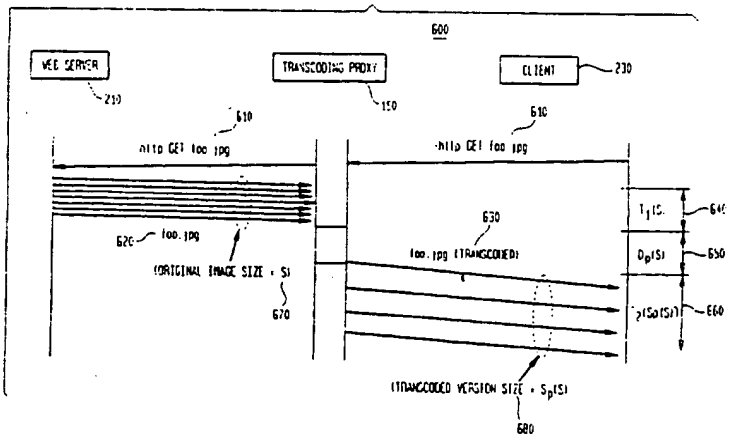
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(54) Automatic image data quality adjustment to reduce response time of a Web server

(57) The present invention provides methods, devices and systems for dynamically adjusting transcoding parameters so as to increase the benefits of transcoding. Methods of adaptation are designed to cope with the variability of network characteristics and of the size of transcoded images. The invention also provides a method and apparatus to enable the transcoding proxy to adjust a quality-size tradeoff on a per-image and/or a per-client basis. The adaptive transcoder chooses different parameters for each object, and provides performance improvements. The invention further provides a general framework for making policy decisions taking into account available bandwidth, content and type of image, and user preferences. The invention also includes methods for generating feedback about the choice of optimal transcoding parameters to the user.

FIG. 6



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Description

[0001] This invention relates to browser proxies that transform image objects embedded inside documents. It is more generally related to any proxy or gateway system that processes MIME encapsulated objects and the world wide web.

[0002] Transcoding proxies sometimes act as intermediaries between web servers and a variety of client devices that are connected over communication links with widely varying characteristics. Generally, a transcoding proxy provides two major benefits: dramatic reduction in download times for low-bandwidth links, and tailoring of web data to the client device.

[0003] Mobile devices are frequently connected via low-bandwidth wireless or medium bandwidth wireline modem links that make the viewing of rich web content, such as images, very cumbersome due to the very long download times that result. In addition, the cost of such downloads can be prohibitive over tariffed wide-area wireless networks. Transcoding web proxies can reduce the size of web data while maintaining most of its semantic value. Download time reductions of six to ten times may be achieved for many typical web images without losing their intelligibility.

[0004] The second important benefit is that such an intermediate proxy is sometimes also capable of tailoring text and images for the multitude of small, weakly connected, but web-enabled, mobile devices that are now available. The capabilities of these mobile devices to receive, process, store and display web content varies widely. Given the variety of client devices, it is difficult for Internet content publishers to tailor content for the individual devices. Consequently, an active web proxy is used to transcode/change the web content to best fit the resolution, color-depth, and size constraints of a small-screened device and to reduce the size of the stored data to a fraction of its original size.

[0005] A typical transcoding web proxy may be implemented by adding a transcoding module in an HTTP proxy. The transcoding module is an input/output system that takes a data object (e.g., an image or HTML page) as input and transforms it into a low resolution object (e.g., a low-quality image or summarized HTML page) according to a set of chosen parameters. These parameters are input to the transcoder, which determines the resolution loss and size reduction of the object. The following discussion is mostly concerned with image objects.

[0006] To maximize the benefits of transcoding, it is important to choose the quality Vs. size tradeoff such that the best quality image is sent within the delay tolerance specified by the user. Choosing the right set of transcoding parameters, however, is difficult. First, it is hard to estimate the size of the transcoded image size because the degree of compression achieved through transcoding is content dependent. For example, some JPEG files can be compressed by up to 80% while others may only yield less than 5% compression. The same is true when GIF-to-GIF or GIF-to-JPEG transformations are applied. Since transcoding is a compute-intensive process, processing is only worthwhile when high compression ratios can be achieved. For images that are already well-compressed (or of low quality) transcoding may be wasteful.

[0007] Even if the size of the transcoded output can be predicted, network variability makes it hard to predict image download times. Since the user perceived quality and latency are the final performance measures, accurate estimates of download times are needed in order to choose the optimal point in the quality Vs. size tradeoff. Over best effort service networks, such as the Internet, accurate estimates of network characteristics (bandwidth, delay, loss rate) are hard to compute. Often the variance is so large that the statistical estimates are not meaningful for making any quality adjustments.

[0008] Another issue that makes policy decisions a complicated task is the location of the bottleneck in the network. when the path between the web server and the proxy is the bottleneck, transcoding does not help at all. On the contrary, it makes things worse due to the store and forward nature of the operation. Ideally, web proxies should stream images from web servers to clients whenever the server to proxy path is the bottleneck. Even in cases where the proxy to client path is the bottleneck, any benefit due to size reduction must be weighed against the store and forward delay incurred due to transcoding.

[0009] Due to the difficulty of estimating the network characteristics and image content, transcoding proxies may often only support adaptation at a very coarse level. Adaptation involves changing transcoding parameters which are usually selected from a predefined set of defaults, or chosen by the user. The problem with both approaches is that the full potential of transcoding is not utilized. Predefined static policies are unresponsive to changes in network bandwidth and user selectable policy decisions are likely to be sub-optimal due to the lack of knowledge about the state of the network. No method exists for providing feedback to the user about the combined state of the network and the proxy. Using iterative refinement, users can converge to the optimal choice of transcoding parameters, but such a process is time consuming and not very user-friendly.

[0010] Figure 1 shows an example transcoding proxy scenario 100 with varied links and varied client devices. As shown in Figure 1, we consider an example scenario in which all of the web requests and responses for clients 130-134 are passed through a generic (Hypertext Transfer Protocol) HTTP proxy 190. In the example scenario of Figure 1, it is the downloading of large data objects, primarily images, over the last link 160-164 from the proxy to the client that typically is the main source of delay in the end-to-end response time experienced by the clients 130-134.

[0011] The transcoding proxy 190 provides massive data thinning of web data to enable real-time browsing of web

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data over low-speed wide-area wireless links like Cellular Digital Packet Data (CDPD) 163 that provides 10 kb/s or less of throughput, depending upon the number of clients sharing the link The end client could be a full-function PC 134 with a good color display so that the primary problem is bandwidth reduction. Alternatively, the client might be a small, web-enabled, mobile devices 130-132 in which case it is advantageous to tailor the web data for the specific client device, particularly the client's display characteristics. Different aspects of transcoding proxy design benefit different scenarios (i.e., tariffed proxy-client link, strong/weak client display, etc.), but all are handled well within the same proxy architecture 100.

[0012] Figure 2 shows a block diagram of an embodiment of transcoding proxy 190 used to transform objects based on user specified preferences and static policies. A transcoding proxy 190 is built by combining a transcoding module 240 with an HTTP proxy engine 220. An HTTP request 222 originates from a client 230 and is forwarded 224 by the proxy 190 to a web server 210. The response data 226 (i.e., HTML pages and GIF and JPEG images) are transformed by the transcoder 240 and then forwarded 228 to the client 230. Typically, a number of transcoding parameters are specified to the transcoder 240 in order to achieve the desired quality/size reduction of the object contained in the response data 226. Transcoding proxies in use today either use a static set of policies 250 or use some form of user specified preferences 260 via path 265 to determine the transcoding parameters. When a fixed set of transcoding parameters are applied to all objects, results are not always beneficial. In fact, in many cases, transcoding leads to poorer performance.

[0013] Accordingly, in a first aspect, the present invention provides a method for a transcoding proxy to facilitate browsing between a plurality of client devices and a plurality of servers connected via a communication network, the method comprising: receiving a request from one of the client devices for an object stored at one of the servers, forwarding the request for the object to said one of the servers, receiving the object from said one of the servers, examining preferences specified by a user of said one of the client devices, examining contents of the object, examining communication network characteristics, choosing a set of transcoding parameters, forming a transcoded form of the object, and sending the transcoded form to said one of the clients.

[0014] Preferably, the network characteristics include bandwidth, and examining network characteristics includes estimating network bandwidth between said one of the servers and the proxy as well as between the proxy and said one of the clients.

[0015] Preferably, the network characteristics include delay, and the step of examining network characteristics includes estimating delay between said one of the servers and the proxy as well as delay between the proxy and said one of the clients.

[0016] The method preferably further comprises providing feedback to the user about a level of transcoding performed on the object to form the transcoded form.

[0017] Preferably, the step of examining includes determining the size of the object.

[0018] In the method as described the object may be of type image forming an image object, and the method further comprises: determining dimensions of the image object, and calculating the compression ratio of the image object. Further to be preferred is that the dimensions of the image object are determined by area of the image in square pixels, and the compression ratio is determined by the bpp ratio of the image object.

[0019] The step of forming a transcoded form preferably employs dynamic adaptation.

[0020] The step of forming a transcoded form is preferably started before the step of receiving the object from said one of the servers is complete. The received object type is preferably of type JPEG forming a JPEG object. Further to be preferred is that the step of forming a transcoded form includes performing JPEG-to-JPEG image transcoding and the step of sending the transcoded form starts writing out at least one MCU of JPEG-encoded output image data before the step of receiving the object is complete.

[0021] In the method as described, the step of sending out the transcoded form is preferably started after processing an initial fraction of the received object, and before the step of receiving the image object from said one of the servers is complete.

[0022] The step of sending out the transcoded form is preferably started before the step of forming a transcoded form of the object is complete.

[0023] In a second aspect, the present invention provides a method for a proxy to form a transcoded form of an object received from a server in satisfaction of a request from a client for an object available from the server, the method comprising dynamically adapting parameters for transcoding the object for the client, forming a transcoded form of the object, and sending the transcoded form to the client. The step of adapting parameters preferably includes determining at least one characteristic of the object. One characteristic is preferably an object-header, the object-header providing information about the size and the type of the object. The method preferably further comprises comparing the size of the object to a threshold parameter called "size_threshold". The step of adapting parameters preferably includes gathering present network characteristics between the server and the proxy and between the proxy and the client. One of the characteristics is preferably network bandwidth and the step of adapting includes estimating network bandwidth between the server and the proxy as well as between the proxy and the client.

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[0024] In the method as described, the transcoded form is preferably dependent upon the estimated bandwidth The step of adapting also preferably includes retrieving preferences of the user, and wherein the transcoded form is dependent upon the preferences. The step of adapting preferably includes examining the contents of the object. The object is preferably of type image forming an image object, and examining the content of the image object includes determining dimensions of the image.

[0025] In the method as described, the step of adapting is preferably dependent upon determining the compression ratio of the image object. The type of image object is further preferably GIF and wherein the step of adapting is dependent upon comparing the compression ratio against a predetermined policy threshold called "gif_threshold".

[0026] The method as described preferably further comprises predicting at least one parameter of the transcoded form of the object. The transcoded form is further preferably the same as an original form of the object. Preferably, at least one of the parameters includes a size of the transcoded form. Preferably also, at least one of the parameters includes the time spent in transcoding the object.

[0027] In a third aspect, the present invention provides a method for predicting parameters of a transcoded form of an object, the object having an initial size and dimension, and the object being received from a server in satisfaction of a request from a client for the object, the method comprising: computing the bpp ratio of the object, gathering a set of statistics of a plurality of previously transcoded objects, and employing the set of statistics and the bpp ratio for predicting the parameters.

[0028] In a method as described, at least one of the parameters is preferably size and the set of statistics includes sizes of a plurality of previously transcoded objects statistics.

[0029] The object is preferably of type image and the set of statistics includes image quality. The plurality of previously transcoded objects are preferably chosen from a predetermined benchmark suite of images.

[0030] In a method as described, the step of employing preferably uses dynamically updating the set of statistics using the statistics of the currently transcoded object. At least one of the parameters is preferably a duration for forming a transcoded form of an object and the set of statistics includes the duration for forming a plurality of previously transcoded objects.

[0031] In a fourth aspect, the present invention provides a transcoding proxy system for facilitating browsing between a plurality of clients and a plurality of servers connected via a communication network, the proxy comprising an HTTP proxy engine to receive a request from one of the clients for an object stored at one of the servers, and to fetch the object from said one of the servers, an object transcoder to form a transcoded form of the object using a set of parameters for transcoding, a dynamic policy module to determine the set of parameters of transcoding, an image size and delay predictor module to gather characteristics of the object, a user preference module to gather quality preferences specified by a user of said one of the clients, and a bandwidth estimation module to estimate available network bandwidth, wherein dynamic policy module dynamically adjusting the parameters of transcoding using the input received from the image size and delay predictor module, user preferences module, and bandwidth estimation module for the purpose of improving satisfaction for the user, and the transcoding system providing feedback to the user about the level of transcoding performed.

[0032] The user preferences module preferably further collects the characteristics such as display size, resolution, & CPU speed of said one of the devices, and provides those characteristics to the dynamic policy module.

[0033] In the system as described, the bandwidth estimation module preferably collects traces of previously established network connections between said one of the servers & the proxy, collects traces of previously established network connections between the proxy and said one of the clients, and estimates the object download time by performing statistical analysis on the collected traces.

[0034] The statistical analysis used for estimating bandwidth between said one of the servers and the proxy is preferably based on computing a statistical measure such as median, mean, or mode of download times of previously fetched objects as determined from the collected traces.

[0035] The statistical analysis used for estimating bandwidth between the proxy and said one of the clients is preferably based on computing aggregate bandwidth of all active connections between the proxy and said one of the clients. The system preferably further comprises displaying a slide bar on said one of the client's display for collecting the user specified preferences. In a system as described, the user of said one of the clients can preferably specify the tradeoff between download time and data quality through the use of a graphical user interface with a slide bar. The user of said one of the clients can preferably specify through the use of a graphical user interface with a slide bar the tradeoff between download time and image quality including a specific switch to select color or gray scale as the desired output form. The user of said one of the clients can further preferably specify through the use of a graphical user interface with a slide bar, the desire to maintain a target response time such that the system automatically reduces data quality (and hence data download size) to compensate for dynamic variations in bandwidth to said one of the clients. The graphical user interface slider bar is also preferably used as an output interface for showing the optimal choice of transcoding parameters to the user.

[0036] In a fifth aspect, the present invention provides an article of manufacture comprising a computer usable me-

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dium having computer readable program code means embodied therein for causing dynamic adaptation of transcoded form of an object in a transcoding proxy, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect, a proxy receiving an object associated with a user from a server, determining parameters of the object, retrieving preferences of the user, gathering present network characteristics, obtaining transcoding policy thresholds, performing a policy decision based upon object parameters, user preferences, network characteristics, and policy thresholds, forming a transcoded object, providing feedback of a level of transcoding performed on the object to the user, and sending the transcoded object to the user.

[0037] In a sixth aspect, the present invention provides an article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing a transcoding proxy to facilitate browsing between a plurality of client devices and a plurality of servers connected via a communication network, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect: receiving a request from one of the client devices for an object stored at one of the servers, forwarding the request for the object to said one of the servers, receiving the object from said one of the servers, examining preferences specified by a user of said one of the client devices, examining contents of the object, examining communication network characteristics, choosing a set of transcoding parameters, forming a transcoded form of the object, and sending the transcoded form to said one of the clients.

[0038] The computer readable program code means in said article of manufacture preferably further comprises computer readable program code means for causing a computer to effect providing feedback to the user about a level of transcoding performed on the object to form the transcoded form. The computer readable program code means in said article of manufacture preferably further comprises computer readable program code means for causing a computer to effect determining dimensions of the object, and calculating the compression ratio of the object. The computer readable program code means in said article of manufacture preferably further comprises computer readable program code means for causing a computer to effect starting the step of forming a transcoded form before the step of receiving the object from said one of the servers is complete.

[0039] In a seventh aspect, the present invention provides a computer program product comprising a computer usable medium having computer readable program code means embodied therein for causing a proxy to form a transcoded form of an object received from a server in satisfaction of a request from a client for an object available from the server, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect: dynamically adapting parameters for transcoding the object for the client, forming a transcoded form of the object, and sending the transcoded form to the client.

[0040] The computer readable program code means in said computer program product preferably further comprises computer readable program code means for causing a computer to effect gathering present network characteristics between the server and the proxy and between the proxy and the client. The computer readable program code means in said computer program product preferably further comprises computer readable program code means for causing a computer to effect adapting parameters for transcoding based upon the estimated bandwidth and preferences of the user.

[0041] In an eighth aspect, the present invention provides a program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for predicting parameters of a transcoded form of an object, the object having an initial size and dimension, and the object being received from a server in satisfaction of a request from a client for the object, said method steps comprising: computing the bpp ratio of the object, gathering a set of statistics of a plurality of previously transcoded objects, employing the set of statistics and the bpp ratio for predicting the parameters.

[0042] Said method step of employing the set of statistics preferably further comprises updating the set of statistics using the statistics of the currently transcoded objects.

[0043] An aspect of the present invention is to provide methods, devices and systems for dynamically adjusting transcoding parameters so as to increase the benefits of transcoding. Methods of adaptation are designed to cope with the variability of network characteristics and of the size of transcoded images.

[0044] In an embodiment, the invention includes three new components: an image size predictor, a network bandwidth (b/w) analyzer, and a policy module. Before initiating any transcoding action, the policy module queries the image size predictor to estimate the size of the output image. The b/w analyzer is queried to collect an estimate of the image transmission time from the server to the proxy, and from the proxy to the client. Based on the collected estimates, the proxy decides whether or not to transcode the image. In addition, the policy module can also compute the optimal point in the quality vs. size tradeoff that would provide the user specified performance criteria (e.g., reduced response time, increased quality).

[0045] Another aspect of the present invention is to provide a method and/or apparatus to enable the transcoding proxy to adjust a quality-size tradeoff on a per-image and/or a per-client basis. The adaptive transcoder chooses different parameters for each object, and provides performance improvements.

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[0046] Still another aspect of this invention provides a general framework for making policy decisions taking into account available bandwidth, content and type of image, and user preferences. The administrator of the proxy chooses from a variety of optimization objectives so as to obtain improved performance from the system. In one embodiment when the proxy transcoder throughput is the bottleneck, the policy module is instructed to judiciously use CPU resources so as to reduce the response time for all users. An advantageous element of the invention is the automated nature of decision making, to free up users from actively controlling the policy engine of the proxy.

[0047] In still another aspect of the present invention a method is provided for generating feedback about the choice of optimal transcoding parameters to the user. In an example of embodiment, the transcoding system provides feedback to the user by dynamically adjusting the position of the user preference slider bar. The user preference slider bar serves both as an input as well as an output device.

[0048] A preferred embodiment of the present invention will now be described by way of example, with reference to the drawings in which:

FIG. 1 shows an example transcoding proxy scenario with varied links and varied client devices;

FIG. 2 shows a block diagram of a transcoding proxy used to transform objects based on user specified preferences and static policies;

FIG. 3 shows a block diagram of an example of a transcoding proxy modified in accordance with the present invention to include an image size predictor, bandwidth estimator, dynamic policy module, and a user feedback generator.

FIG. 4 shows an example block diagram of an example HTTP proxy with caching and transcoding modules in accordance with the present invention;

FIG. 5 shows an example flow diagram of a transcoding dynamic policy module in accordance with the present invention;

FIG. 6 shows an example web request-response cycle using a transcoding proxy in accordance with the present invention;

FIG. 7 shows an example regime where transcoding is useful in accordance with the present invention;

FIG. 8 shows an example flow diagram of a example policy function in accordance with the present invention;

FIG. 9 shows an example block diagram of an example image size prediction module in accordance with the present invention;

FIG. 10 shows an example block diagram of an example bandwidth prediction module in accordance with the present invention;

FIG. 11 shows input/feedback user interface in accordance with the present invention; and

FIG. 12 illustrates an example timing diagram of streaming transcoding in accordance with the present invention.

[0049] Figure 3 shows a block diagram 300 of an example embodiment of changes to transcoding proxy 190 in accordance with the present invention. A comparison of Figure 3 to Figure 2 shows a replacement of the static policy module, 250 in Figure 2, with a dynamic policy module, 370 in Figure 3. A purpose of the dynamic policy module 370 is to make decisions concerning when to turn transcoding on and off and what transcoding policy (i.e., the transcoding algorithm along with its parameters) to use. The dynamic policy module 370 also interfaces with an image size and delay predictor 375, a bandwidth estimator 380, and a user feedback provider 390. In the embodiment shown, the policy module 370 employs a number of criteria, including: the characteristics of the data (e.g., size of the images, current encoding efficiency, structural role in the HTML page) as determined by the content analysis flow diagram (shown in Figure 5), the current estimate of the bandwidth on the proxy-to-client and server-to-proxy links (shown in Figure 10), the characteristics of the client, particularly the client display capabilities, and the user preferences concerning the preferred rendering of the data (shown as the user slide bar preferences in Figure 11).

[0050] The items shown in Figures 5, 10 and 11 are described below. In particular, the user *slide bar preferences* of Figure 11, provide a method of interacting with the transcoding proxy so as to dynamically change the tradeoff between

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image quality and download time. In addition to serving as an input interface, the slider bar (1140 1150 1160 of Figure 11) also acts as an output interface, displaying the feedback 390 that is received from the dynamic policy module 370

[0051] Figure 4 shows a block diagram 400 illustrating an example function of a multi-resolution cache 410 in a transcoding HTTP proxy system 400 in accordance with the present invention. Caches are useful in HTTP proxies to provide reduced response time for repeated data requests (by the same or different clients) for the same data object. A variety of methods may be used to assure that the cached data is up-to-date. In the example caching transcoding system 400, the multi-resolution cache 410 stores an original version of the data, as well as other possible forms of the data, including reduced resolution versions that have been transcoded for specific device types.

[0052] As an example, we again consider the case of an image data object, but it is understood by those skilled in the art that these methods can be applied to other data types. We describe a method for storing, tagging and retrieving various forms of the data in the context of a caching transcoding proxy system.

[0053] Referring to Figure 4, it is assumed that a JPEG image is received from the server 210 in response to a request by a client 230. This image is decoded from the lossy JPEG encoding format to a bit-map representation of the image. Those skilled in the art of image processing recognize that the JPEG encoding standard describes images using coefficients that weight Discrete Cosine Transforms (DCTs) so a compute-intensive decoding step is generally required to obtain the actual colors of each pixel. This bit-map requires a larger storage size than the original JPEG image. However, given an adequate size cache it may be worthwhile to store (via data path 420) this expanded size image so as to avoid the compute-intensive step of JPEG decoding when a transcoded version of the same image is later required but with different transcoding parameters than the first request. In a second step, based on the transcoding parameters (i.e., color depth, scaling factor, and the JPEG quality factor) the JPEG image is re-encoded. The image may be re-encoded as a JPEG image or in an alternative encoding format. The final transcoded version of the image is also stored in the multi-resolution cache 410 via data path 420.

[0054] In the example embodiment, when additional data requests occur, the HTTP proxy 220 first checks its cache 410 to see if an "up-to-date" version of the data object is available at the requested resolution or transcoding level. Each object in the multi-resolution cache 410 is stored with a version specifier that includes: a URL description, a time stamp for the data object, and the object characteristics. For a JPEG image the object characteristics include color-depth, scaling factor, and JPEG quality factor. An alternative embodiment has an indication that the JPEG image has been decoded and stored in its bit-map form, or that it has been converted and stored as a GIF with various characteristics.

[0055] If an up-to-date version of the object is available with the requested type and resolution, then that version is returned to the client. If this is not available, but an up-to-date version of the object exists in either its original JPEG form or the decoded bit-map form, then this version is returned to the transcoder 240 with an indication of its characteristics. This enables the transcoder 240 to produce the desired version of the object, which is returned to the client 230 and stored in the multi-resolution cache 410 via data path 420.

[0056] It is noted that there are several extensions to this scheme that are obvious to those skilled in the art. One extensions uses an already transcoded version of the object, rather than to the original data object, to generate a further resolution-reduced version of the object. Methods for managing the different resolution versions of data objects in a cache are further described in R. O. LaMaire and J. T. Robinson, "Conserving Storage Space by Means of Low Resolution Objects", docket Y0997308, US patent application filed February 13, 1998.

[0057] Figure 5 shows an example flow diagram for the dynamic policy module 370 of Figures 3 and 4. Figure 5 also shows how the policy module 370 interfaces with the HTTP proxy engine 220 and the object transcoder 240 of Figure 3. The methods described below apply to many content types including text, images, audio, and video. However, the following discussion focuses on image data types only. It is evident to those skilled in the art that concepts and dynamic policies are applicable to other media types.

[0058] Figure 5 shows that based on the response header received from the server 210, the HTTP proxy engine 220 first determines the size of the object 510. If the content-type of the response is "image/*" 520, the proxy engine 220 passes the handle for the object to the dynamic policy module 370 for further analysis. Inside the policy module 370, the size of the input object is compared against a pre configured threshold called "size_threshold" 530. If the objects is smaller than "size_threshold", or the content type is not "image/*" 520, then the object is not transcoded, but instead is forwarded 515 to the client without any content modification. Small objects (such as bullets, thumbnails, logos, etc.) found on the web are typically GIF objects which are already well compressed due to GIF encoding. Transcoding such objects does not generally yield further compression.

[0059] We convert GIF images to GIF or JPEG images that are reduced in size and/or color-depth (the choice of GIF or JPEG as the end format depends on the image characteristics). In addition, we convert JPEG images to JPEG images that are reduced in JPEG quality, size, and/or color-depth. JPEG quality refers to a transcoding parameter that is used to determine the degree to which the coefficients of the Discrete Cosine Transformations used in the JPEG encoding standard are quantized. It has been found that the JPEG quality parameter is also a good predictor of perceived image quality This parameter varies in the range 1 to 100, where 100 represents very high quality. JPEG images

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found on the web typically have a JPEG quality parameter of 75.

[0060] For large images, the type of the image coding (JPEG or GIF) and the efficiency of coding are important factors in transcoding decision making. Since JPEG is a lossy compression method, size reduction is always possible by reducing quality factor. Similar quality reduction, however, cannot be applied to GIF files since GIF is a lossless compression method. To achieve quality reduction, a GIF file must first be decoded and then re-encoded as a quality-reduced JPEG image. This method, however, may not always provide size reduction. GIF format is usually more efficient for coding maps, logos, and drawings while JPEG is more efficient for coding natural images. Converting GIF to JPEG is useful only when the original GIF image is not efficiently coded.

[0061] we define bits per pixel (bpp) as a measure of the compression efficiency. Bpp is computed as the ratio of the image file size to the image area in pixels. In processing step 540, X and Y dimensions and the bpp value of the input image are computed by parsing the image header. If the input object is of type "image/jpg" 550, transcoding is always performed. -However, if the content type is "image/gif" 525, only those objects which yield a bpp ratio larger than "gif_threshold" 535 are transcoded. GIF files that are not very efficiently encoded yield a bpp value that is larger than "gif_threshold". Thus, the decision step 535 is very effective in identifying compressible GIF files with high accuracy. Though not show in Figure 5, it is evident to those skilled in the art that other transcoding policies, such as scaling and file truncation (for progressively encoded data) can be used for well-compressed GIFs.

[0062] An important aspect of the proposed invention is that decision steps 510-565 are carried out as soon as the image header is received. If the decision is to not transcode, image segments can be forwarded as soon as they are received from the server without incurring store and forward delay. Similarly, when transcoding is to be performed, images can either be buffered and then transcoded (store and forward transcoding), or each segment can be transcoded on-the-fly (streaming transcoding method).

[0063] After identifying an image that is compressible, the next step involves determining the extent to which the selected image should be transcoded. The policy function 565 is responsible for collecting input from three different sources (image size predictor 375, bandwidth estimator 380, user preference selector 260) and subsequently selecting transcoding parameters in accordance with the steps shown in Figure 8. The chosen parameters determine the extent and types of compression performed by the object transcoder 240. For example, the scaling parameter determines how much an image is downsampled. Quantization parameters control how an image is quantized in the pixel domain and/or the frequency domain. The number of colors in a color mapped image can be reduced, or a 24-bit color image may be converted to 8-bit grayscale, or even a monochrome representation. The process of transcoding is performed in step 570 and the output of the transcoder is forwarded to the client 230.

[0064] An important aspect of the policy function 565 is the analytical framework for making transcoding decisions. The analytical framework takes into consideration factors such as available bandwidth, type and size of the image, user preferences and provides an objective criteria for making transcoding decisions. As an example, we consider the objective of minimizing response time for the user, but it is understood by those skilled in the art that using the same framework other optimization criteria can also be applied. We describe a method for determining when it is beneficial to transcode, and to what extent transcoding should be applied. The embodiment described herein is referred to as dynamic adaptation of transcoding parameters.

[0065] Figure 6 shows an example web request-response cycle and the response time of fetching an object of size S through a store-and-forward transcoding proxy 190. We define a store-and-forward image transcoder as an image transcoder which must wait to accumulate an entire input image before transcoding can begin on this image and then must wait to generate a transcoded image in its entirety before it is made available to be output. As shown in Figure 6, the original image 620 of size S (bytes) 670 is downloaded into the store-and-forward proxy over the server-proxy connection with effective bandwidth B_{sp} (bits/sec). The transcoder introduces a delay $D_x(S)$ 650 and generates an output image 630 of size $S_x(S)$ 680. Both the transcoding delay 650 and output image's byte size 680 are denoted to be dependent upon the input image's byte size S 670. The transcoded image is then transmitted over a proxy-client connection having effective bandwidth B_{pc}.

[0066] The policy function needs to weigh the cost (delay) of transcoding against any size reduction achieved by transcoding. For transcoding to provide benefits, delay introduced due to transcoding must be offset by the reduction in transmission time due to compression. For very low bandwidth proxy-client access links, the reduction in response time due to aggressive image compression typically far outweighs the addition to response time caused by compute-intensive transcoding. However, Figure 7 shows that as the bandwidth of the proxy-client link increases, there comes a point (transcoding threshold 710) at which it is no longer beneficial to transcode since the reduction in response time due to aggressive compression decreases as a function of the bottleneck link's bandwidth, while the transcoding time remains constant.

[0067] Suppose R_o is the response time of fetching a web object of size S from the web server with transcoding turned off. Similarly, let R_p denote the response time of fetching the transcoded version of the same web object through the transcoding proxy. For the purpose of the following discussion we assume that caching is not supported at the proxy.

[0068] The client perceived response time with transcoding turned off is the sum of the following three terms:

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$$R_o = 2 * RTT_{pc} + 2 * RTT_{sp} + S/min(B_{pc}, B_{sp})$$

[0069] RTT_{pc} is the network roundtrip time latency between the client and the proxy and, similarly RTT_{sp} is the latency between the proxy and the server. Fetching the web object requires a *TCP SYN/ACK* exchange as well as an *HTTP* request/response, thereby contributing $2 * RTT_{pc} + 2 * RTT_{sp}$ to the delay term. In addition, a web image incurs a transmission delay equal to the spread in time between arrival of its first and the last bits. Let $min(B_{pc}, B_{sp})$ denote the bottleneck bandwidth between the client and the server. In the absence of a proxy, the first and the last bits of an image will be spread in time by $S/min(B_{pc}, B_{sp})$. This spread corresponds to the effective transmission time of the image over the concatenated server-to-proxy-to-client connection.

[0070] when transcoding is turned on, the proxy operates in a store and forward mode. $2 * RTT_{pc} + 2 * RTT_{sp}$ is again the fixed component of the response time. $D_p(S)$ is the additional term that represents the transcoding delay. The resulting response time for the transcoded object can be expressed as:

$$R_p = 2 * RTT_{pc} + 2 * RTT_{sp} + D_p(S) + S/B_{sp} + Sp(S)/B_{pc}$$

Transcoding will reduce response time if $R_p < R_o$. That is,

$$D_p(S) + S/B_{sp} + S_p(S)/B_{pc} < S/min(B_{pc}, B_{sp})$$

Clearly, when $B_{pc} > B_{sp}$, R_p is always greater than R_o. On the other hand, when $B_{pc} < B_{sp}$, transcoding is useful if and only if:

$$D_p(S) + S/B_{sp} < \{S - S_p(S)\}/B_{pc}$$

[0071] The above equation precisely characterizes the regime in which transcoding reduces response time. Figure 8 shows a flow diagram of an example policy function constructed using the analytical framework described above. 810 marks the entry point of the policy function. The policy function 800 is called from 565 with the original image object size as one of the inputs to the policy function. Variable S is set equal to the input object size and the quality factor q is initialized to the best possible initial image quality (for example, the quality of the input image). In step 830, the policy function 800 issues a query to the bandwidth estimator 380 asking for the estimated download time of the object size S from the specified server to the proxy, referred to as $T_1(S)$. It also asks for the estimate of the download time for the same object from the proxy to the client, referred to as $T_2(S)$. Based on the logs of previous connections to the chosen destination, the bandwidth estimator returns an estimate of $T_1(S)$ and $T_2(S)$. In the next step 840, the policy function queries the image size & delay predictor 375 to find an estimate of the transcoded image size $S_p(S)$. It then computes the estimated download time savings by subtracting the download time estimate of the transcoded image size $T_2(S_p(S))$ from $T_2(S)$ 850. Finally, in step 870 the two quantities (transcoding delay + $T_1(S)$ - the download savings) and the target response time reduction are compared. If the first term is less than the second term, computation is stopped and the chosen quality factor q is returned as an output 880. Otherwise, the loop 840-870 is reentered with a reduced q value.

[0072] It is noted that more efficient search techniques or variants of objective functions can be designed by those skilled in the art without departing from the spirit of the policy function framework presented in this invention. One extension would be to rearrange the terms in the policy equation as follows:

$$\text{Response time reduction}(q) = \{S - S_p(S)\}/B_{pc} - D_p(S) - S/B_{sp}$$

[0073] In the above equation, $S_p(S)$ is also a function of the quality factor (the smaller the output size, the poorer the quality). Note that the transcoding delay has been found to be effectively independent of the quality factor. There are two independent variables in the above equation: q, the quality factor, and the target response time reduction. Several different policies can be developed within the framework of the above equation. For example:

Minimize response time for all users;
Maximize quality for a user specified response time constraint;
Optimize overall system performance, not just one user.

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[0074] Since transcoding is a compute-intensive task and the proxy only has limited CPU power the proxy's CPU cycles are best spent on the set of tasks that maximize overall user satisfaction. During the peak usage period, if every user turns transcoding on there may not be sufficient CPU cycles available to satisfy all transcoding requests. By delegating the responsibility of parameter selection to the policy function 800, the system can automatically select the optimal transcoding parameters and provide consistent and predictable response to the end user. If users were to select these parameters independently, the transcoding system could not operate at the optimal performance level.

[0075] Let us now consider the transcoding delay and size estimation. The decision step 870 requires two additional inputs: an estimate of the size of the transcoded image, $S_p(S)$, and the transcoding delay $D_p(S)$, that is incurred during the process of transcoding. An accurate prediction of these two quantities is difficult to obtain since they depend on the image content, type of coding used, original quality factor, processor speed, and the load on the proxy. As was the case for the bandwidth estimators, the present invention uses statistical methods to estimate these two quantities.

[0076] Figure 9 is a block diagram of an example of the image size prediction module in accordance with the present invention. As shown in 910, we initialize our system with statistical characterizations of $S_x(q)$ that are based on a large benchmark set of images. The method shown in 910 is used to initialize the transcoded image size distribution functions that depend on the parameters *bpp* and *q*. The proxy continually adds new sample points 920 to the distribution function as it fetches and transcodes new image objects. The function of 920 enables the image size predictor 375 to adapt its behavior to different data sets that a client may be accessing.

[0077] Thus, in the method described in 930, we use statistical methods to estimate the delay and output size and use the bpp ratio as the criteria for performing a more accurate classification of images and hence of forming a better estimate of the resulting transcoded file size. This method works particularly well for GIF files.

[0078] Using similar statistical methods, $D_p(S)$ can be estimated based on benchmark initialization and on-line updating of the statistical model. we have also determined from our statistical work, that the transcoding delay is well characterized as being a linear function of the number of pixels (as opposed to file size).

[0079] Now we consider the bandwidth and download time estimation. The accuracy of decision step 870 also depends to a large extent on the accuracy of image download time estimates. Bandwidth estimator 380 shown in Figures 3-5 is responsible for providing these time estimates. The bandwidth estimator 380 records every packet send and receive event at the proxy and performs statistical analysis on the collected traces to make predictions about the state of the network. Those skilled in the art of network monitoring recognize that the network monitoring function can be implemented in several different ways. One implementation would be a shim layer between the proxy application and the socket layer Another implementation would be a processing layer above any packet filtering software. Generally the implementation built over the packet filtering software will provide more accurate estimates of bandwidth and download time. The present invention presents no requirement that the bandwidth monitor 380 and the policy decision step 870 should both run on the same machine, though collocating the two modules minimizes the overhead of communication between them.

[0080] Figure 10 shows an example bandwidth estimator module 380 in accordance with the present invention. The module consists of two components; trace monitor 1010 and a statistical analyzer 1020. The trace monitor continuously monitors all connections between the clients and the proxy. The same trace monitor (or another instance of it) is also used to monitor the traffic between the proxy and all web servers. For each monitored connection the following information is recorded:

time when a new connection is established,
source address, source port number and destination address, destination port number of each network connection,
number of bytes sent and received on each connection and the respective timestamp of each send and receive event,
time when connections are closed.

[0081] The statistical analyzer 1020 maintains a database of all past and all current active connections. For each connection it also keeps a history of when and how many bytes were sent and/or received on that connection. Based on this history the statistical analyzer 1020 is able to make predictions about the download time of future connections. For predicting server to proxy download time and proxy to client download time we use different heuristics.

[0082] Server to proxy traces exhibit behavior that is common among wide-area TCP connections. It has been observed that sequence Vs timestamp traces are non-linear and we have found that linear estimation concepts such as average or median bandwidth don't yield accurate estimates. To predict the download time of an object of a given size, bandwidth estimator looks at the history of connections to the chosen destination and computes the distribution function of the download time for all objects that have roughly the same size. The median, or some other appropriate statistical function of this distribution, is returned as the download time estimate.

[0083] In contrast, proxy-to-client TCP behavior is dominated by the effects of having a bandwidth constrained link, which is typically the last hop 160-164. Because there is a bottleneck link, the aggregate of all active TCP connections

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to a client typically saturate the bottleneck link. Thus, for providing proxy to client download time estimates, bandwidth estimator aggregates all active connections to a client into a single group. For each group of connections it plots a time vs number of bytes plot and then performs a linear curve-fit on the data. This technique provides accurate estimate of the current available bandwidth between the proxy and the client. Although this value changes with time, the oscillations in most cases are bounded. For example, bandwidth monitor can easily detect whether the client is connected by a 10Mb ethernet, 14.4 modem, or 28.8 modem by analyzing at the output of the curve fitting algorithm. The predicted values are not exact (20- 30% deviation from the correct values), but those skilled in the art recognize that accuracy of bandwidth estimation can be improved by refining the estimation algorithm.

[0084] Consideration is now given to the transcoding user interface. Transcoding user interface is the interface through which the user can dynamically change the tradeoff between image quality and download time. It is represented as the item 260 in Figures 2-5. Figure 11 shows an example implementation of the user preference interface in accordance with the current invention. This user interface is represented well as a linear slide bar, which can be implemented as a Java applet, to allow users to continuously vary the image quality. As shown in Figure 11 an option for selecting color (vs. gray scale) is also provided. Further, an option for selecting autopilot can be used in the following two ways: 1) as an indication to the proxy that it can automatically decide whether or not to perform transcoding, based on the current estimates of the client-proxy and proxy-server link bandwidths and currently available CPU resources as discussed above, or 2) as an indication to the proxy to try and maintain the current download times that the user is currently experiencing (i.e., by varying image quality at the proxy to compensate for dynamic bandwidth changes that are detected by the bandwidth estimation subsystem), or both 1) and 2). On occasions when the user requires a full-fidelity version of the data, they can easily request the refined data by adjusting the slide bar (downwards) and requesting the higher quality data. Typically, we find that almost all of our web browsing can be done by transcoding images to a sixth or tenth of their original size, and only rarely do we actually find a object, such as a map, that we need to request a refinement of. Note that alternative HTML-only interfaces can have been invented for supporting non-Java devices such as windows CE based platforms.

[0085] Now we consider streaming image transcoding. The above description is generally applicable to a store-and-forward transcoding proxy. Following, we describe conditions under which it is beneficial for a streamed image transcoder to engage in transcoding. A streamed image transcoder is an image transcoder which starts writing out image data encoded in an output format before having fully read in the complete input stream of bytes corresponding to the entire image encoded in the input format.

[0086] In Figure 12 we illustrate an example of the reasoning behind our algorithm by using a timing diagram. The input image arrives as a stream of bits spaced apart by $1/B_{sp}$. The streaming image transcoder will take a group of G bits for transcoding, incurring a small store-and-forward delay D_1. The group of bits are then transcoded into a group of G_p output bits incurring a delay D_2. If $D_2<D_1$, then the image transcoder can convert each input group G to its corresponding output group G_p before the next input group G needs to be processed. In this case, the streaming image transcoder's internal memory requirement is bounded. However, if $D_2>D_1$, then the image transcoder will not be able to process input bits fast enough. In this latter case, given a continuous input stream, then the image transcoder's internal memory requirement grows without bound, i.e. the image transcoder's finite-length internal RAM buffers will overflow. Therefore, we desire than the transcoding delay D_2 satisfy $D_2<D_1$. Clearly, $D_1 = G/B_{sp}$. To find D_2, let $D_p(S)$ = the predicted image transcoding time for an image of S bits ($D_p(S)$ actually depends on other parameters, such as image content and dimension, but we use $D_p(S)$ for simplicity of notation). Then, $D_2 = D_p(s)/(S/G)$. To avoid overflowing the RAM buffer, the group transcoding delay must satisfy $D_p(S)/(S/G) < G/B_{sp}$, or

$$D_p(S) < S/B_{ps} \qquad \text{(Condition A)}$$

[0087] Assuming that Condition A holds true, then the output transcoded groups G_p will be uniformly spaced by a delay equal to D_1. The transmission channel can send each transcoded group of bits G_p in time $D_3 = G_p/B_{pc}$. In case i), we illustrate $D_3(i) < D_1$, i.e. each output group G_p can be sent before the next output group is ready for transmission. In case ii), $D_3(ii) > D_1$, so that the output transmission link cannot send the produced bits fast enough to keep the output queue empty. In case ii), the transmission link's output queue grows without bound given a continuous stream of transcoded bits, causing overflow for finite-length link buffers. Therefore, we desire that the delay caused by the transcoded output group size $D_3(i) < D_1$. Clearly, $D_3(i) = G_p/B_{pc}$. To avoid overflowing the transmission link's output buffer, the transcoded output image group size G_p must satisfy $G_p/B_{pc} < G/B_{sp}$, or

$$c > B_{ps}/B_{pc} \qquad \text{(Condition B)}$$

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where c = group image compression ratio G/G_p which we assume to be on average equivalent to the overall image compression ratio In summary the streamed image transcoder should only perform transcoding when both Condition A and Condition B are satisfied. If the proxy-server link is the bottleneck. i.e. $B_{cp} < B_{pc}$. then Condition B reduces to $c > N$. where N is a number less than 1. Normally. the compression ratio is always greater than 1. so Condition B will always be satisfied. In this case. only Condition A must be satisfied in order for transcoding to not be disadvantageous. In fact. when the proxy-server link is the bottleneck. Condition B could be interpreted as providing an upper bound on the ratio of expansion allowed for a transcoded image. namely $1/c < B_{pc}/B_{sp}$. Expansion of an image may occasionally be necessary when format conversion is mandatory. e.g. GIF->Palm format. The above equation allows us to determine when such format conversion will increase the chances of buffer overflow. and when format conversion will not cause buffer.overflow. For example, if $B_{sp} = 1\ b_{ps}$, $B_{pc} = 2\ b_{ps}$. and G = 1 bit. then Condition B says that the output group G_p can expand to a maximum of 2 bits. If the client-proxy link is the bottleneck. i.e. $B_{sp} > B_{pc}$. then Condition B says that the image compression ratio c must be greater than the ratio of proxy-server to client-proxy bandwidths in order for transcoding to be worthwhile. In addition, Condition A must still be satisfied.

[0088] It is noted that condition A and condition B are tight bounds that assume that the buffer must never be allowed to overflow Those skilled in the art recognize that looser constraints may be derived given that images are of finite-length, rather than the continuous stream assumed in the analysis. More relaxed constraints would permit more time for transcoding and/or allow less aggressive compression.

[0089] It is thus an aspect of the present invention to provide a method for a transcoding proxy to facilitate browsing between client devices and servers connected via a communication network. The method includes receiving an HTTP GET request from a client devices for an object stored at one of the servers, forwarding the GET request for the object to the server. receiving the object from the servers. examining preferences specified by a user of the client device, examining contents of the object, examining communication network characteristics, choosing a set of transcoding parameters. forming a transcoded form of the object. sending the transcoded form to the client, and/or examining network characteristics including estimating network bandwidth between the server and the proxy as well as between the proxy and the client, and/or estimating delay between the servers and the proxy as well as delay between the proxy and the client device, and/or providing a feedback to the user about a level of transcoding performed on the object, and/or the step of examining including determining the size of the object. and/or determining dimensions of the object, and/or calculating the compression ratio of the object. If the object is of type image, dimensions of the image object are determined by area of the image in square pixels, and the compression ratio is determined by the bpp ratio of the image object. The present invention allows both store-and-forward and streaming transcoding, thus allowing forming a transcoded form before the step of receiving the object from the servers is complete. This method can be applied to JPEG. GIF and other image types. Another aspect of this invention is that it allows sending out the transcoded form before the step of forming a transcoded form of the object is complete.

[0090] There are several other considerations that are important. The above examples for the concepts of the present invention are usual for image and video, etc. The wide use of the Internet has shown the value of JPEG and MPEG compressed image data. Audio coded data also needs to be decompressed, mixed with special sound effects, merged with other audio data, edited and processed in the real domain. Similar implementations are performed for other industrial, commercial, and military applications

[0091] This invention may also be provided as a process, an article of manufacture, apparatus, system, architecture and/or a computer product. For example, it may be implemented as an article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing a computer to perform the methods of the present invention.

[0092] It is noted that although the description of the invention is made for particular arrangements of steps, the intent and concept of the present invention are suitable and applicable to other arrangements. For example, the invention is also adaptable to any browser although embodiment is directed towards web browsing only. Although primary consideration is given to dynamic implementations, the invention may be employed with a combination of static, quasi-dynamic and dynamic implementations.

Claims

1. A method for a transcoding proxy to facilitate browsing between a plurality of client devices and a plurality of servers connected via a communication network, the method comprising:

   receiving a request from one of the client devices for an object stored at one of the servers,

   forwarding the request for the object to said one of the servers,

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receiving the object from said one of the servers,

examining preferences specified by a user of said one of the client devices,

examining contents of the object,

examining communication network characteristics,

choosing a set of transcoding parameters,

forming a transcoded form of the object, and

sending the transcoded form to said one of the clients.

2. A method as recited in claim 1, wherein the network characteristics includes bandwidth, and examining network characteristics includes estimating network bandwidth between said one of the servers and the proxy as well as between the proxy and said one of the clients.

3. A method as recited in claim 1 or claim 2, wherein the network characteristics includes delay, and examining network characteristics includes estimating delay between said one of the servers and the proxy as well as delay between the proxy and said one of the clients.

4. A method as recited in any preceding claim, further comprising providing feedback to the user about a level of transcoding performed on the object to form the transcoded form.

5. A method as recited in any preceding claim, wherein the step of forming a transcoded form employs dynamic adaptation.

6. A method as recited in any preceding claim, wherein the step of forming a transcoded form is started before the step of receiving the object from said one of the servers is complete.

7. A method as recited in any preceding claim, wherein the step of sending out the transcoded form is started after processing an initial fraction of the received object, and before the step of receiving the image object from said one of the servers is complete.

8. A method as recited in any preceding claim 1, wherein the step of sending out the transcoded form is started before the step of forming a transcoded form of the object is complete.

9. A transcoding proxy system for facilitating browsing between a plurality of clients and a plurality of servers connected via a communication network, the proxy comprising:

an HTTP proxy engine to receive a request from one of the clients for an object stored at one of the servers, and to fetch the object from said one of the servers,

an object transcoder to form a transcoded form of the object using a set of parameters for transcoding,

a dynamic policy module to determine the set of parameters of transcoding,

an image size and delay predictor module to gather characteristics of the object,

a user preference module to gather quality preferences specified by a user of said one of the clients, and

a bandwidth estimation module to estimate available network bandwidth,

wherein said dynamic policy module dynamically adjusts the parameters of transcoding using the input received from the image size and delay predictor module, user preferences module, and bandwidth estimation module for the purpose of improving satisfaction for the user, and the transcoding system provides feedback to the user about the level of transcoding performed.

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10. A computer program comprising computer program instructions to cause a computer to perform the steps of the method as claimed in any of claims 1 to 8.

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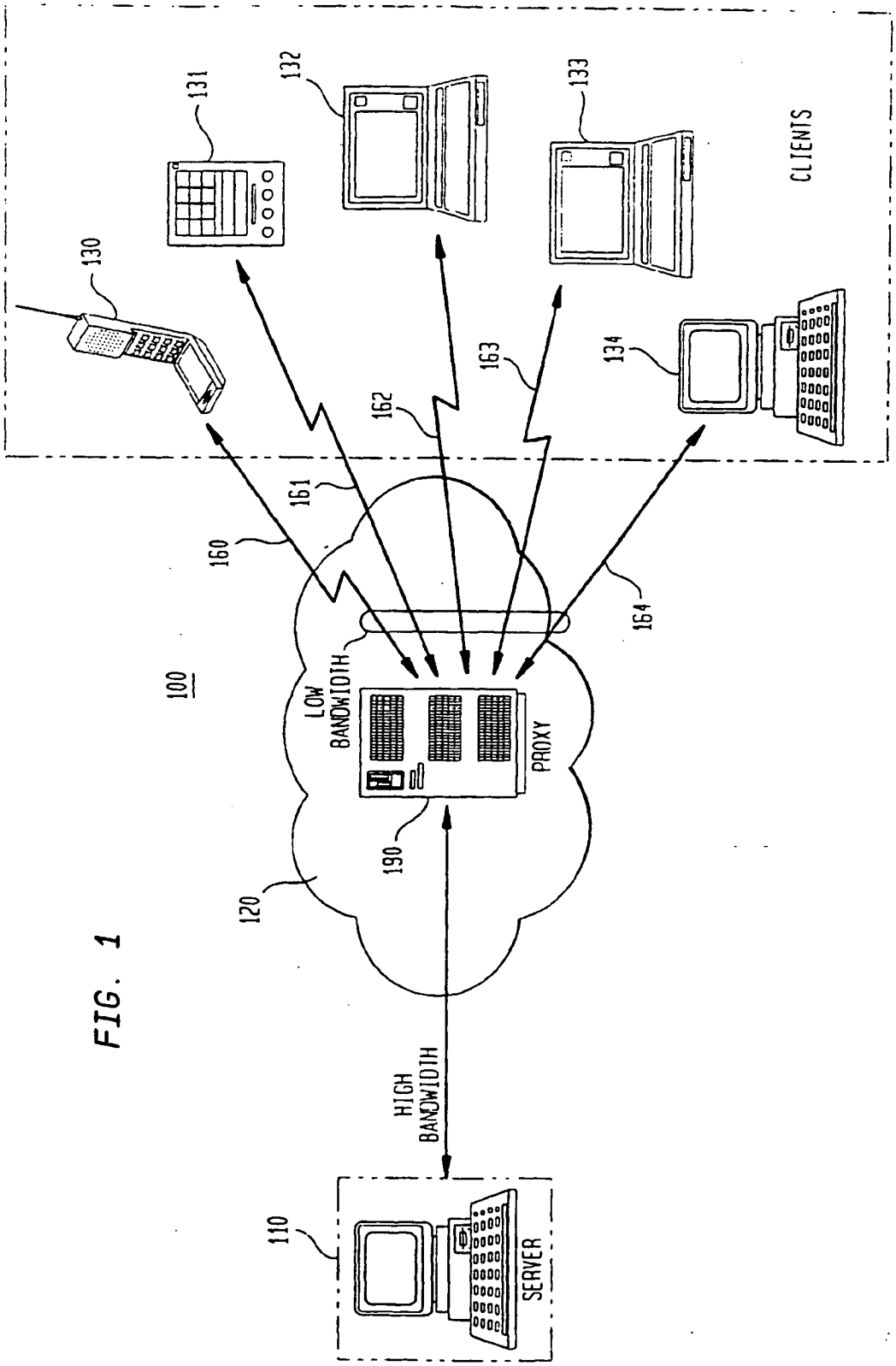
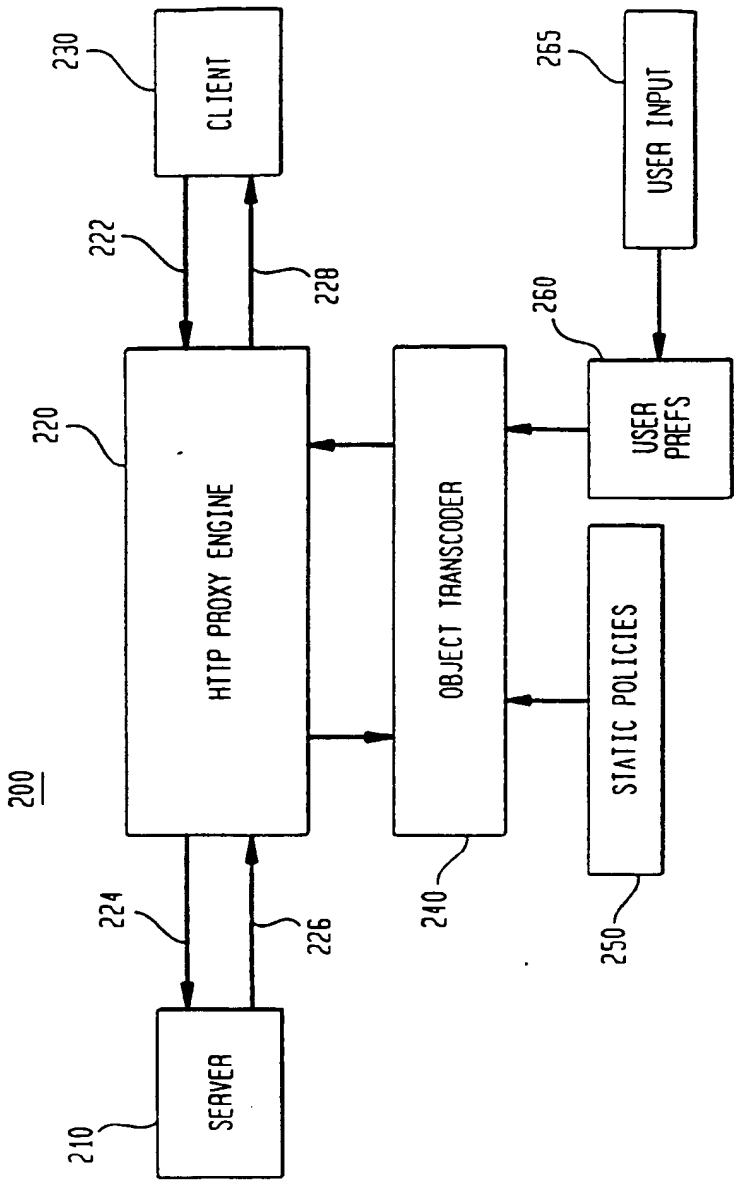


FIG. 1

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FIG. 2



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FIG. 3

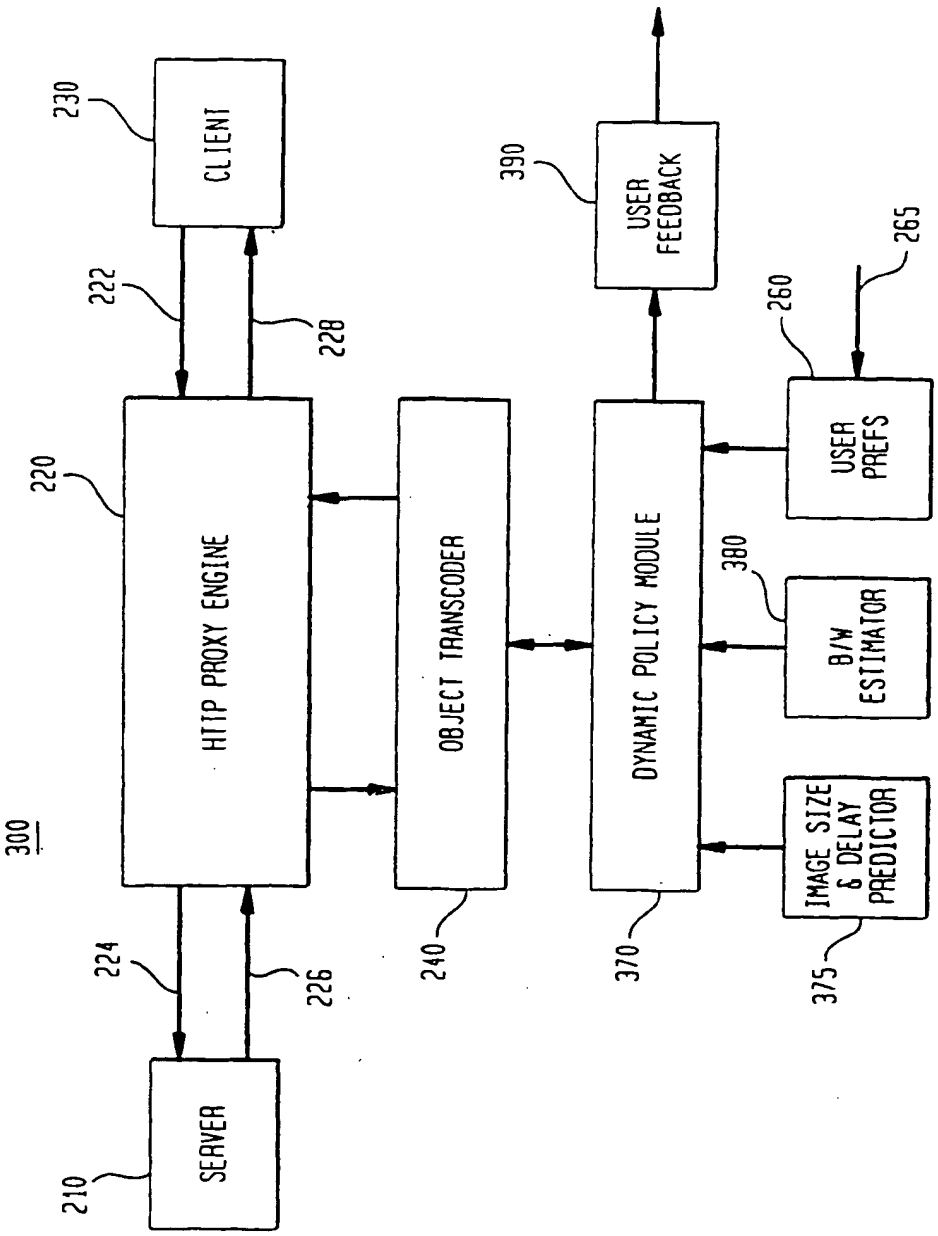
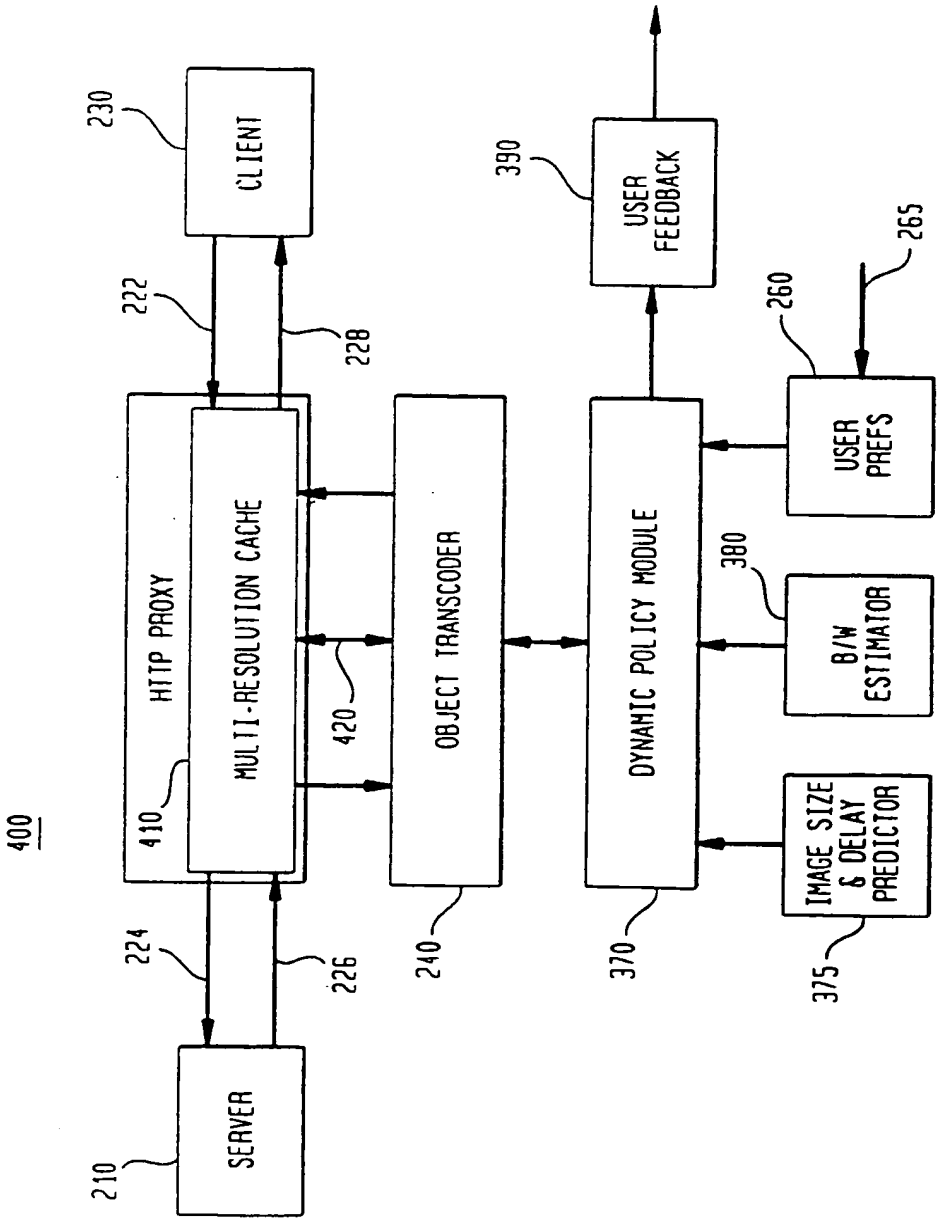
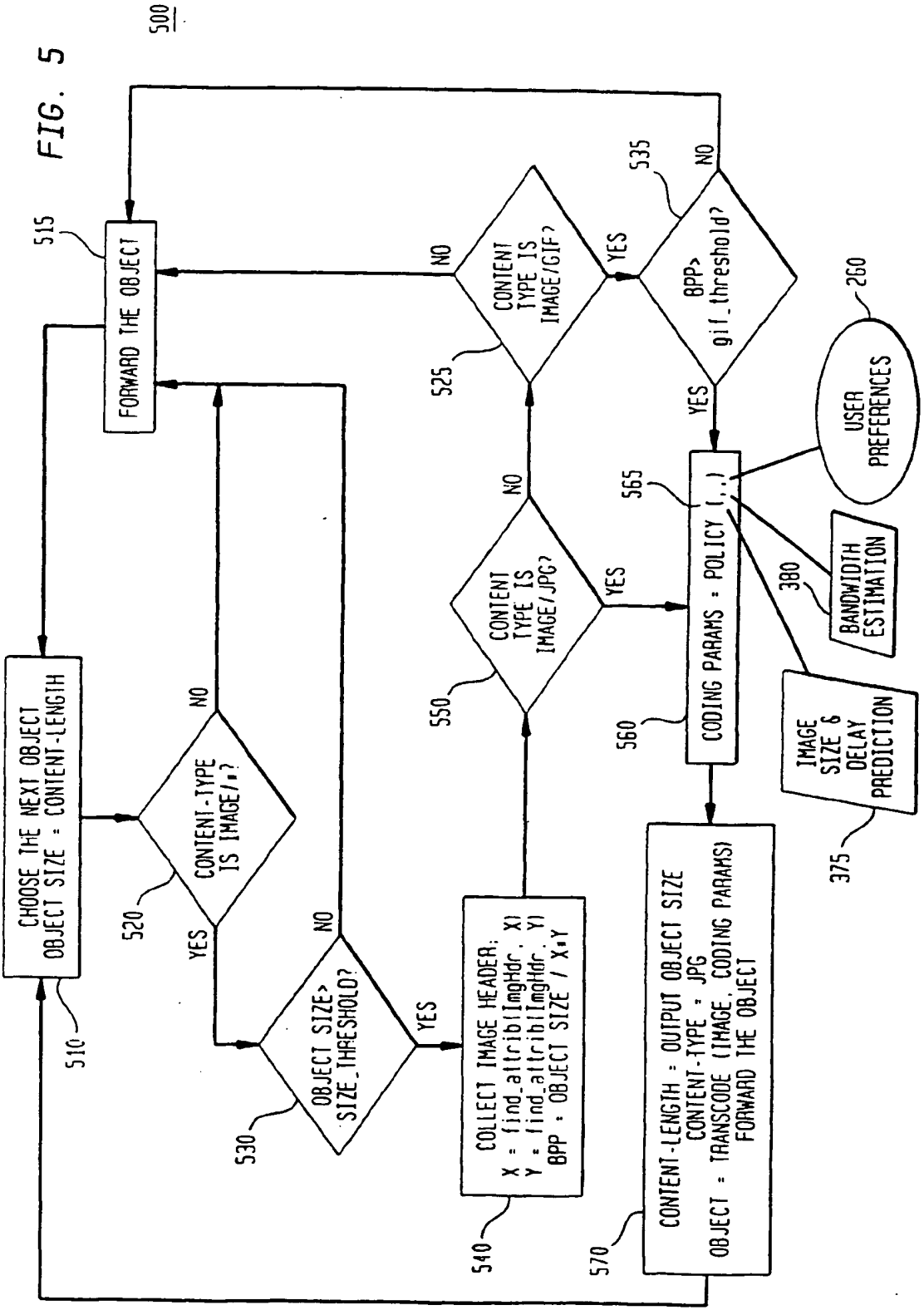

300
CLIENT
230
222
228
HTTP PROXY ENGINE
220
OBJECT TRANSCODER
240
DYNAMIC POLICY MODULE
370
USER FEEDBACK
390
USER PREFS
260
265
B/W ESTIMATOR
380
IMAGE SIZE & DELAY PREDICTOR
375
224
226
SERVER
210

FIG. 4



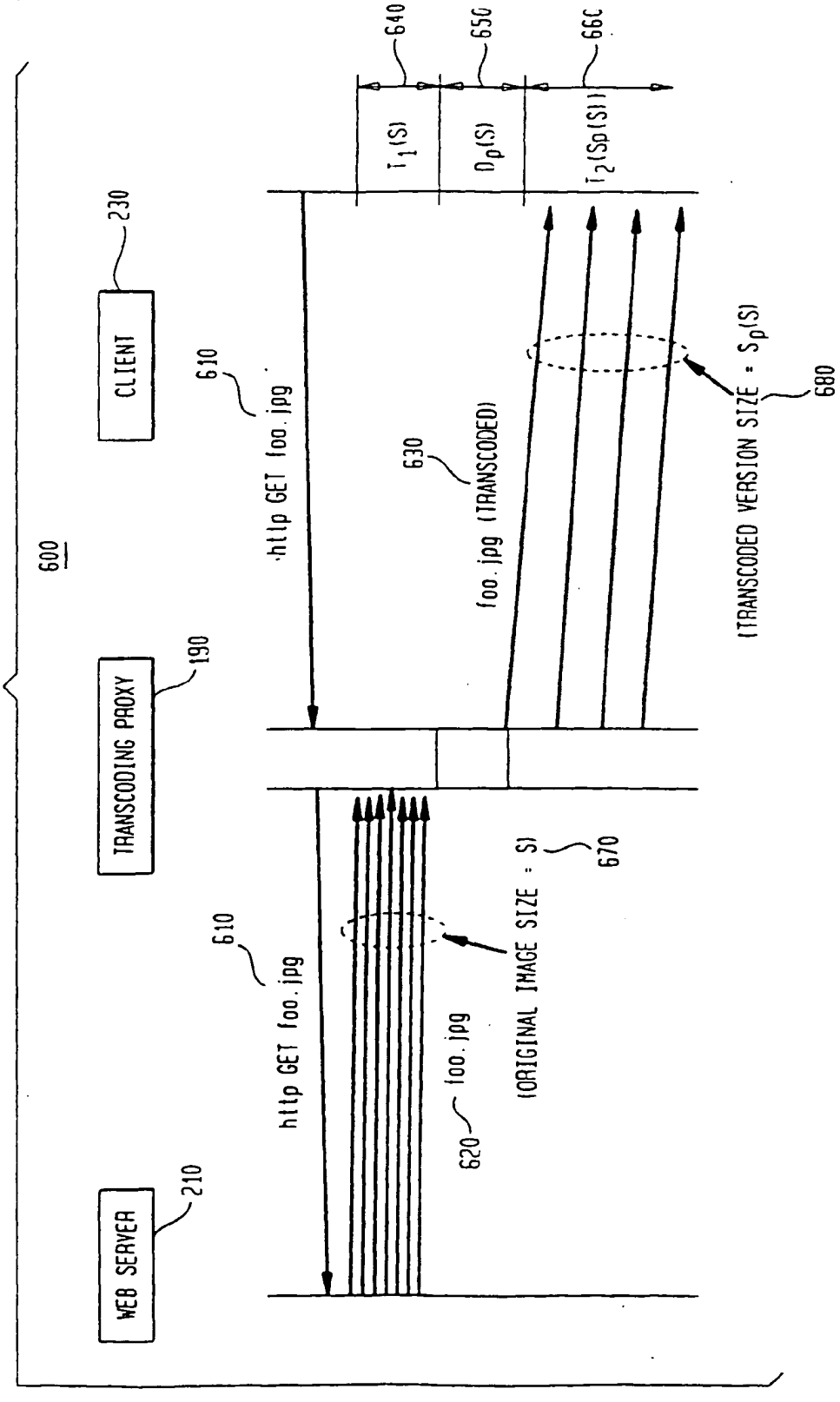
BNSDOCID <EP 0992922A2 I. >

FIG. 5



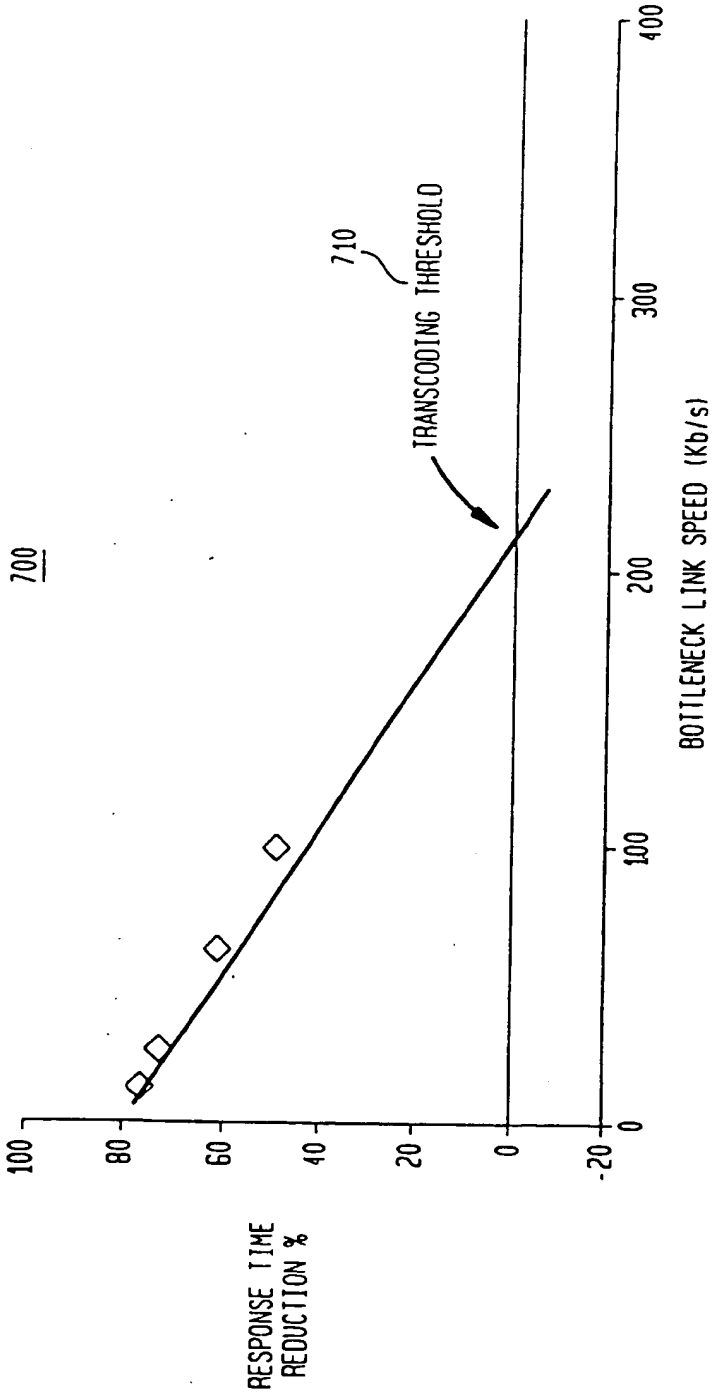
BNSDOCID <EP 0992922A2 1 >

FIG. 6



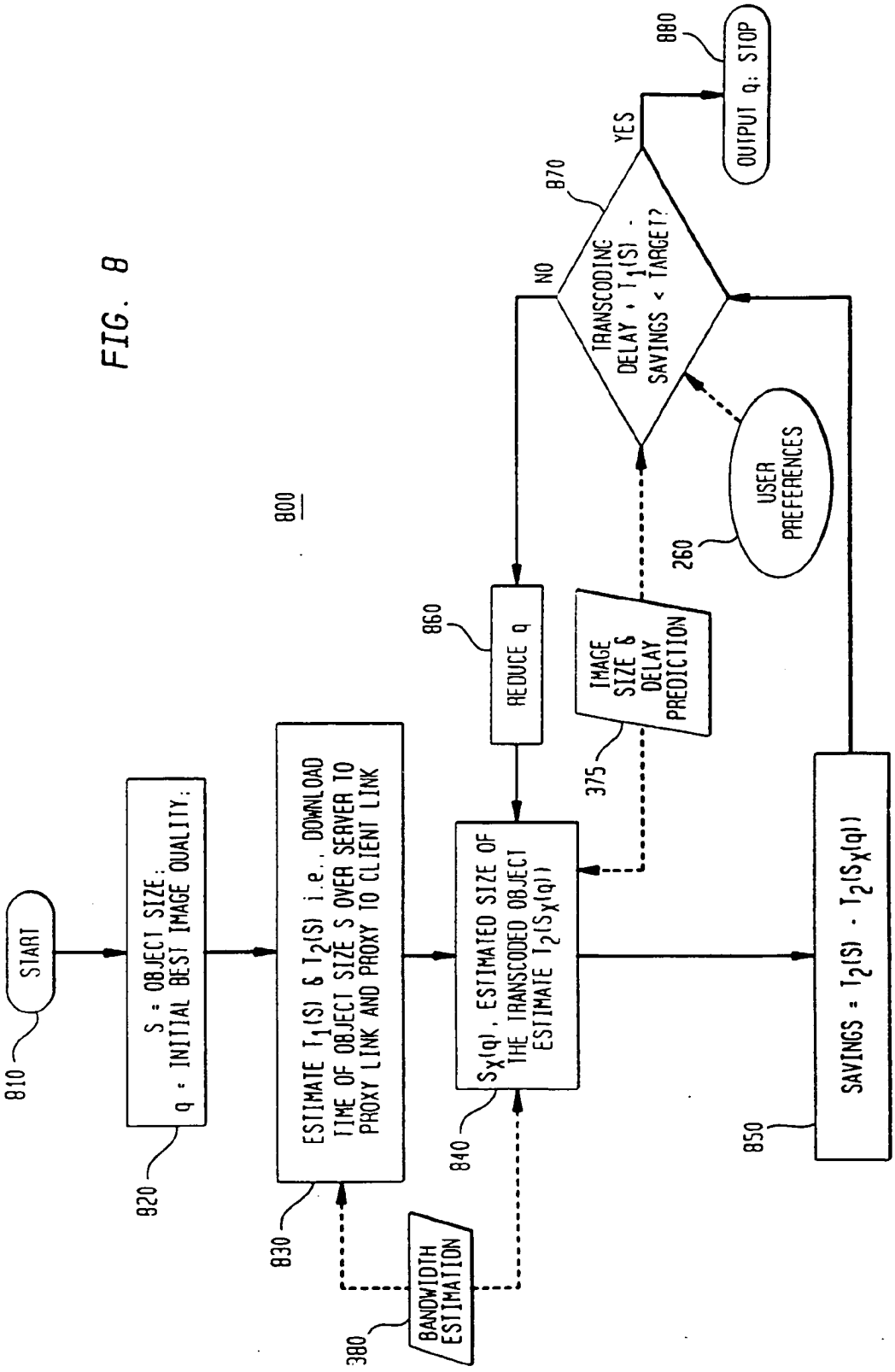
BNSDOCID: <EP 0992922A2 >

FIG. 7



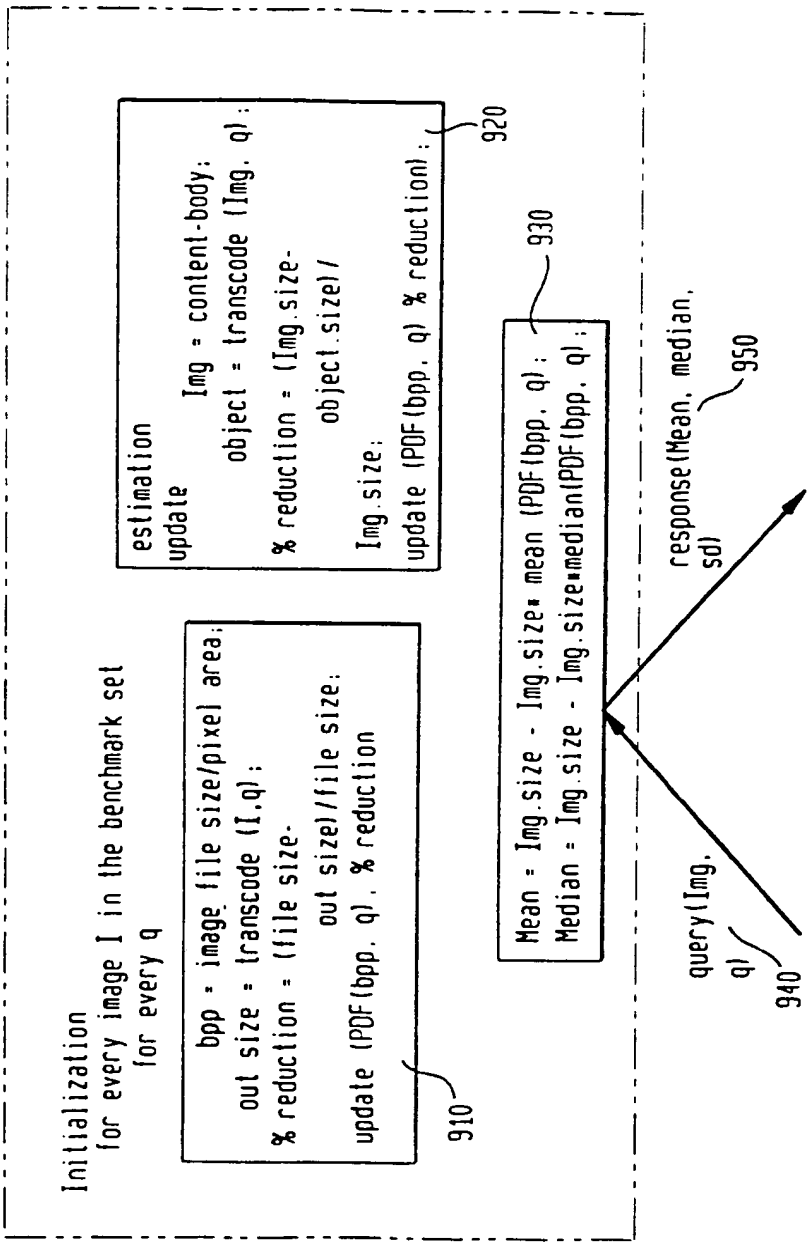
BNSDOCID <EP 0992922A2 >

FIG. 8



BNSDOCID <EP_ ... 0992922A2 I_>

FIG. 9



BNSDOCID <EP 0992922A2 >

FIG. 10

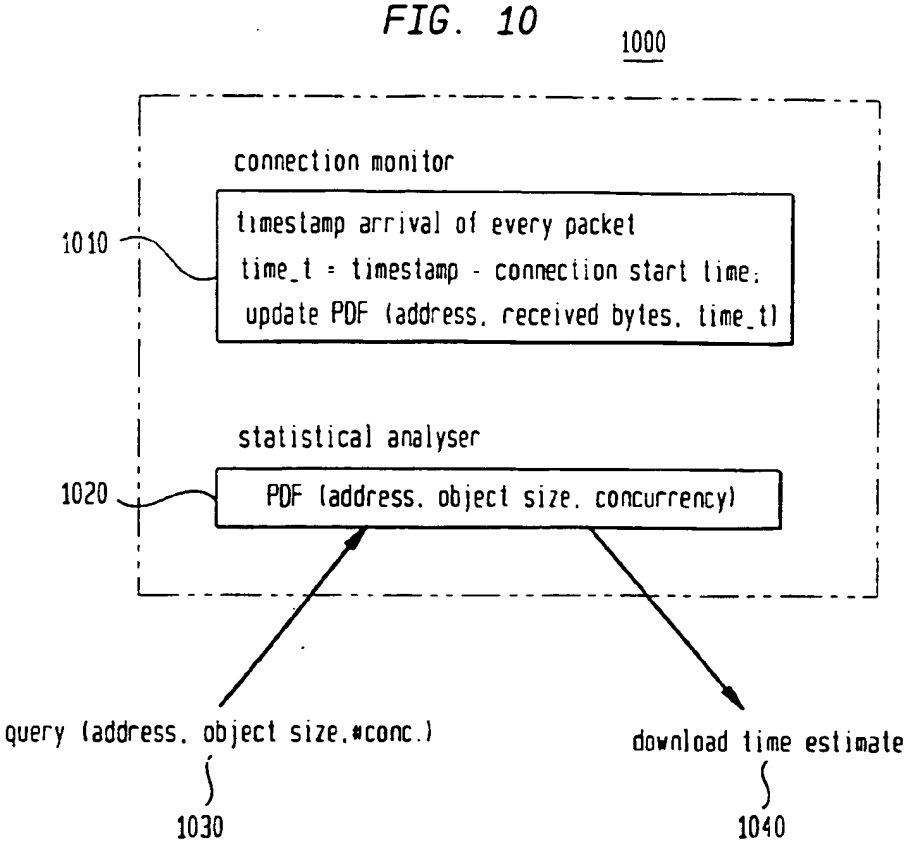
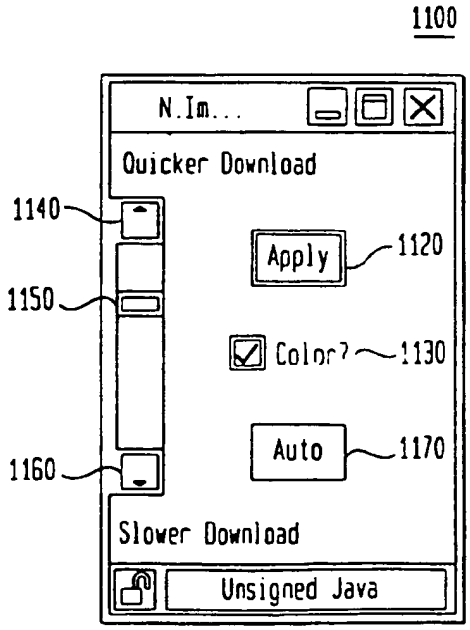
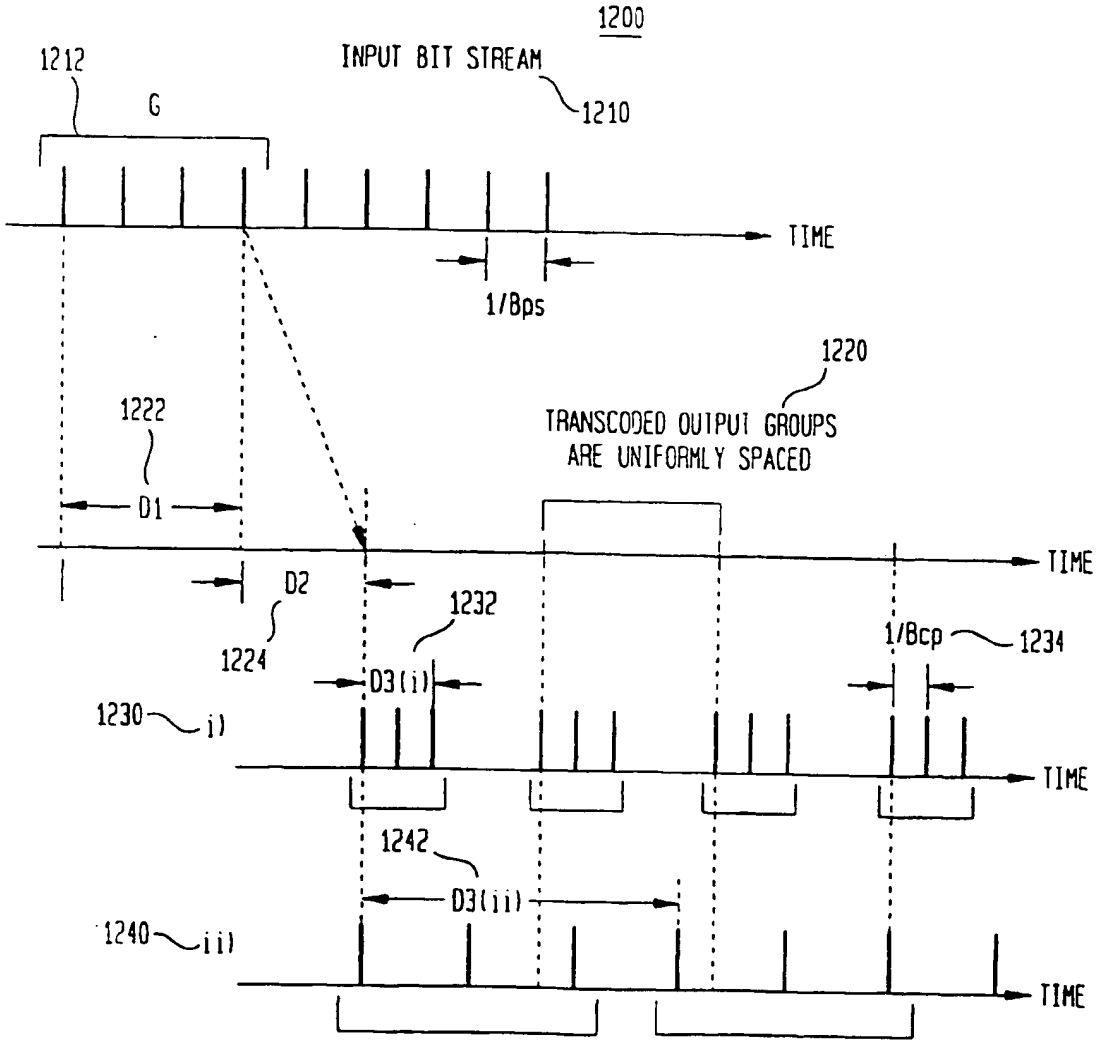


FIG. 11



BNSDOCID <EP 0992922A2 >

FIG. 12



BNSDOCID <EP ____0992922A2 I >

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 992 922 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
10.01.2001 Bulletin 2001/02

(51) Int Cl.7: **G06F 17/30**

(43) Date of publication A2:
12.04.2000 Bulletin 2000/15

(21) Application number: **99307580.3**

(22) Date of filing: **24.09.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **29.01.1999 US 236622**
02.10.1998 US 102944 P

(71) Applicant: **International Business Machines Corporation**
Armonk, NY 10504 (US)

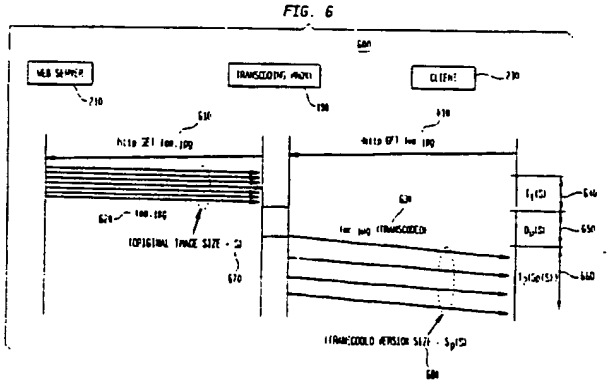
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- **Mummert, Todd William,**
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- **Rubas, James, c/o IBM United Kingdom Ltd.**
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United Kingdom Limited,
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Winchester, Hampshire SO21 2JN (GB)

(54) Automatic image data quality adjustment to reduce response time of a Web server

(57) The present invention provides methods, devices and systems for dynamically adjusting transcoding parameters so as to increase the benefits of transcoding. Methods of adaptation are designed to cope with the variability of network characteristics and of the size of transcoded images. The invention also provides a method and apparatus to enable the transcoding proxy to adjust a quality-size tradeoff on a per-image and/or a per-client basis. The adaptive transcoder chooses different parameters for each object, and provides performance improvements. The invention further provides a general framework for making policy decisions taking into account available bandwidth, content and type of image, and user preferences. The invention also includes methods for generating feedback about the choice of optimal transcoding parameters to the user.

FIG. 6



EP 0 992 922 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 30 7580

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
P,X	HAN R ET AL: "DYNAMIC ADAPTATION IN AN IMAGE TRANSCODING PROXY FOR MOBILE WEB BROWSING" IEEE PERSONAL COMMUNICATIONS,US,IEEE COMMUNICATIONS SOCIETY, vol. 5, no. 6, 1 December 1998 (1998-12-01), pages 8-17, XP000790121 ISSN: 1070-9916 * abstract; figure 1 *	1-10	G06F17/30
X	WO 98 43177 A (INTEL CORP) 1 October 1998 (1998-10-01) * abstract; figures 1,3 * * page 3, line 6-14 * * page 4, line 5 - page 5, line 29 * * page 12, line 6 - page 14, line 22 *	1-10	
A	EP 0 811 939 A (WEBTV NETWORKS INC) 10 December 1997 (1997-12-10) * abstract * * column 1, line 13 - column 2, line 49 *	1-10	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

G06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	14 November 2000	König, W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

BNSDOCID <EP 0992922A3 I >

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 30 7580

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-11-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9843177 A	01-10-1998	US 5902846 A	11-05-1999
		AU 6865698 A	20-10-1998
		BR 9811457 A	19-09-2000
		EP 1012733 A	28-06-2000
EP 0811939 A	10-12-1997	US 5918013 A	29-06-1999
		AU 3375197 A	05-01-1998
		JP 10228437 A	25-08-1998
		WO 9746943 A	11-12-1997
		US 6023268 A	08-02-2000
		US 5940074 A	17-08-1999
		US 6073168 A	06-06-2000
		US 5935207 A	10-08-1999
		US 5996022 A	30-11-1999
		US 5974461 A	26-10-1999

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

BNSDOCID <EP 0992922A3 1 >

OIPE
OCT 24 2003
PATENT & TRADEMARK OFFICE

Attorney's Docket No.: 3399P103/1218

Patent

First Named Inventor: Rikard M. Kjellberg

Check One:

___ Declaration Submitted with Initial Filing OR

_X_ Declaration Submitted After Initial Filing (Surcharge under 37 C.F.R. § 1.16(e) Required).

Complete If Known:

Application No.: 10/600,746
Filing Date: 06/19/2003
Art Unit: _____
Examiner Name: _____

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
Device Capability Based Discovery, Packaging and Provisioning of Content for Wireless Mobile Devices

the specification of which

___ is attached hereto.

_X_ was filed on (MM/DD/YYYY) 06/19/2003 as
United States Application Number 10/600,746
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 specification, including the claim(s), as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

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(s)			Priority Claimed?		Certified Copy Attached?	
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No

I hereby appoint the Practitioners associated with Customer Number 26529 as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected herewith.

Direct all correspondence to (check one):

X **Customer Number 26529**

I hereby declare that all statements made herein of my own knowl dge are true and that all statements made on informati n and belief are believed t be tru ; and further that these statements were made with the knowledg that willful false statements and the like made are punishable by fine r impris nment, r both, under 18 U.S.C. 1001 and that such willful false statements may je pardize the validity of the application or any patent issued thereon.

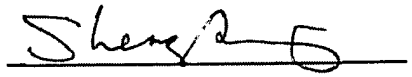
Full Name of Sole/First Inventor: **Rikard M. Kjellberg** Citizenship: **Sweden**

Inventor's Signature:  **Date of Signature:** 9/2-03

Residence: (City) Santa Cruz (State/Country) CA/US

Mailing Address: 23911 East Cliff Drive, Santa Cruz, CA 95062, US

Full Name of Second/Joint Inventor: **Sheng Liang** Citizenship: **US**

Inventor's Signature:  **Date of Signature:** 8/27/03

Residence: (City) Cupertino (State/Country) CA/US

Mailing Address: 10440 Oakville Avenue, Cupertino, CA 95014, US

Full Name of Third/Joint Inventor: **Tomas G. Lund** Citizenship: **Sweden**

Inventor's Signature:  **Date of Signature:** 8/27/03

Residence: (City) ~~Foster City~~ MENLO PARK (State/Country) CA/US

Mailing Address: ~~718 Bounty Drive #1815, Foster City, CA 94404, US~~ 1010 NOEL DR #14, MENLO PARK, CA 94025, US

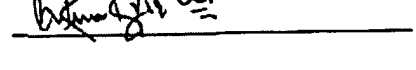
Full Name of Fourth/Joint Inventor: **William Chan** Citizenship: **US**

Inventor's Signature:  **Date of Signature:** 8/26/03

Residence: (City) San Mateo (State/Country) CA/US

Mailing Address: 1341 David Street #314, San Mateo, CA 94403, US

Full Name of Fifth/Joint Inventor: **Ramakrishna Chinta** Citizenship: **India**

Inventor's Signature:  **Date of Signature:** 8/27/03

Residence: (City) Sunnyvale (State/Country) CA/US

Mailing Address: 874 Flin Way, Sunnyvale, CA 94087, US

Full Name of Sixth/Joint Inventor: **Xinbi Chen** Citizenship: **China**

Inventor's Signature:  **Date of Signature:** 8/27/03

Residence: (City) Palo Alto (State/Country) CA/US

Mailing Address: 524 Kendall Avenue Apt. 1, Palo Alto, CA 94306, US

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number: 3399 P103

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	11	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	11 minus 20=	* 0
INDEPENDENT CLAIMS	3 minus 3 =	* 0
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
X$ 9=		OR	X$18=	0
X42=		OR	X84=	0
+140=		OR	+280=	0
TOTAL		OR	TOTAL	750

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1)		(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1)		(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1)		(Column 2)	(Column 3)
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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.

Please type a plus sign (+) inside this box → [+]

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	3399P103
First Inventor	Rikard M. Kjellberg, et al.
Title	Device Capability Based Discovery, Packaging and Provisioning of Content for
Express Mail Label No.	EV336585205US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

17399 U.S. PTO 10/600746 06/19/03

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. ☐ Applicant claims small entity status. See 37 CFR 1.27.
3. ☒ Specification *[Total Pages 30]* *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☒ Drawing(s) *(35 U.S.C. 113)* *[Total Sheets 14]*
5. Oath or Declaration (unsigned) *[Total Pages 3]*
   a. ☒ Newly executed (original or copy)
   b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 18 completed)*
      i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named 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)*
8. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all of the following are necessary)*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ paper
   c. ☐ Statements verifying identity of above copies
9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 C.F.R. § 3.73(b) Statement *(when there is an assignee)* ☒ Power of Attorney
11. ☐ English Translation Document *(if applicable)*
12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment ☐ Application Amended to Reflect Claim of Priority
14. ☒ Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
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 its equivalent.
17. ☐ Other: _____

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____

Prior application Information: Examiner _____ *Group/Art Unit:* _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

18. CORRESPONDENCE ADDRESS

☒ *Customer Number or Bar Code Label* 26529 PATENT TRADEMARK OFFICE *or* ☐ *Correspondence address below*

Name					
Address					
City		*State*		*Zip Code*	
Country		*Telephone*	(408) 720-8300	*Fax*	(408) 720-8383

Name (Print/Type)	Jordan M. Becker	*Registration No. (Attorney/Agent)*	39,602
Signature		*Date*	06/19/03

Based on PTO/SB/05 (05-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 05/02/2003.
SEND TO: Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

06/19/03
16623 U.S. PTO

FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

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

TOTAL AMOUNT OF PAYMENT ($) 750.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Rikard M. Kjellberg
Examiner Name	
Group/Art Unit	
Attorney Docket No.	3399P103

METHOD OF PAYMENT (check one)

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☒ Credit any overpayments

☒ Charge any additional fee(s) required under 37 CFR §§ 1.18, 1.17, 1.18 and 1.20.

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	750.00
1002	330	2002	185	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 750.00

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	11	- 20** =	0	x	18.00	=	$0.00
Independent Claims	3	- 3** =	0	x	84.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple Dependent claim, if not paid
1204	84	2204	42	**Reissue independent claims over original patent
1205	18	2205	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

***or number previously paid, if greater, For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1404	320	2401	180	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	850	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	1809	375	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($)

SUBMITTED BY

Complete (if applicable)

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Based on PTO/SB/17 (01-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 05/02/2003.
SEND TO: Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Please type a plus sign (+) inside this box → [+]

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	3399P103
First Inventor	Rikard M. Kjellberg, et al.
Title	Device Capability Based Discovery, Packaging and Provisioning of Content for
Express Mail Label No.	EV336585205US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

17399 U.S. PTO 10/600746 06/19/03

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. ☐ Applicant claims small entity status. See 37 CFR 1.27.
3. ☒ Specification *[Total Pages 30]* *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☒ Drawing(s) *(35 U.S.C. 113)* *[Total Sheets 14]*
5. Oath or Declaration (unsigned) *[Total Pages 3]*
   a. ☒ Newly executed (original or copy)
   b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 18 completed)*
      i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named 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)*
8. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all of the following are necessary)*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ paper
   c. ☐ Statements verifying identity of above copies
9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 C.F.R. § 3.73(b) Statement *(when there is an assignee)* ☒ Power of Attorney
11. ☐ English Translation Document *(if applicable)*
12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment ☐ Application Amended to Reflect Claim of Priority
14. ☒ Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
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 its equivalent.
17. ☐ Other: _____

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____

Prior application Information: Examiner _____ *Group/Art Unit:* _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

18. CORRESPONDENCE ADDRESS

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06/19/03
16623 U.S. PTO

FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

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

TOTAL AMOUNT OF PAYMENT ($) 750.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Rikard M. Kjellberg
Examiner Name	
Group/Art Unit	
Attorney Docket No.	3399P103

METHOD OF PAYMENT (check one)

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☒ Credit any overpayments

☒ Charge any additional fee(s) required under 37 CFR §§ 1.18, 1.17, 1.18 and 1.20.

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	750.00
1002	330	2002	185	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 750.00

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	11	- 20** =	0	x	18.00	=	$0.00
Independent Claims	3	- 3** =	0	x	84.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple Dependent claim, if not paid
1204	84	2204	42	**Reissue independent claims over original patent
1205	18	2205	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

***or number previously paid, if greater, For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1404	320	2401	180	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	850	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	1809	375	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

Other fee (specify) _____

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APPLICATION DATA SHEET

APPLICATION INFORMATION

Application Type::	Regular
Subject Matter::	Utility
Title::	Device Capability Based Discovery, Packaging and Provisioning of Content for Wireless Mobile Devices
Attorney Docket Number::	3399P103
Request for Early Publication?::	No
Request for Non-Publication?::	No
Total Drawing Sheets::	14
Small Entity?::	No

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REPRESENTATIVE INFORMATION

Representative Designation::	Registration Number::	Representative Name::
Primary	39602	Jordan M. Becker

DOMESTIC PRIORITY INFORMATION

Application::	Continuity Type::	Parent Application::	Parent Filing Date::
This Application	An application claiming the benefit under 35 USC 119(e)	60/393,024	06/28/2002
This Application	An application claiming the benefit under 35 USC 119(e)	60/392,383	06/28/2002
This Application	An application claiming the benefit under 35 USC 119(e)	60/393,041	06/28/2002
This Application	An application claiming the benefit under 35 USC 119(e)	60/392,999	06/28/2002

UNITED STATES PATENT APPLICATION

FOR

Device Capability Based Discovery, Packaging and Provisioning of Content for Wireless Mobile Devices

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Date of Deposit June 19, 2003
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Julie Arango
(Typed or printed name of person mailing paper or fee)

Julie Arango 6/19/03
(Signature of person mailing paper or fee)

Device Capability Based Discovery, Packaging and Provisioning of Content for Wireless Mobile Devices

[0001] This application claims the benefit of U.S provisional patent applications nos.: 60/393,024; 60/392,383; 60/393,041; and 60/392,999, each of which was filed on June 28, 2002, and each of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] At least one embodiment of the present invention pertains to systems and methods for providing digital content to wireless services subscribers, and more particularly, to facilitating management and delivery of digital content from multiple content suppliers to multiple wireless services subscribers in multiple domains.

BACKGROUND

[0003] Personal mobile communication/computing devices, such as cellular telephones, personal digital assistants (PDAs) and two-way pagers, have become commonplace in many countries. These devices are referred to collectively herein as "mobile devices" or "wireless devices". The current state-of-the-art of mobile devices has advanced far beyond that of their predecessors. For example, early cellular telephones were used analog signals to communicate over wireless telecommunications networks (or simply "wireless networks") and were nothing more than mobile telephones. Today's cellular telephones typically are all digital and provide many other functions in addition to telephony capability. For example, many of the latest generation of mobile telephones (and other mobile devices) allow their users to play games, access World Wide Web pages, exchange email, exchange and download files, exchange short messaging service (SMS) messages, and send and receive video.

[0004] With new mobile devices providing a wider range of capabilities, there is increasing demand among the users of these devices (i.e., wireless services subscribers) for new and interesting types of digital content that can be used on these mobile devices, such as games and other applications, images, ring tones, screensavers, wallpapers, etc. Although newer mobile devices often come pre-provisioned with certain digital products when first acquired by the subscriber, it is desirable to allow subscribers to acquire additional digital products for use in their

mobile devices as such products become available. While this capability already exists, currently subscribers acquire digital content directly from the content suppliers (typically via the wireless network and the Internet). This process is inconvenient if a subscriber wishes to acquire various different items of digital content from different suppliers, since the subscriber must navigate to the web sites of different suppliers. Therefore, it is further desirable to make many different types of digital content available to subscribers at one time through a centralized "store".

[0005] From the content supplier's perspective, another impediment to the efficient distribution of digital content is the fact that different mobile devices often require different content packaging formats and provisioning protocols. In order to make a given item of digital content available to multiple mobile devices supporting different provisioning models, a digital content supplier will normally deploy that item of content multiple times, packaging it differently for each of the provisioning models. For example, an image to be delivered to Nokia-COD phones and Sprint-GCD OTA phones would be deployed twice, custom-packaged for each of those two delivery modes. It is very burdensome for digital content suppliers to have to package and provision the digital content they produce in a manner that is suitable for all of the devices in the marketplace. Moreover, it is difficult for content suppliers to keep up with the constant changes in device capabilities for the many mobile devices in the marketplace. Consequently, there is often a gap between the interoperability of a given digital product and how effective it can be used on a device. Therefore, the problem exists of how to efficiently allow many digital content providers to distribute many different types of digital content to subscribers using many different types of mobile devices.

[0006] A related problem is how to charge subscribers for the digital content they acquire. In one known system. The wireless carrier's system is capable of connecting to an external billing system and provides billing events to that system when a subscriber performs a chargeable action. However, this scenario assumes that all subscribers belong to a single organization that also owns the billing system. Furthermore, it assumes that a single currency is used. Yet many multi-national organizations have a parent company with subsidiaries in many countries. Different countries have different currencies, taxes and other charges. Each subsidiary may

implement its own support/business infrastructure to deal with local regulations and customs, particularly with respect to the billing process. Consequently, the carrier's system must be able to generate billing events and direct them to the appropriate external billing system. Furthermore, it must be able to present the customer with a charge for each service, in the applicable currency and expressed in a way that is appropriate considering local taxes, fees and other regulations.

[0007] One way to address this problem, which only partially solves it, is to use credit card systems. In this scenario, the credit card company acts as an intermediary in the billing process. This approach consolidates all billing at one point. Settlement is done between the product/service provider and the subscriber provider (e.g., the wireless carrier) for a fee. This approach, however, does not handle the currency, taxes, fees and regulations issues mentioned above.

SUMMARY OF THE INVENTION

[0008] One aspect of the invention is a method and apparatus for providing access to content for use on wireless communication devices. Multiple items of content are stored in a server system, to be made available for use in wireless communication devices used by multiple wireless services subscribers. Each of the items of content is associated in the server system with multiple different provisioning models for provisioning the content in wireless communication devices. Each of the provisioning models corresponds to a different set of device capabilities.

[0009] In another aspect of the invention, multiple different implementations of at least one of the items of content are received, where each implementation corresponds to a different set of device capabilities. A product catalog containing a description of the items of content is also maintained. The product catalog includes, in association with each item of content, a reference to each implementation of the item of content.

[0010] Other features of the present invention will be apparent from the accompanying drawings and from the detailed description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] One or more embodiments of the present invention are illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

[0012] Figure 1 illustrates the relationship between the download manager, content suppliers, and subscribers;

[0013] Figure 2 shows a network architecture in which a download manager in accordance with the invention can be deployed;

[0014] Figure 3 schematically shows the components of the download manager;

[0015] Figure 4 shows the components of the device capability manager;

[0016] Figure 5 shows the relationship between a product entry and implementations of the product in the product catalog;

[0017] Figure 6 shows the relationship between a product and its implementations;

[0018] Figure 7 shows how various data elements are used in the billing process;

[0019] Figure 8 illustrates a simplified process by which a product can be listed in the product catalog in a way that facilitates device-tailored product discovery and provisioning;

[0020] Figure 9 shows a process by which the product catalog is displayed to a subscriber;

[0021] Figure 10 shows a process by which a purchase of a product can be made using the download manager;

[0022] Figure 11 illustrates the separation, within the download manager, of content from how the content is provisioned;

[0023] Figure 12 illustrates a process by which a product is provisioned in a client device using the appropriate one of various provisioning protocols;

[0024] Figure 13 shows an example of the software deployment architecture of the download manager; and

[0025] Figure 14 illustrates the hardware architecture of a computer system in which the download manager can be implemented.

DETAILED DESCRIPTION

[0026] A system and method for efficiently managing the publication, purchase and delivery of digital content from multiple content suppliers to multiple wireless services subscribers in multiple domains are described below. As used in this description, the terms "digital content", "digital product", "content", and "product" are used interchangeably and mean software and/or data embodying things such as games and other applications, applets or the like; images; screensavers; wallpaper; ring tones; etc., particularly (but not necessarily exclusively) those designed for use in mobile devices such as cellular telephones, personal digital assistants (PDAs), and other small-footprint wireless/mobile devices. For convenience the terms "purchase" or "buy" are used to mean either actual purchase or any other conventional way in which a subscriber can acquire rights to use digital content (e.g., by acquiring a license).

Overview

[0027] As described in greater detail below, a system which manages publication, purchase and delivery of digital content is implemented in a network server system that includes one or more server computer systems on a network. The server system includes an application server referred to herein as the "download manager". Digital content suppliers can publish and manage their products using the download manager via a computer network, such as the Internet, and can make their products available to wireless services subscribers through the download manager for purchase or licensing. Subscribers can access the server system via wireless networks to purchase rights to download and use the digital content on their wireless communication devices.

[0028] Figure 1 illustrates the relationship between the download manager, content suppliers, and wireless services subscribers (users of mobile devices). The download manager 1 acts as an intermediary between multiple content suppliers 2 (e.g., 2A, 2B, etc.) and multiple customers (e.g., 3A, 3B, etc.), e.g., wireless services subscribers, belonging to multiple "domains". In the supply chain process for distribution of digital content, a content supplier 2 adds a digital product to the set of products managed by the download manager 1 (i.e., products "in the store"). The supplier 2 then associates various attributes with the product. Once the product has been submitted to the

product store, a product administrator associated with the download manager 1 verifies its quality and determines whether it should be made available to the customers 2 or if it should be rejected. Once the product is approved, customers 2 can buy the product by accessing the download manager 1 from their client devices.

[0029] To facilitate description, it is henceforth assumed herein that the customers are users of mobile devices and, therefore, are subscribers of warless services (although that need not be the case); thus, customers are henceforth called "subscribers" herein. Note, however, that the techniques described herein need not be limited to wireless services subscribers or mobile client devices.

Domains and Partner Management

[0030] Among other advantageous features, the download manager 1 facilitates partner management. A "partner", as the term is used herein, is an entity that holds a relationship to a subscriber for purposes of delivery of digital products, billing, returns, etc. For example, a partner can be an Internet portal, an Internet Service Provider (ISP), a wireless carrier, an application service provider (ASP), etc. A partner also appoints a number of content suppliers to supply products to the product store. Partner management is the concept of being able to assign responsibility for various parts of the digital product supply chain to different categories of users.

[0031] The entities "within the store" (managed by the download manager 1) belonging to a partner are partitioned into entities called "domains". A "domain", as the term is used herein, is an entity, defined in the download manager 1, that describes the billing relationship between a partner and a set of subscribers, as well as describing a partitioning of product space and administrative responsibilities. As such, a domain can represent a grouping of wireless services subscribers, such as a wireless carrier or a subsidiary of a wireless carrier, a business enterprise, or any other defined group of wireless services subscribers. The domain manager maintains a database of data defining the associations between domains and partners, administrators, subscribers and products.

[0032] Domains facilitate the proper billing of subscribers from multiple organizations and/or with multiple wireless carriers (or other subscriber providers), and facilitate

presentation of product descriptions to subscribers in the languages and currencies appropriate for their local countries or regions.

[0033] The domain entity is also used in the download manager 1 to classify other entities as belonging to a domain 1-to-1, belonging to a domain 1-to-many, many-to-many, or not belonging to a domain. In general, a domain captures the following relationships to the subscribers:

1) how subscribers are charged for the products they purchase and in which currency;

2) to which user groups the subscribers can belong;

3) from which product categories the subscribers can select products; and

4) which products are accessible to the subscribers.

[0034] In certain embodiments of the invention, a domain has the following properties:

- a name (localized)
- a description (localized)
- a uniform resource locator (URL) to a web site giving further description of the domain
- a contact address including contact person, contact telephone numbers, fax numbers and postal address
- the currency to use for billing and display purposes
- reference to handlers for various different payment models (e.g., online payment, pre-payment and post-payment)
- a set of references to rating handlers used for adjustment of product prices

[0035] The name and the descriptions have localized values for the set of languages registered in the system.

[0036] The distinction between domain entities and non-domain entities also forms the basis for delegated administration. More specifically, for each domain, the responsibility for supplying products, approving or rejecting products, etc. can be delegated to different suppliers and administrators. Thus, each domain is associated with a set of administrators that handle the products in the store. In certain embodiments of the invention, these administrators include a system administrator, a domain administrator, a product administrator, and a customer care administrator.

[0037] The system administrator is the overall administrator for the download manager 1, who can create new domains and their respective domain administrators to help regulate it. He also maintains the ability to control non-domain entities such as devices, content types, etc. The domain administrator is the overall administrator for a given domain. He has the ability to manage all of the suppliers and subscribers for his domain as well as create product and customer care administrators for the domain. The product administrator is responsible for managing the entire product lifecycle for the content submitted by the domain's suppliers. The customer care administrator is responsible for managing subscribers belonging to the domain. Each subscriber belongs to only one domain and can only see products for the domain to which he belongs.

[0038] A partner appoints a number of content suppliers who provide products to the product store. A supplier can only submit products to the domain(s) to which he belongs. The relationship between suppliers and domains is many-to-many. Products are approved and deployed separately for each domain.

[0039] From the content supplier's perspective, all entities in the download manager 1 that are domain-related are only selectable based on the domains to which the supplier can provide products. For example, a supplier can only choose from among the product categories and license models that belong to the domains to which the supplier has the right to supply products.

Network Environment

[0040] Figure 2 shows a network architecture in which a download manager in accordance with the invention can be advantageously deployed. One or more wireless networks 22 are connected to a computer network 24 through corresponding gateways 23. The computer network 24 may be the Internet, although alternatively, it could be essentially any other type of computer network, such as a corporate intranet, a local area network (LAN), etc., or a combination of such networks.

[0041] A number of mobile client devices 21 (e.g., 21A, 21B, etc.) operate on each wireless network 22. A number of servers 25 (e.g., 5A, 5B, etc.) operate on the computer network 24 to provide a variety of services for the mobile devices 21 and/or to one or more non-mobile client devices 29 coupled to the computer network 24. For

example, the servers 25 may include World Wide Web servers, file servers, application servers, etc.

[0042] Each gateway 23 is operated by the wireless carrier of the wireless network to which it is directly connected. Each gateway 23 provides an interface between a particular wireless network 22 and the computer network 24 (e.g., the Internet), providing routing and, if necessary, appropriate protocol translation and/or content transcoding. In some cases, the gateway 23 may be a standalone device or system. In other cases, the gateway 3 may be part of a more-capable server system that provides additional value-added services to users of client devices 21; such as a proxy service 27, a provisioning manager 28, etc.

[0043] A download manager 1 in accordance with the present invention is connected to the computer network 24, either directly (as shown) or indirectly. The download manager 1 can be, but does not have to be, operated by a wireless carrier.

Download Manager

[0044] Figure 3 schematically shows the download manager in greater detail, according to certain embodiments of the invention. In the illustrated embodiment, the major components of the download manager include a delivery manager31, a product manager 32, a business & operations manager 33, and multiple protocol handlers 34. Each of these components is preferably implemented as software, data, or a combination of software and data. However, in other embodiments, some or all of these components could be implemented in hardwired circuitry. The download manager 1 may also include a database 35 of published content, as shown, although at least some of the published content may instead be stored remotely.

[0045] The product manager 32 is the download manager's interface to the various content suppliers and provides centralized product cataloging (including enabling qualified content suppliers to register content for analysis and publication) and complete product life cycle support (i.e., management of content submission, analysis, approval, publication, use, maintenance, and eventual deactivation). The term "publication", as used herein, means making a product available on the download manager to wireless services subscribers for downloading to their client devices. The delivery manager 31

is the download manager's interface to the various subscribers and is responsible for delivering purchased digital content to subscribers, including invoking a protocol handler appropriate for communicating with each requesting mobile device. The protocol handlers 34 support multiple product discovery protocols and multiple product delivery protocols simultaneously. Hence, the protocol handlers 34 include product discovery handlers (e.g., a WAP handler, a Web handler, a Motorola Discovery handler) and product delivery handlers (e.g., a MIDP OTA handler, a Motorola OTA handler, a Nokia COD OTA handler). The business & operations manager 33 is mainly responsible for managing domain information and processes for charging subscribers for purchases of content. These components are described further below.

[0046] As shown in Figure 3, the delivery manager 31 in certain embodiments includes a security manager 36, a device capability manager 37, a personal vault 38, a storefront 39, and a notification manager 40. The storefront 39 is a conventional graphical user interface for allowing subscribers to make online purchases. It can be branded to a particular wireless carrier, for example, or other business entity. The security manager 36 is responsible for authentication of subscribers and client devices for purposes of purchasing content and preferably can support multiple authentication schemes, such as HTTP-based authentication, MSISDN/NIA based authentication, etc. The personal vault 38 stores, on a subscriber-by-subscriber basis, information to facilitate digital rights management (DRM), such as product licenses and/or other "purchase" information of the products purchased by each subscriber. This allows a subscriber to remove downloaded content from a mobile device without losing rights to the product, or to recover products on a device in cases of device hard reset, loss, etc.

[0047] The notification manager 40 can provide various types of notifications to subscribers using various communication channels, such as email, SMS, and WAP Push. The notification manager 40 can generate notifications automatically, such as notifications of new products or product upgrades, or in response to commands from a system administrator, such as account notifications, notifications of special promotions, etc.

[0048] The device capability manager 37 is responsible for device recognition (e.g., supporting device recognition through UAProf using Profile headers and Profile-Diff

headers), device capability determination (e.g., retrieving device descriptors using best efforts and appending device capabilities to the session context), and device capability management (e.g., automated management of UAProf capable devices and quarantine of undefined or partially defined devices). As described further below, recognition of devices and their capabilities is used for a variety of purposes, such as to filter the set of available products that a subscriber can discover when connecting to the download manager 1, to select the appropriate implementations of products that are purchased, and to select the appropriate provisioning model for provisioning a purchased product in a client device.

[0049] Figure 4 shows the components of the device capability manager 37 according to an embodiment of the invention. The device capability manager 37 includes a device manager 41, a device handler manager 42, a delivery context cache 43, a set of device recognition handlers 44, a device data access object (DAO) 45, a device information database 46, a UAProf parser 47, a UAProf resolver 48, a dm-config.xml file 49, and a DeviceVocabulary file 50. The device information database 46 stores information identifying mobile devices and their corresponding capabilities. The device manager 41 contains all of the business logic that supports the user interface and the rest of the download manager 1. The device DAO 45 contains all data logic and scripted query language necessary to communicate with the device information database 46.

[0050] The device handler manager 42 is responsible for discovering and determining the types of devices accessing the download manager 1. Upon startup of the download manager 1, the device handler manager 42 loads the device recognition handlers 44 ordered by the dm-config.xml file 49. This order is then used to determine which headers are to be processed first. The delivery context cache 43 is used to help improve performance on subsequent look-ups. If no device capabilities can be found or processed by the chain of handlers 44, the device handler manager 42 then uses a default delivery context as defined by an administrative user interface.

[0051] The illustrated embodiment includes three device recognition handlers 44: an XwapProfile handler, a UserAgent handler, and a quarantine handler. The XwapProfile handler is responsible for processing the "x-wap-profile" and "x-wap-profil-diff" request headers in requests from mobile (client) devices. It makes use of the UAProf parser 47

to parse RDF-compliant files and the UAProf resolver 48 to resolve the differences of the headers. The UAProf parser 47 parses RDF-compliant files. The UAProf resolver 48 reads resolution rules from the device-vocabulary.xml configuration file 50 and uses these rules to help merge x-wap-profile and x-wap-profile-diff headers.

[0052] The UserAgent handler is responsible for processing the "user-agent" request headers. It uses regular expression matching to best match the capabilities with the incoming "user-agent" header. If no user-agent header can be found or one is found but does not match to any existing capabilities, the request header is passed to the next handler in the chain.

[0053] The quarantine handler is responsible for processing any "accept" request headers. If the quarantine handler finds a user-agent header, it will add a new record in a device match table. Otherwise, it will simply return a delivery context with a set of capabilities determined by the "accept" headers and capabilities already defined by the default device profile.

[0054] The device capability manager 37 is capable of managing client devices in either of two categories: actual devices and generic devices. In response to client device requests, the device capability manager 37 uses actual device information from the request and any applicable stored generic device definitions to recognize the accessing client device and its capabilities. The system administrator can define devices (or device capabilities) in either category. An actual device is a particular make and model of client device, such as "Nokia 6310". Actual devices are identified solely from incoming requests, based on the UserAgent and x-wap-profile headers in the requests, for example. A generic device is a predefined device or set of device capabilities. Examples of some generic device definitions are: all Nokia devices (e.g., "vendorname=nokia"), all devices with display size > 40, and all devices which support SMS. In response to client device requests, the device capability manager 37 uses the UserAgent or x-wap-profile header to identify the actual device accessing the system and to look up its corresponding capabilities in the device information database 46, which are combined with any applicable generic device definitions to determine the capabilities of the client device. The use of this information is described further below.

[0055] It is useful now to define two types of device capabilities which the device capability manager is able to resolve: static capabilities and active capabilities. As defined in the download manager, "static" capabilities are the well-known set of attributes for a given device which are defined during pre-processing, not on-the-fly. These are associated with a client device as identified in the UserAgent or x-wap-profile headers. Generic devices, as defined above, only have static capabilities. "Active" capabilities represent a dynamic collection of attributes extracted during an interaction between the client device and the download manager, typically from the Accept headers. These two types of device capabilities are stored separately in the device information database 46.

[0056] The ability for a user to discover content based on the static (well-known) capabilities of his device is valuable. With the number of device manufacturers and content providers in the market, there is often a gap between the interoperability of a given content and how effective it can be run on a device. By using the system's unique ability to capture the capabilities of a device and for content suppliers to select compatible devices for their content, the download manager 1 is capable of targeting supported products to their respective devices for a subscriber. In addition, the download manager 1 is able to easily adapt to the ever-changing modifications to capabilities and requirements and is highly scalable as more devices and content are pushed into the system, without a substantial decrease in performance.

[0057] Referring again to Figure 3, the product manager 32 in certain embodiments includes a product workflow manager 51, a content analysis manager 52, a pricing manager 53, and a product catalog 54. The product workflow manager 51 allows the system administrator to define and modify details of the product workflow for processing content submitted by content providers. An example of a product workflow is (n chronological order): 1) submission, 2) content analysis, 3) listing of content in the product catalog, 4) usage of the content, 5) maintenance of content, and 6) content retirement (i.e., cancellation or deletion).

[0058] The content analysis manager 52 manages the process of verifying content quality and compliance with various requirements when the content is initially submitted by the content supplier (e.g., compliance with its declared type, content structure

resource utilization, etc.). Content must pass the content analysis process satisfactorily before being listed in the product catalog 54 (i.e., published).

[0059] The pricing manager 53 allows administrators to add, modify and delete license for products in the store. The pricing manager 53 also includes and invokes a set of rating handlers at the time of purchase, which can adjust the price of the product based on various factors (e.g., promotions, applicable rebates, etc.), as described further below.

[0060] The product catalog 54 contains descriptions of all published items of content (products). Referring to Figure 5, the catalog 54 includes, for each product entry 56, a reference 58 to at least one implementation 57 of that product. An implementation 57 can be simply a binary file (a "binary") representing the product. In some cases, however, an implementation 57 may represent two or more binaries 61, as shown in Figure 6. Also as represented in Figures 5 and Figure 6, any particular product may have multiple implementations published on the download manager, each of which may be designed for a different specific client device or set of client devices.

[0061] Hence, any particular product entry in the catalog 54 can include references to multiple implementations of the product. However, the products shown to any particular subscriber when the subscriber views the catalog are filtered according to the device capabilities of the subscriber's device. More specifically, only those products that have at least one implementation compatible with the subscriber's device are shown to the subscriber. As shown in Figure 5, each implementation entry 57 also includes a list (59A or 59B) of devices supported by that implementation. Each product entry 56 in the catalog 54 includes a list 59 of the devices that are supported by that product. Which represents the aggregation of all of the devices supported by all of the implementations 57 of that product.

[0062] In addition, for any particular product, the catalog may include a description 60 of the product in multiple different languages, to accommodate subscribers in different countries. Product descriptions 60 are shown to each subscriber in the appropriate language, and the prices of products are shown in the appropriate currency, according to the domain of which the subscriber is a member. The domain of the subscriber is identified by the domain manager 62, as described below.

[0063] Referring again to Figure 3, the business & operations manager 33 in certain embodiments includes an operation administration and management (OA&M) module 61, a domain manager 62, and a payment manager 63. The OA&M module 61 provides a Web based user interface for administering the download manager 1. It supports role-based delegation of administration duties (e.g., system administrator, domain administrator, product administrator, customer care administrator, etc.) and interfaces with the provisioning manager to provide logging and reporting of key events and transactions.

[0064] The payment manager 63 is responsible for the process of charging subscribers when they purchase content and supports multiple different languages and currencies, partitioned by domain. The approach to billing and payment assumes that there are local billing mechanisms in place, each of which has an established relationship to the subscriber already. The local billing mechanism operates in the local currency using the local taxes, fees and other applicable charges for the subscriber's region. It also invoices at intervals that are customary for the region.

[0065] In certain embodiments of the invention, a subscriber can select the preferred payment model to use of three available payment models:

- Online payment – payment is performed 'just-in-time'. A typical implementation performs the payment transaction at the time of the purchase.
- Pre-paid payments – payment is performed before purchase and the purchase is deducted from the pre-paid amount.
- Post payments – payment is performed after the purchase by invoice.

[0066] A separate payment handler of a set of payment handlers 64 is accessible to the payment manager 63 for each of these payment models (see Figure 3), and the payment manager is responsible for invoking the appropriate payment handler 64 at the time of purchase.

[0067] Referring now to Figure 7, anytime a subscriber logs in to the download manager, a session 71 is created. The session 71 holds a reference to a unique subscriber profile 72 associated with the subscriber. Each subscriber has such a subscriber profile, which points to the organization that holds the billing relationship with

the subscriber (i.e., the partner responsible for invoicing the subscriber) and an indication of the subscriber's selected payment model (i.e., post-paid, pre-paid, or online).

[0068] The download manager 1 also maintains a subscriber provider profile 73 for each subscriber provider (e.g., wireless carrier, etc.). Each subscriber provider profile 73 holds a reference to each of the payment handlers 64, an indication of the local currency, and an indication of any value added tax and/or other charges that normally apply to the offered services in the region.

[0069] The product catalog 54, as described above, holds the name, description and price of each product, as well as information indicating the supported devices. There is a separate entry for each supported local currency. There are no dependencies between the prices in various currencies for the same product.

[0070] This approach allows a product (or service) to have many different prices, on in each supported currency. There are no dependencies between prices other than that they all apply to one product. This approach, therefore, supports localized pricing policies and local taxes, etc.

[0071] The payment manager 63 includes a set of rating handlers (not shown), which are responsible for adjusting the price of products based on various factors, such as promotional offers, applying rebates, etc. Prices of content may change from time to time, subject to factors such as rebates, promotions, etc. At the time of purchase, the price of the product is determined by invoking the rating handlers. Each rating handler is called by the payment manager 63 with a reference to the corresponding product license and a reference to the subscriber. The rating handler is responsible for adjusting the price, if appropriate, and returning a new price.

[0072] Each of the payment handlers includes a charge method. During purchase the charge method of the registered payment handler for the payment model selected by the subscriber is called. The argument to the charge method is a data structure, ChargeDetailRecord, generated by the payment manager 63, which holds information about the subscriber, the product, the product license with the price, and the domain of the subscriber. The charge method can either approve the charge and, thus, allow the purchase, or it can deny the purchase.

[0073] Referring again to Figure 3, the domain manager 62 manages the associations between domains and partners, subscribers, suppliers, and products, and stores all of the domain information. As noted above, each domain can have the following properties:

- a name (localized)
- a description (localized)
- a uniform resource locator (URL) to a web site giving further description of the domain
- a contact address including contact person, contact telephone numbers, fax numbers and postal address
- the currency to use for billing and display purposes
- reference to handlers for online payment, pre-payment and post-payment
- a set of references to rating handlers

[0074] The domain manager 62 enables flexible business models to be implemented via revenue sharing between, and charging by, different stakeholders (partners).

[0075] Various aspects of the operation of the download manager 1 will now be described further with reference to Figures 8 through 13. Figure 8 illustrates a simplified process by which a product can be listed in the product catalog in a way that facilitates device-tailored product discovery and provisioning, according to an embodiment of the invention. Certain operations in the product workflow are not shown in Figure 8 to facilitate explanation, such as content analysis and approval. Initially, at block 801 the download manager 1 receives inputs from a product supplier defining a product and one or more implementations of that product. At block 802, the download manager receives inputs from the supplier specifying one or more devices (actual or generic) which support each implementation and one or more provisioning protocols to be used for each implementation. At block 803 the download manager 1 stores the product definition, the implementations, and a list of all of the supported devices and provisioning protocols. Finally, at block 804 the download manager 1 determines the set of all possible devices which support the product and stores this information in association with the product information in the product catalog 54.

[0076] Figure 9 shows a process by which the catalog is displayed to a subscriber, according to an embodiment of the invention. At block 901 a client device operated by the subscriber connects to the download manager 1. The domain manager 62 then identifies the domain of the subscriber at bock 902 based on its stored domain and subscriber associations. At block 903, the product manager 32 selects the language and currency to be used based on the domain of the subscriber (each domain has one language and currency). At block 904, the device capability manager 37 identifies the client device (e.g., from the UserAgent or x-wap-profile header) and its corresponding set of static (well-known) device capabilities. When a request to view available products is received from the client device (block 905), at block 906 the product manager 32 determines from the product catalog 54 which products are supported by the client device, based on the (static) capabilities of the client device. The download manager 1 then sends a response to the client at block 907, to cause the client device to display product information relating to only those products supported by the client device, in the appropriate currency and language for the subscriber's domain.

[0077] Figure 10 shows a process by which a purchase of a product can be made, according to an embodiment of the invention. After displaying the product catalog 54 to the subscriber, the download manager 1 receives the subscriber's selection of the product to purchase at block 1001. At block 1002 the pricing manager 53 calls all of the registered rating adapters. The rating adapters then adjust the price of the selected product, if appropriate, at block 1003. At block 1004 the pricing manager 53 then presents a license object indicating the price to the subscriber. If the subscriber confirms the purchase (block 1005), then at block 1006 the provisioning manager requests the payment manager 63 to charge the applicable price for the product. The payment manager 63 responds at block 1007 by selecting the applicable payment handler 44 based on the domain to which the subscriber belongs and the subscriber's preferred payment model (prepaid, post-paid, or online). Finally, at block 1008 the selected payment handler 44 performs the charge method to complete the transaction.

Multiple Provisioning Models

[0078] Different client devices often require different content provisioning protocols and packaging formats. In order to make a given item of digital content available to multiple mobile devices supporting different provisioning models, a digital content supplier would normally have to deploy that item of content multiple times, packaging it differently for each of the provisioning models. The download manager 1, however, separates content from how it is provisioned to a device. As described above and as illustrated conceptually in Figure 11, in the download manager 1 the product information is separated from the content itself, the content is separated from how it is packaged for delivery, the packaged content is separated from the delivery mechanism, and the delivery mechanism is separated from the discovery mechanism (the mechanism by which the subscriber discovers a product). By virtue of this separation, a content supplier is able to deploy content only once, targeting a wide range of devices, and the download manager 1 will deliver the content to those devices over a wide range of provisioning protocols.

[0079] When a product is submitted to the download manager 1 by a supplier, the supplier specifies which devices are supported by each implementation of the product. This information is then stored by the download manager 1 and used to select the proper packaging and provisioning protocol when the product is subsequently purchased.

[0080] The provisioning model used to provision a particular product in a particular client device is based on the device capabilities of the client device as well as the content type of the best-fit implementation. A provisioning "model", in this context, includes a particular provisioning protocol and a content packaging format. The ability to deliver the "best-fit" content based on "active" (dynamic) capabilities of a device is advantageous. Content provisioning provides the second part of targeting products to a given subscriber based on his device's capabilities. Whereas product discovery as described above relies on the "static" capabilities, provisioning relies on the "active" capabilities to determine the exact and often new enhancements of the client device. Given that a device can be fitted or enhanced with new features not described by the default set of capabilities originally intended for the device, the download manager 1

can use these active capabilities to find the best match content to provision to the device.

[0081] Figure 12 illustrates a process by which a product is provisioned in a client device using the appropriate one of various provisioning protocols. At block 1201, in response to a subscriber purchasing a product, the delivery manager 31 selects the best implementation of the product based on the device capabilities (static and active) of the client device. At block 1202 the download manager retrieves the content type of the selected implementation (e.g., MIDlet, EXE file, applet, iAppli, etc.). At block 1203 the download manager 1 selects the appropriate provisioning model available for that implementation, based on the device capabilities of the client device and the content type of the selected implementation. The provisioning manager 28 then creates a content descriptor for the implementation at block 1204, based on the selected provisioning model. The content descriptor specifies the name of the content to be provisioned, the size of the content, a location (e.g., a URL) at which the content is stored, and the content type of the content. The content descriptor is unique to the provisioning handler (protocol) of the selected provisioning model.

[0082] The provisioning manager 28 then downloads the content descriptor to the client device at block 1205. The client device parses the descriptor and then requests the content. When the provisioning manager 28 receives the request for the content from the client device at block 1206, the provisioning manager 28 responds at block 1207 by downloading the content using the provisioning protocol of the selected provisioning model (e.g., COD OTA, Openwave Download Fun, MIDP OTA, etc.)

Download Manager Deployment Architecture

[0083] Figure 13 shows an example of the software deployment architecture of the download manager 1 at a high level, according to an embodiment of the invention. Each instance of the download manager 1 resides on a host 131 that has access to a database 140. The host 131 is a server-class computer system including an operating system (e.g., Solaris). The database 140 may represent multiple physical databases, which in aggregate store all of the data used by the download manager 1 (i.e., product information, subscriber information, partner information, domain information, etc.). In

the illustrated embodiment, each host 131 includes a Java Virtual Machine (JVM) 132 which runs on top of the operating system and which hosts an application server 133. On top of the application server 133 is a Web container 134 that contains Java Server Pages (JSPs) 135 and servlets 136 as well as application components 137 including the business logic and data access layer 138 of the download manager 1.

[0084] The download manager 1 is formed by the Web container 134 and its contents, the application components 137, and at least a portion of the database 140. Horizontal scaling can be achieved by adding more hosts131 hosting instances of the download manager 1. In that case, an Internet Protocol (IP) load balancer 139 provides sticky load balancing, i.e., directing all session-specific traffic to the same host.

[0085] The above-described software architecture (i.e., the download manager) can be implemented in one or more conventional server-class computer systems. Figure 14 illustrates the hardware architecture of such a computer system at a high-level. Note that this architecture is also representative of at least some client devices that access the download manager 1. Note also that Figure 14 is a conceptual representation which represents any of numerous possible specific physical arrangements of hardware components; however, the details of such arrangements are not germane to the present invention and are well within the knowledge of those skilled in the art.

[0086] The processing system shown in Figure 14 includes one or more processors 140, i.e. a central processing unit (CPU), read-only memory (ROM) 141, and random access memory (RAM) 142, each connected to a bus system 146. Also coupled to the bus system 146 are a mass storage device 143, a data communication device 144, and in some embodiments, one or more additional input/output (I/O) devices 145.

[0087] The processor(s) 140 may be, or may include, one or more programmable general-purpose or special-purpose microprocessors or digital signal processors (DSPs), microcontrollers, application specific integrated circuits (ASICs), programmable logic devices (PLDs), or a combination of such devices. The bus system 146 includes one or more buses or other physical connections, which may be connected to each other through various bridges, bus controllers and/or adapters such as are well-known in the art. For example, the bus system 146 may include a "system bus", which may be connected through one or more adapters to one or more expansion buses, such as a

Peripheral Component Interconnect (PCI) bus, HyperTransport or industry standard architecture (ISA) bus, small computer system interface (SCSI) bus, universal serial bus (USB), or Institute of Electrical and Electronics Engineers (IEEE) standard 1394 bus (sometimes referred to as "Firewire"). In alternative embodiments, some or all of the aforementioned components may be connected to each other directly, rather than through a bus system.

[0088] The mass storage device 143 may be, or may include, any one or more devices suitable for storing large volumes of data in a non-volatile manner, such as a magnetic disk or tape, magneto-optical (MO) storage device, or any of various types of Digital Versatile Disk (DVD) or Compact Disk (CD) based storage, or a combination of such devices.

[0089] The data communication device 144 is a device suitable for enabling the processing system to communicate data with a remote processing system over a data communication link 148, and may be, for example, a conventional telephone modem, a wireless modem, an Integrated Services Digital Network (ISDN) adapter, a Digital Subscriber Line (DSL) modem, a cable modem, a radio transceiver, a satellite transceiver, an Ethernet adapter, or the like.

[0090] The I/O devices 145 (which may be omitted in a system that operates exclusively as a server and provides no direct local user interface) may include, for example, one or more devices such as: a pointing device such as a mouse, trackball, touchpad, or the like; a keyboard; audio speakers; and/or a display device such as a cathode ray tube (CRT), a liquid crystal display (LCD), or the like. Other variations upon the illustrated set of components can be implemented in a manner consistent with the invention.

[0091] Software (including instructions and data) 147 to implement the techniques described above may be stored in one or more of ROM 141, RAM 142, and mass storage device 143. In certain embodiments, the software 147 may be initially loaded into the processing system by downloading it from a remote system through the communication device 144.

[0092] Thus, a system and method for managing the publication, purchase and delivery of digital content from multiple content suppliers to multiple wireless services subscribers in multiple domains have been described. Although the present invention

has been described with reference to specific exemplary embodiments, it will be recognized that the invention is not limited to the embodiments described, but can be practiced with modification and alteration within the spirit and scope of the appended claims. Accordingly, the specification and drawings are to be regarded in an illustrative sense rather than a restrictive sense.

CLAIMS

What is claimed is:

1. A method of providing access to content for use on wireless communication devices, the method comprising:

receiving and storing in a server system a plurality of items of content to be made available for use in wireless communication devices used by a plurality of wireless services subscribers; and

associating each of the items of content in the server system with a plurality of different provisioning models for provisioning the content in wireless communication devices, each of the provisioning models corresponding to a different set of device capabilities.

2. A method as recited in claim 1, wherein each provisioning model includes a provisioning protocol and a corresponding set of provisioning descriptors.

3. A method as recited in claim 1, further comprising:

receiving a request for one of the items of content from a wireless services subscriber;

identifying device capabilities of a wireless communication device used by the subscriber in response to the request;

selecting one of a plurality of provisioning models associated in the server system with the requested item of content, based on the device capabilities of the wireless communication device used by the subscriber;

packaging the requested item according to the selected provisioning model; and

provisioning the requested item in the wireless communication device used by the subscriber according to the selected provisioning model.

4. A method as recited in claim 3, wherein:

said packaging the requested item comprises creating a provisioning descriptor for the requested item according to the selected provisioning model, and associating the provisioning descriptor with the requested item; and

said provisioning the requested item in the wireless device comprises sending the packaged requested item to the wireless communication device used by the subscriber according to a provisioning protocol associated with the selected provisioning model.

5. A method of providing access to content for use on wireless communication devices, the method comprising:

receiving and storing a plurality of items of content to be made available for use in wireless communication devices used by a plurality of wireless services subscribers, including receiving a plurality of different implementations of at least one of the items of content, where each implementation of any given item of content corresponds to a different set of device capabilities; and

maintaining a product catalog containing a description of the items of content, the product catalog including, in association with each item of content, a reference to each implementation of said item of content.

6. A method of providing access to digital content for use on wireless communication devices, the method comprising:

receiving and storing in a server system a plurality of items of digital content to be made available for use in wireless communication devices used by a plurality of wireless services subscribers, including receiving and storing a plurality of different implementations of at least one of the items of digital content, where each implementation of any given item of digital content corresponds to a different set of device capabilities;

operating the server system to maintain a product catalog containing a description of the items of digital content, wherein the product catalog includes, in association with each item of digital content, a reference to each implementation of said item of digital content;

receiving a request from a wireless device used by one of the subscribers;

in response to the request, selecting a portion of the product catalog to be presented to the subscriber, based on device capabilities of the wireless device used by the subscriber; and

presenting the selected portion of the product catalog to the subscriber via a wireless network, such that the selected portion, as presented to the subscriber, provides only a single description of each item of digital content in said portion, regardless of the number of implementations of each said item.

7. A method as recited in claim 6, wherein said selecting a portion of the product catalog comprises:

in response to the request, determining the identity of the wireless device used by the subscriber, wherein each implementation of the plurality of items of digital content has been previously associated in the server system with at least one device identity, according to corresponding device capabilities supported by the implementation; and

selecting the portion of the product catalog to be presented to the subscriber based on the identity of the wireless device used by the subscriber.

8. A method as recited in claim 6, further comprising:

receiving from the subscriber a request for one of the items of digital content in said portion of the product catalog;

selecting an implementation of the requested item of digital content, based on device capabilities of the wireless device used by the subscriber; and

downloading the selected implementation of the item of digital content to the wireless device used by the subscriber.

9. A method as recited in claim 1, further comprising associating each of the items of digital content in the server system with a plurality of different provisioning models, each of the provisioning models corresponding to a different set of device capabilities, each provisioning model including a provisioning protocol and a corresponding set of

provisioning attributes and descriptors for provisioning digital content in wireless devices.

10. A method as recited in claim 9, further comprising:

receiving from the subscriber a request for one of the items of digital content in said portion of the product catalog;

identifying device capabilities of the wireless device used by the subscriber;

selecting one of a plurality of provisioning models associated with the requested item in the server system, based on the device capabilities of the wireless device used by the subscriber;

packaging the requested item according to the selected provisioning model; and

provisioning the requested item in the wireless device used by the subscriber according to the selected provisioning model.

11. A method as recited in claim 10, wherein:

said packaging the requested item comprises creating a provisioning descriptor for the requested item according to the selected provisioning model, and associating the provisioning descriptor with the requested item; and

said provisioning the requested item in the wireless device comprises sending the packaged requested item to the wireless device used by the subscriber according to a provisioning protocol associated with the selected provisioning model.

ABSTRACT OF THE DISCLOSURE

A network server system includes a download manager that manages the publication, purchase and delivery of digital products from multiple suppliers to wireless services subscribers in multiple domains. Product suppliers can publish and manage their products on the server system via a computer network and make their products available to the subscribers for purchase or licensing. The subscribers in each domain can access the server remotely to purchase rights to download and use the products on associated wireless communication devices. Multiple different implementations of any product can be maintained, where each implementation corresponds to a different set of device capabilities. Each product can also be associated with multiple different provisioning models, each corresponding to a different set of device capabilities.

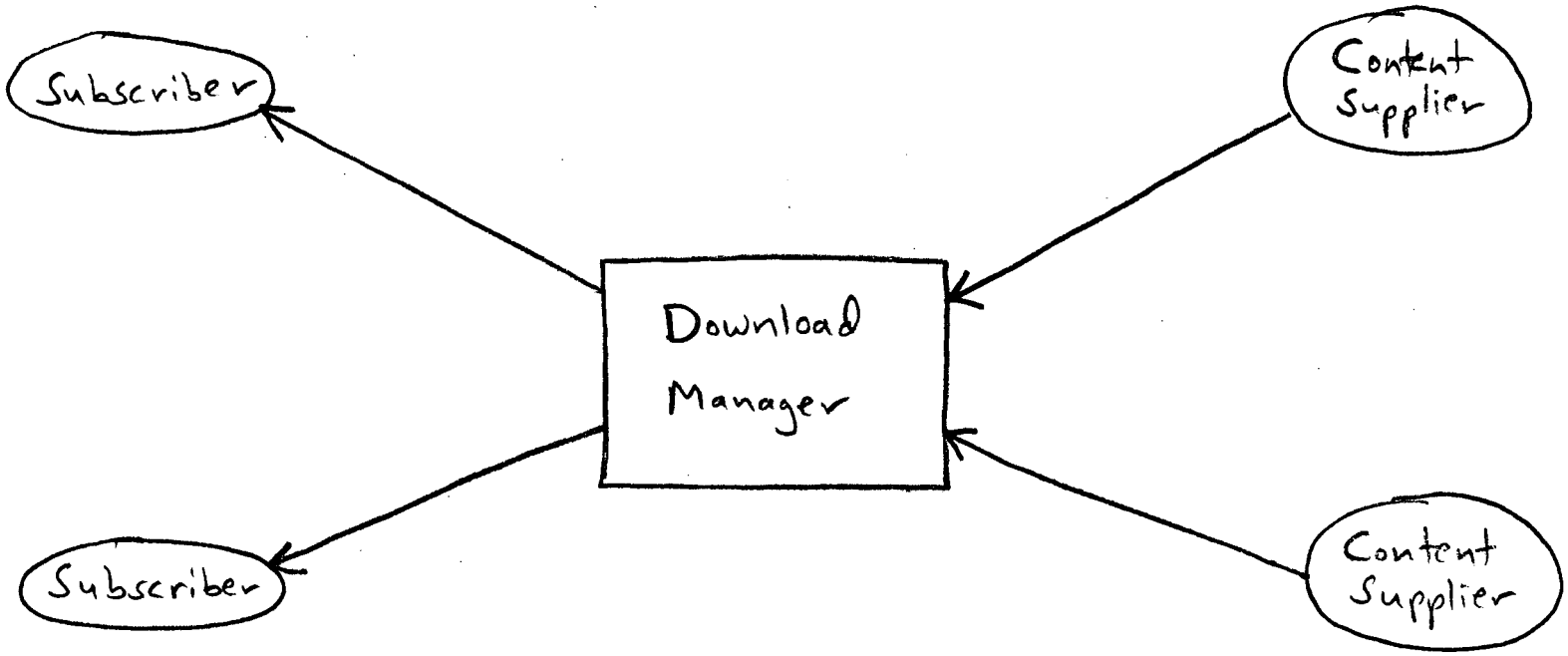

Subscriber
Content Supplier
Download Manager
Subscriber
Content Supplier

FIG. 1

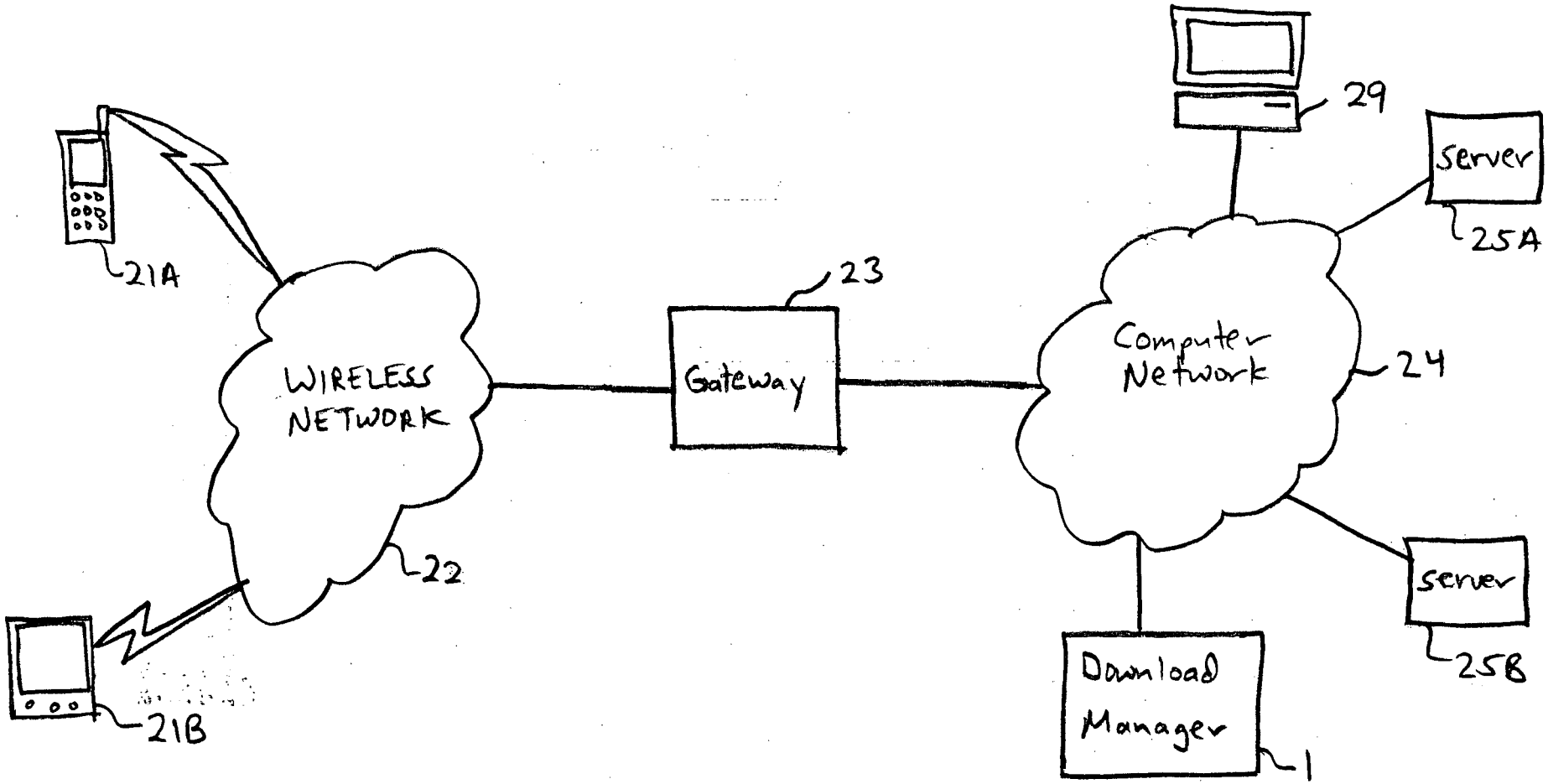

21A
WIRELESS NETWORK
22
23
Gateway
Computer Network
24
29
Server
25A
Server
25B
Download Manager
1
21B

FIG. 2

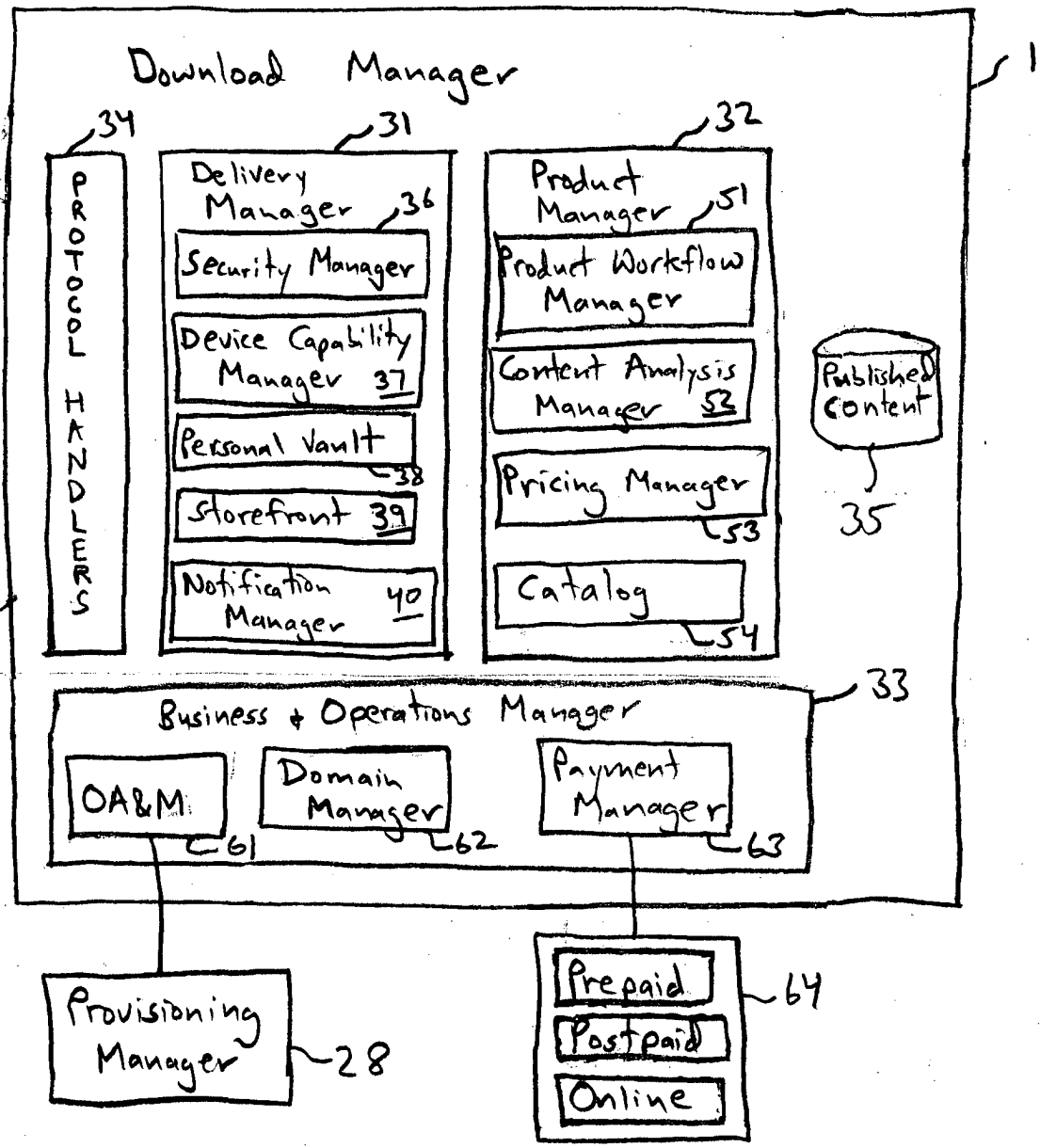

Download Manager
1
34
PROTOCOL HANDLERS
31
Delivery Manager
36
Security Manager
Device Capability Manager 37
Personal Vault
38
Storefront 39
Notification Manager 40
32
Product Manager
51
Product Workflow Manager
Content Analysis Manager 52
Pricing Manager
53
Catalog
54
Published Content
35
33
Business & Operations Manager
OA&M
61
Domain Manager
62
Payment Manager
63
Provisioning Manager
28
Prepaid
Postpaid
Online
64

FIG. 3

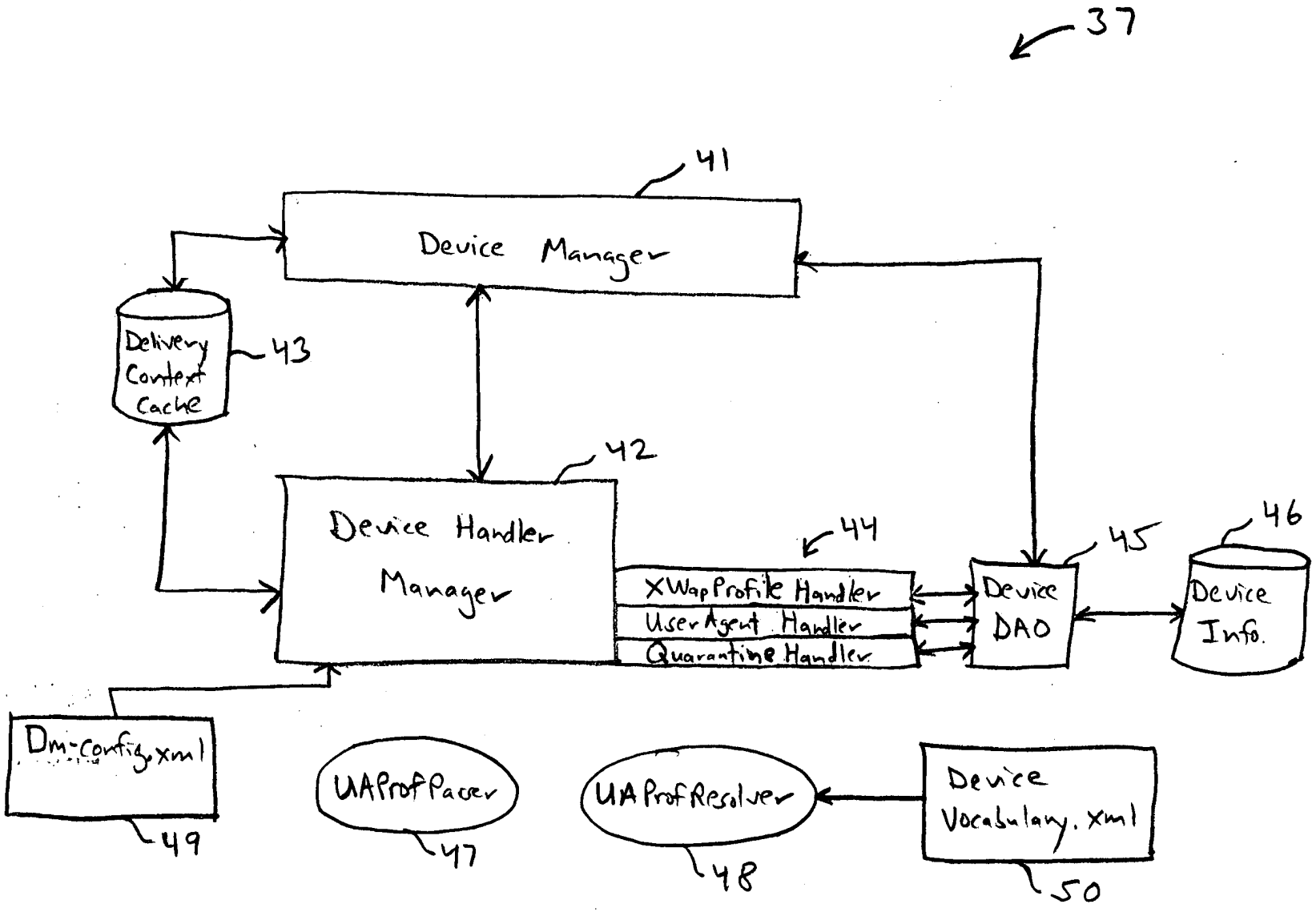

37
41
Device Manager
Delivery Context Cache
43
42
Device Handler Manager
44
XWapProfile Handler
UserAgent Handler
Quarantine Handler
45
Device DAO
46
Device Info.
Dm-config.xml
49
UAProfPacer
47
UAProfResolver
48
Device Vocabulary.xml
50

FIG. 4

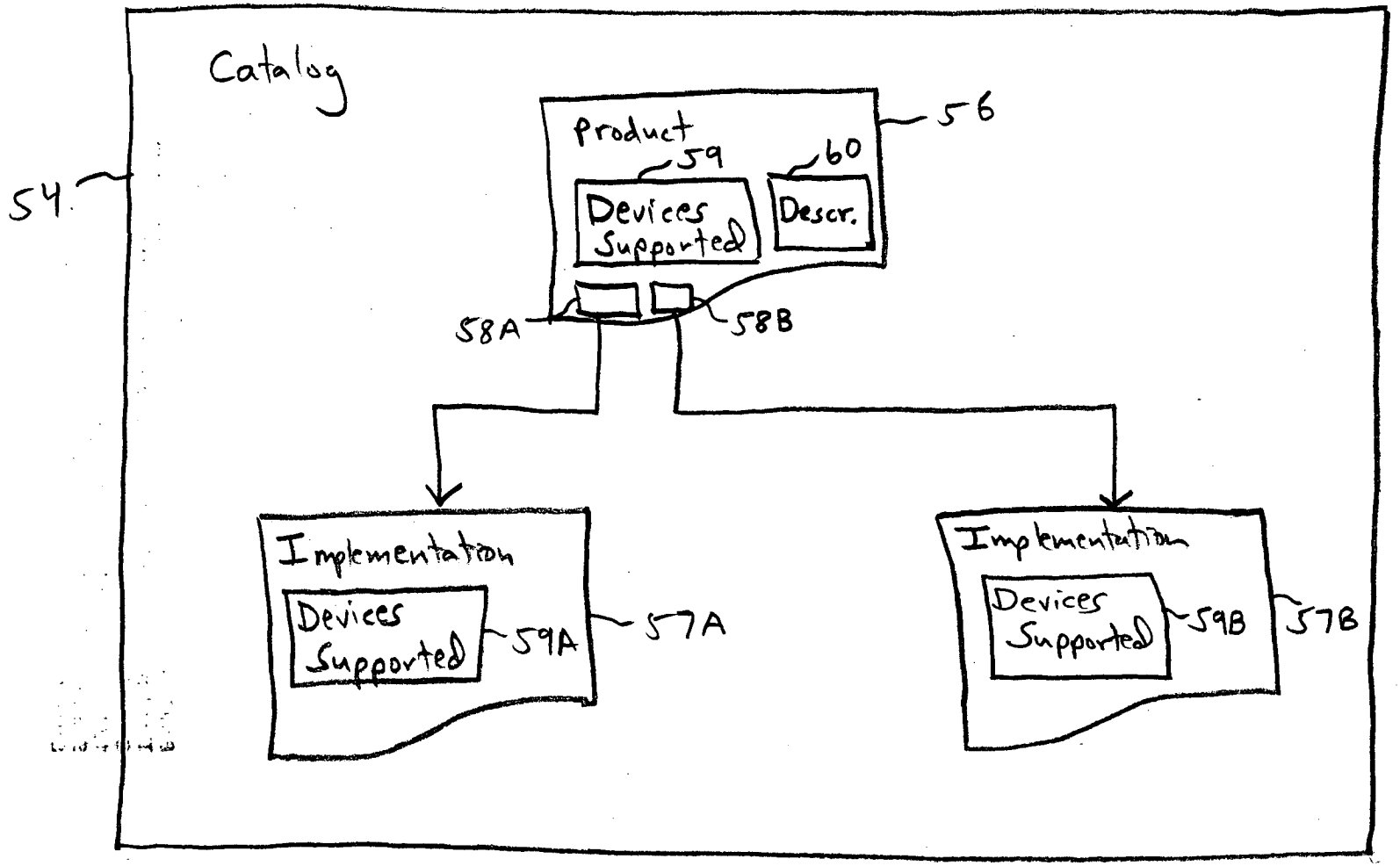

Catalog
54
Product
56
59
60
Devices Supported
Descr.
58A
58B
Implementation
Devices Supported
59A
57A
Implementation
Devices Supported
59B
57B

FIG. 5

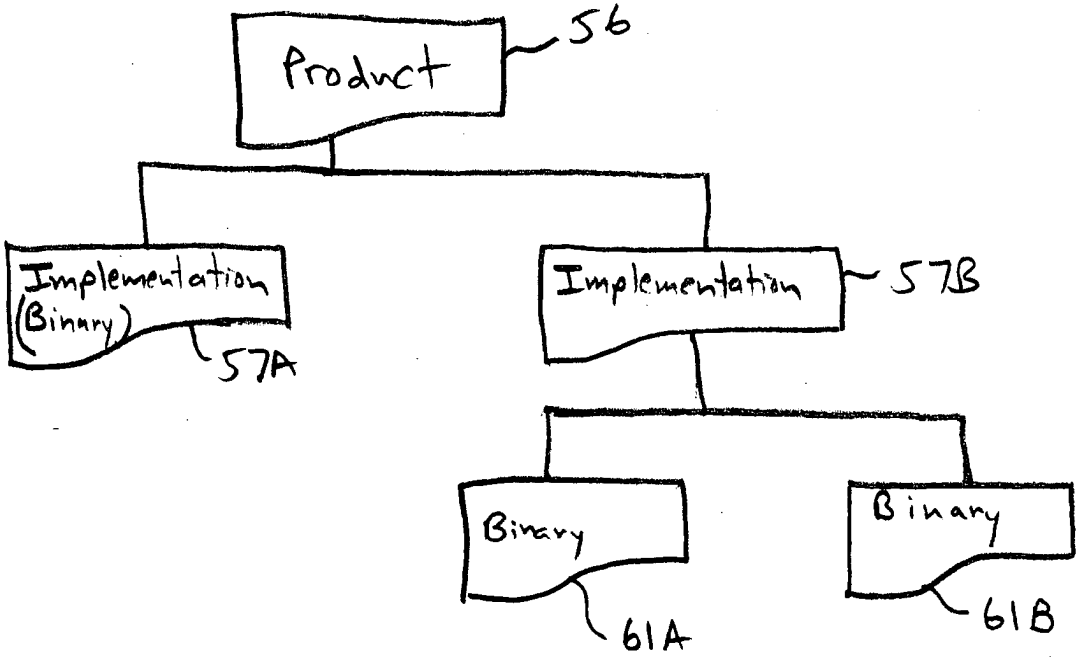

Product
56
Implementation
(Binary)
57A
Implementation
57B
Binary
61A
Binary
61B

FIG. 6

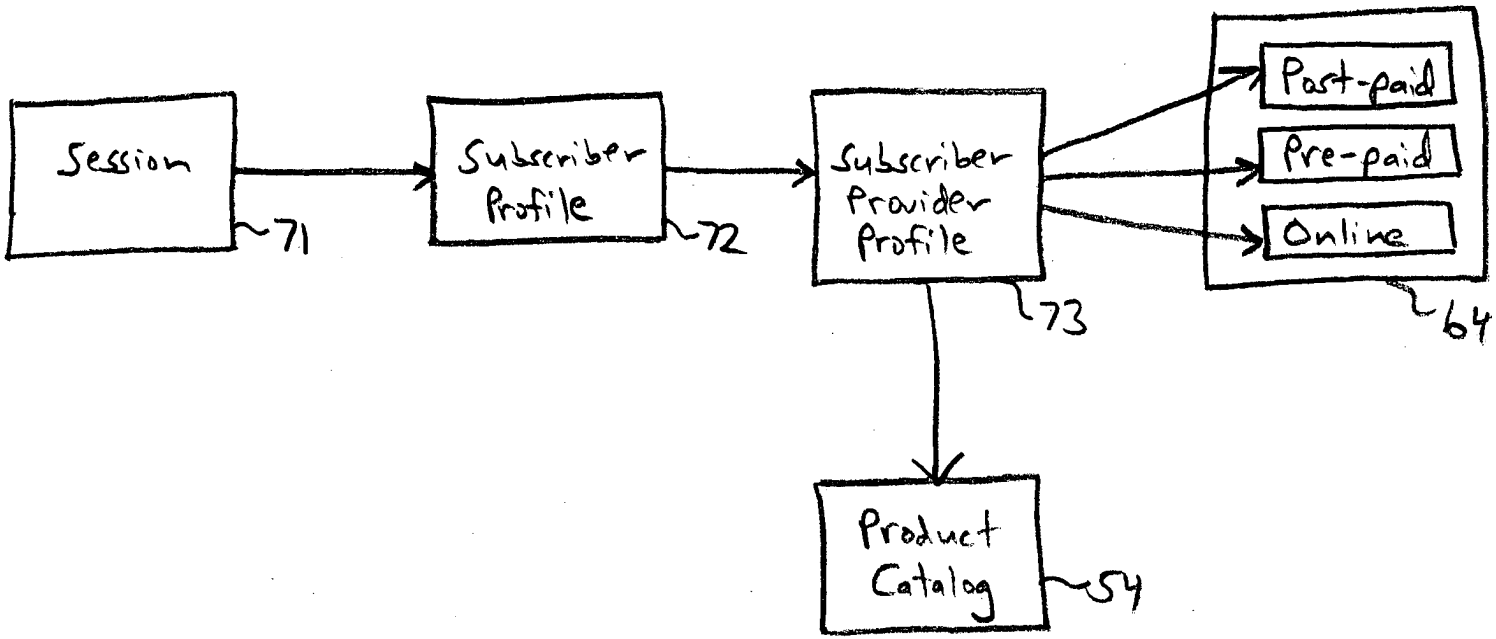

Session
71
Subscriber Profile
72
Subscriber Provider Profile
73
Post-paid
Pre-paid
Online
64
Product Catalog
54

FIG. 7

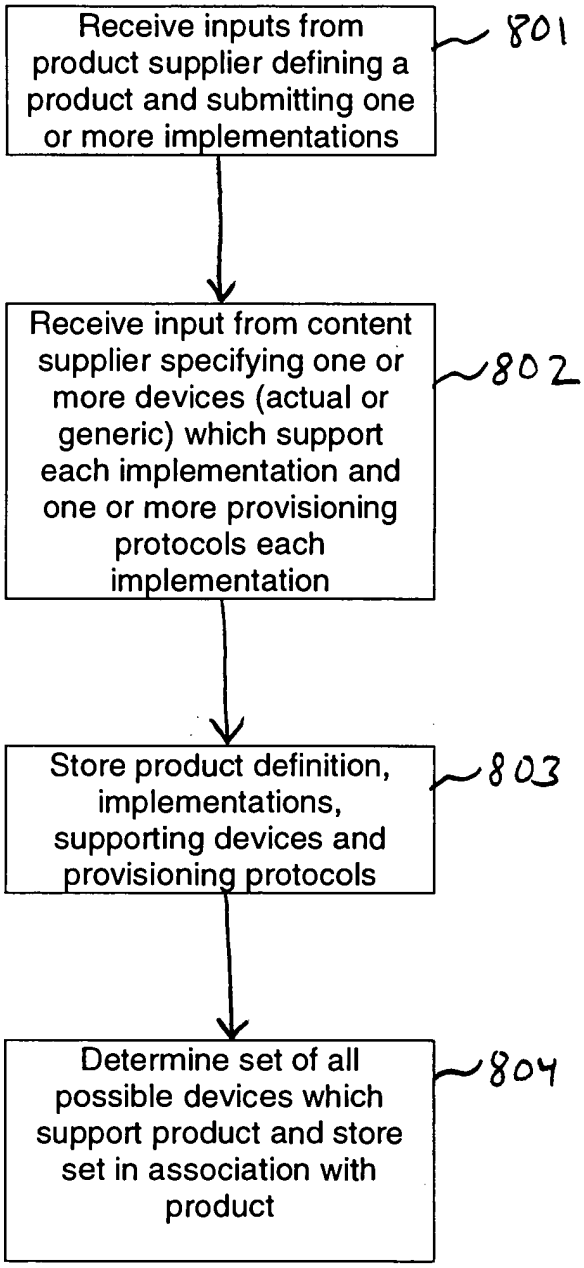

Receive inputs from product supplier defining a product and submitting one or more implementations
801
Receive input from content supplier specifying one or more devices (actual or generic) which support each implementation and one or more provisioning protocols each implementation
802
Store product definition, implementations, supporting devices and provisioning protocols
803
Determine set of all possible devices which support product and store set in association with product
804

FIG. 8

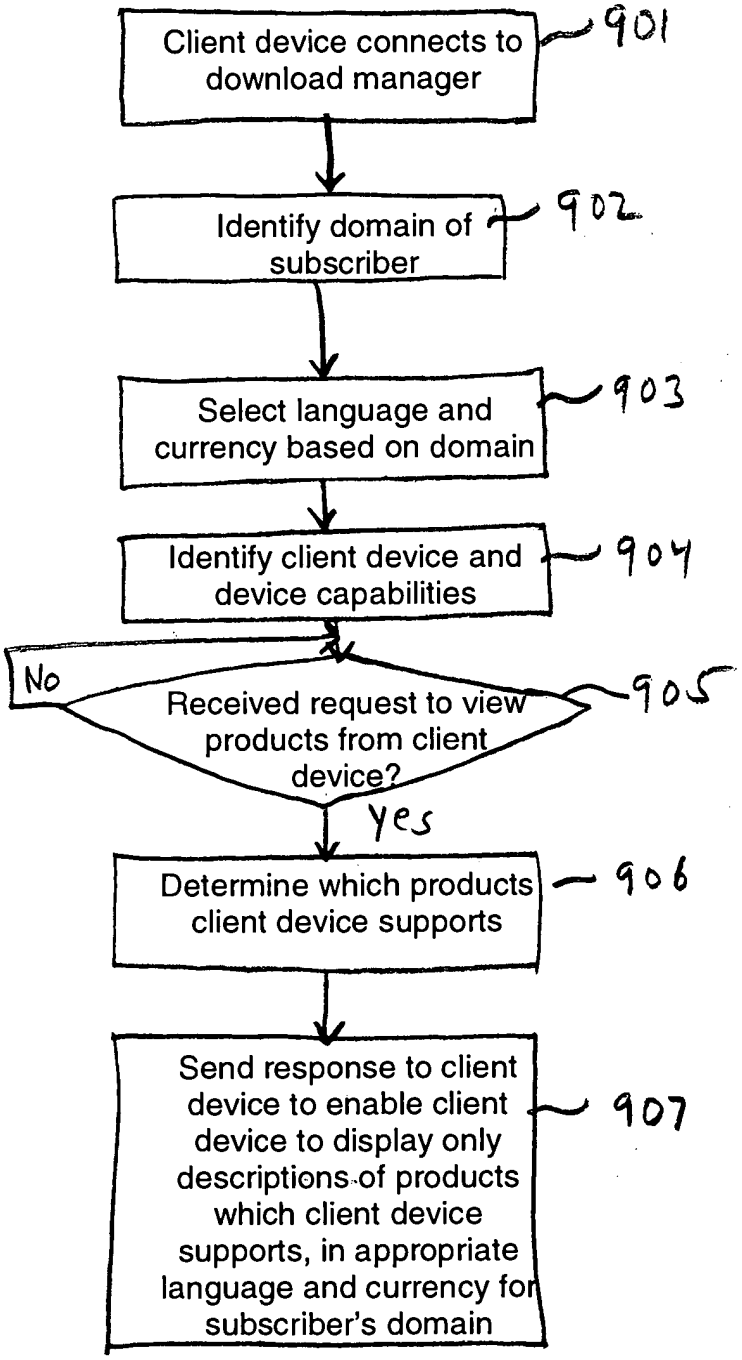

Client device connects to download manager
901
Identify domain of subscriber
902
Select language and currency based on domain
903
Identify client device and device capabilities
904
No
Received request to view products from client device?
905
Yes
Determine which products client device supports
906
Send response to client device to enable client device to display only descriptions of products which client device supports, in appropriate language and currency for subscriber's domain
907

FIG. 9

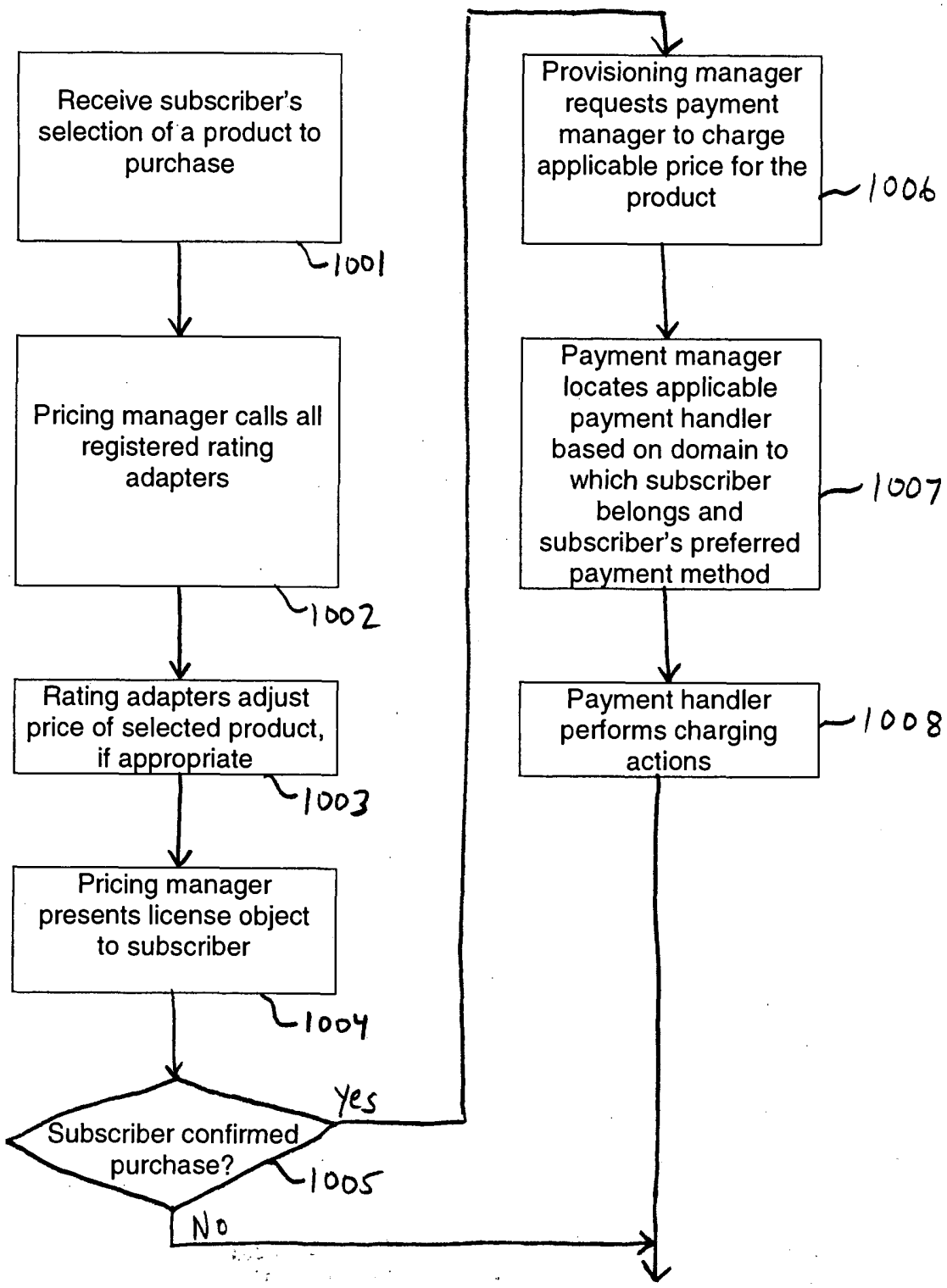

Receive subscriber's selection of a product to purchase
1001
Pricing manager calls all registered rating adapters
1002
Rating adapters adjust price of selected product, if appropriate
1003
Pricing manager presents license object to subscriber
1004
Subscriber confirmed purchase?
1005
Yes
No
Provisioning manager requests payment manager to charge applicable price for the product
1006
Payment manager locates applicable payment handler based on domain to which subscriber belongs and subscriber's preferred payment method
1007
Payment handler performs charging actions
1008

FIG. 10

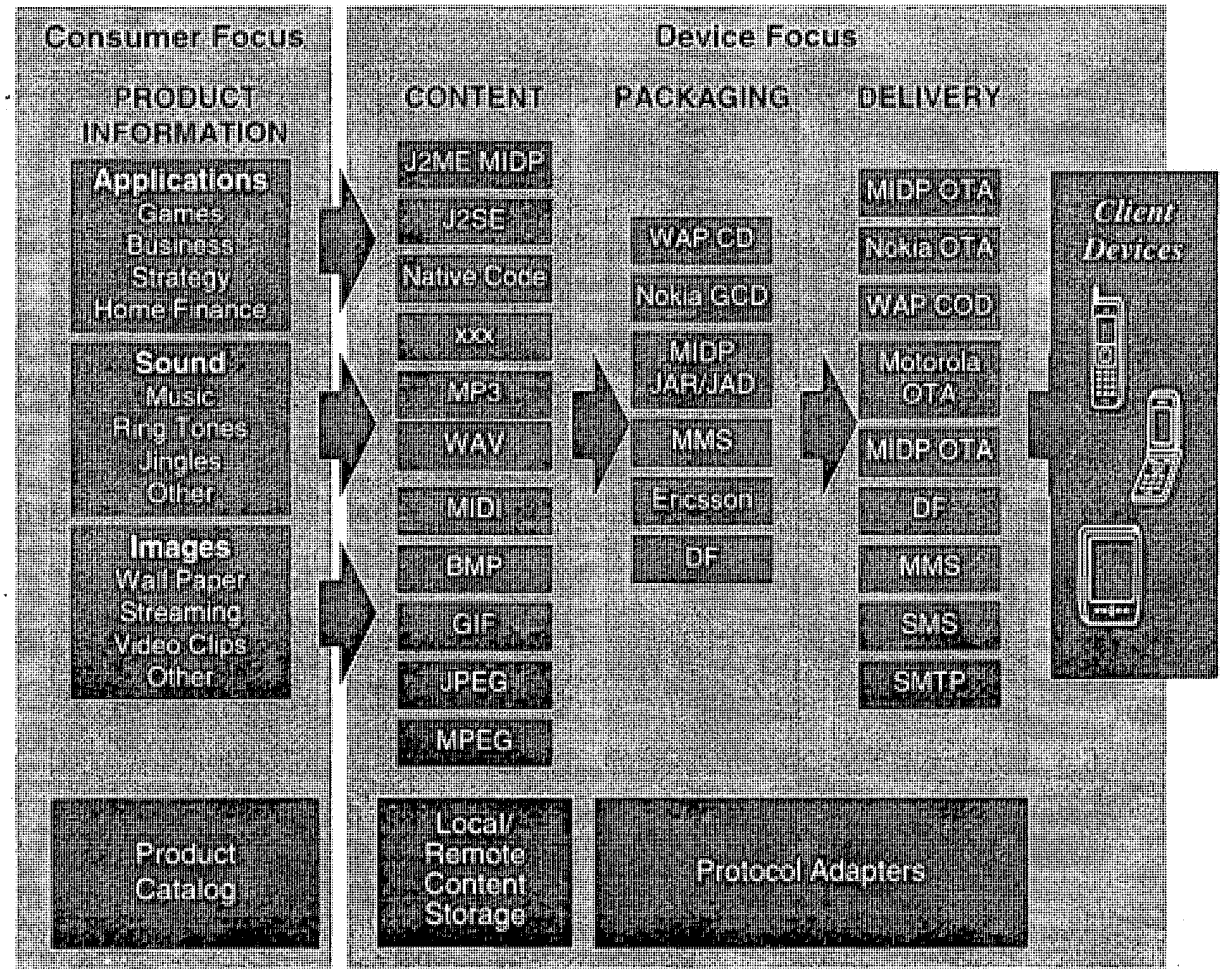

Consumer Focus
PRODUCT INFORMATION
Applications
Games
Business
Strategy
Home Finance
Sound
Music
Ring Tones
Jingles
Other
Images
Wall Paper
Streaming
Video Clips
Other
Product Catalog
Device Focus
CONTENT
PACKAGING
DELIVERY
J2ME MIDP
J2SE
Native Code
xxx
MP3
WAV
MIDI
BMP
GIF
JPEG
MPEG
WAP CD
Nokia GCD
MIDP JAR/JAD
MMS
Ericsson
DF
MIDP OTA
Nokia OTA
WAP COD
Motorola OTA
MIDP OTA
DF
MMS
SMS
SMTP
Client Devices
Local/ Remote Content Storage
Protocol Adapters

FIG. 11

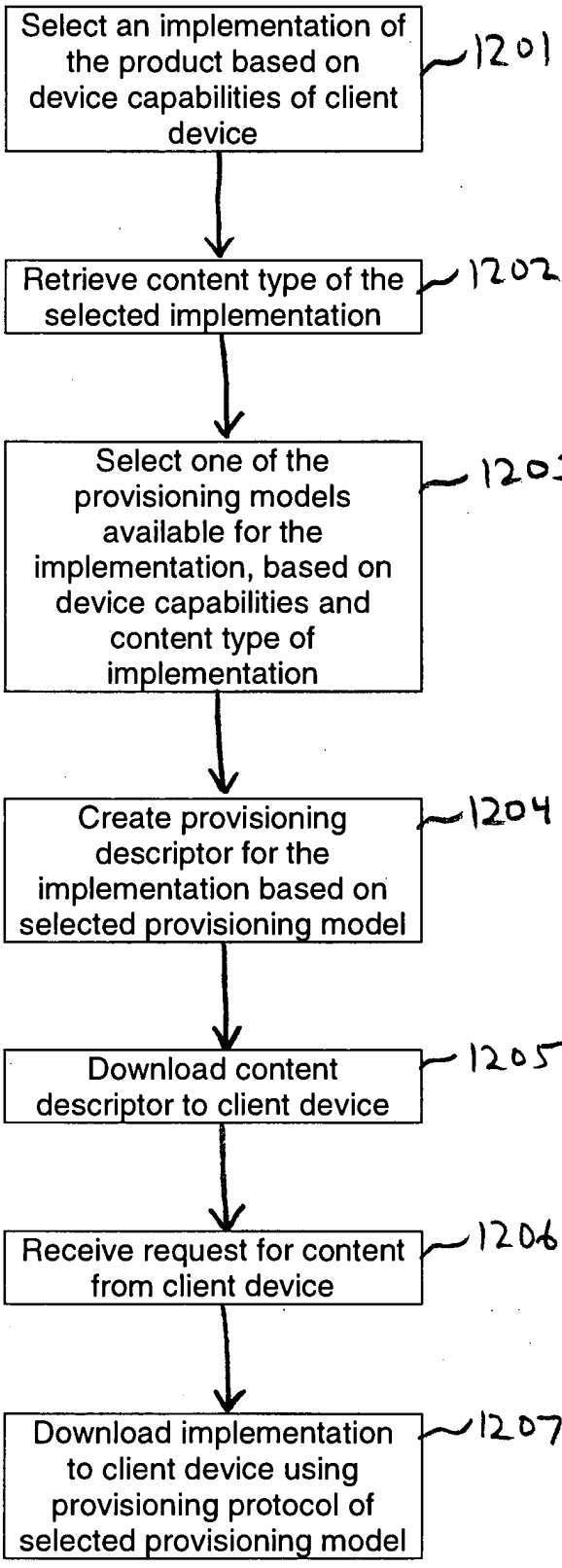

Select an implementation of the product based on device capabilities of client device
1201
Retrieve content type of the selected implementation
1202
Select one of the provisioning models available for the implementation, based on device capabilities and content type of implementation
1203
Create provisioning descriptor for the implementation based on selected provisioning model
1204
Download content descriptor to client device
1205
Receive request for content from client device
1206
Download implementation to client device using provisioning protocol of selected provisioning model
1207

FIG. 12

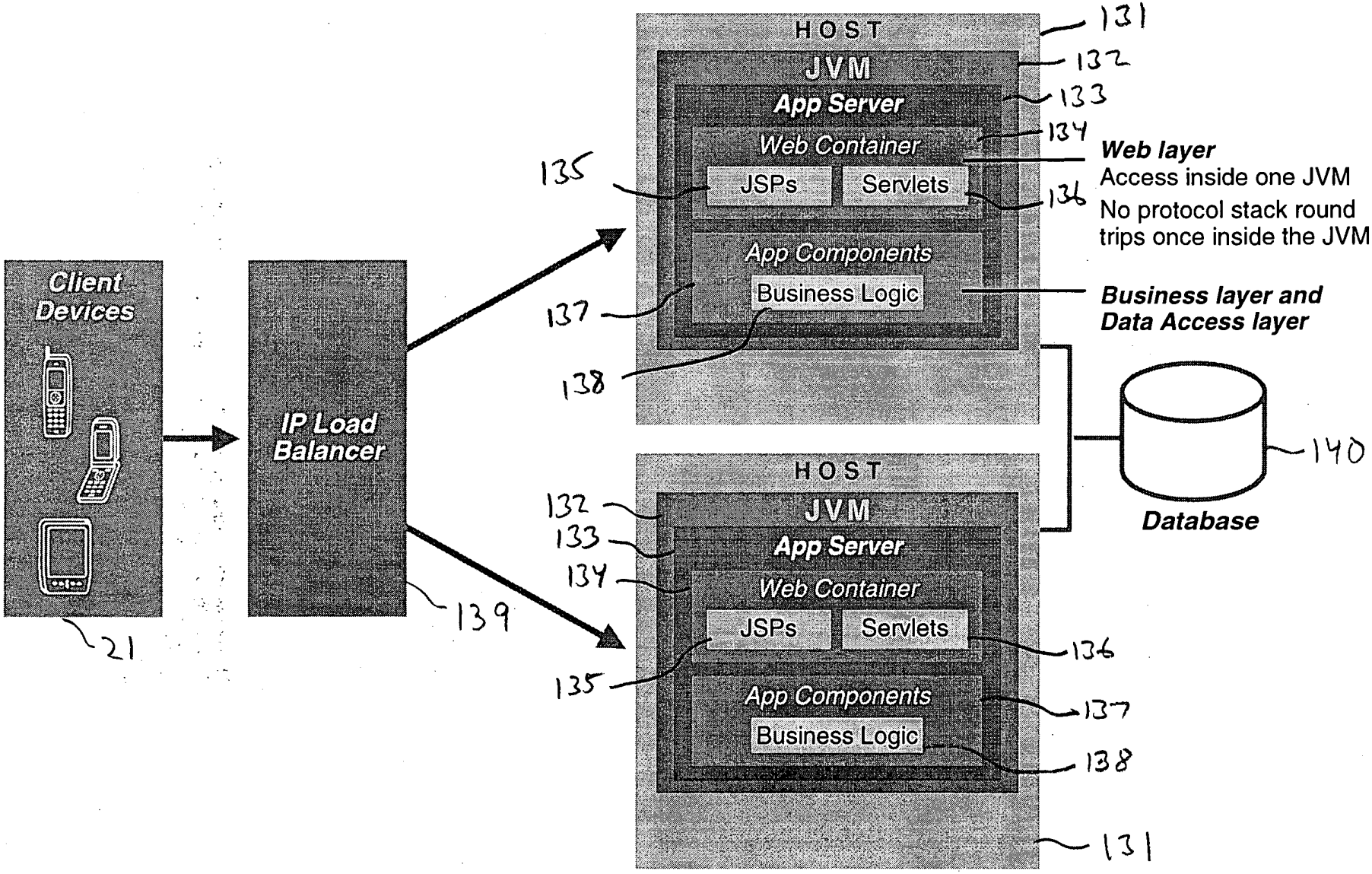

Client Devices
IP Load Balancer
HOST
JVM
App Server
Web Container
JSPs
Servlets
App Components
Business Logic
HOST
JVM
App Server
Web Container
JSPs
Servlets
App Components
Business Logic
Database
Web layer
Access inside one JVM
No protocol stack round trips once inside the JVM
Business layer and Data Access layer
131
132
133
134
135
136
137
138
139
140
21

FIG. 13

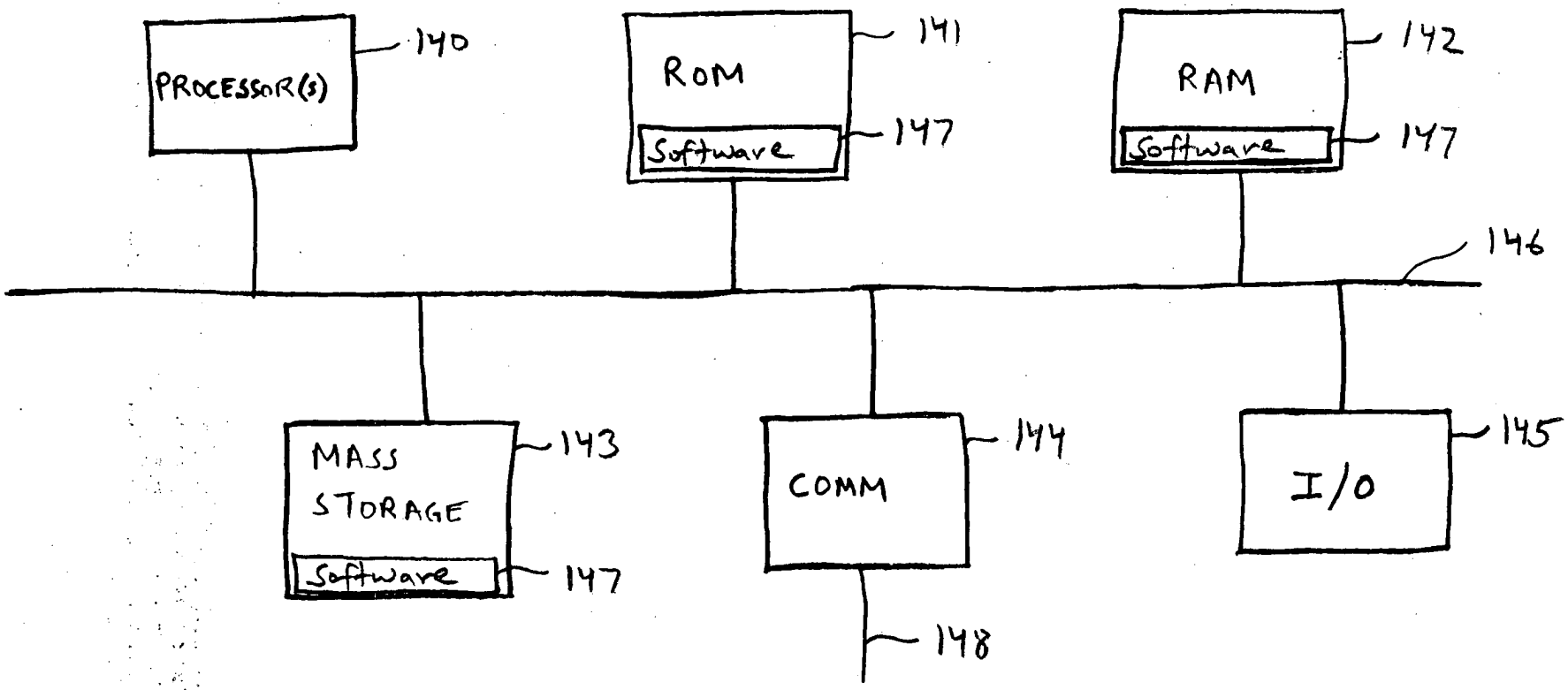

PROCESSOR(S)
140
ROM
141
Software
147
RAM
142
Software
147
146
MASS STORAGE
143
Software
147
COMM
144
148
I/O
145

FIG. 14

Attorney's Docket No.: 3399P103/1218 Patent

First Named Inventor: Rikard M. Kjellberg

Check One:

X Declaration Submitted with Initial Filing OR

___ Declaration Submitted After Initial Filing (Surcharge under 37 C.F.R. § 1.16(e) Required).

Complete If Known:

Application No.: Not yet assigned
Filing Date: Herewith
Art Unit: Not yet assigned
Examiner Name: Not yet assigned

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
Device Capability Based Discovery, Packaging and Provisioning of Content for Wireless Mobile Devices

the specification of which

X is attached hereto.

___ 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 specification, including the claim(s), as amended by any amendment specifically referred to above.

I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application. I do not know and do not believe that the claimed invention was in public use or on sale in the United States of America more than one year prior to this application, nor do I know or believe that the invention has been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

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(s)			Priority Claimed?		Certified Copy Attached?	
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No

I hereby appoint the Practitioners associated with Customer Number 26529 as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected herewith.

Direct all correspondence to (check one):



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PATENT TRADEMARK OFFICE

I h reby d clar that all statem nts mad her in of my wn knowledg ar true and that all statements mad n inf rmati n and beli f are b lieved t b tru ; and furth r that these statements wer mad with the kn wledg that willful fals statements and the like s mad ar 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.

Full Name of Sole/First Inventor:	**Rikard M. Kjellberg**	Citizenship:	**Sweden**
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Mailing Address:	23911 East Cliff Drive, Santa Cruz, CA 95062, US		
Full Name of Second/Joint Inventor:	**Sheng Liang**	Citizenship:	**US**
Inventor's Signature:	_____	**Date of Signature:**	_____
Residence: (City)	Cupertino	(State/Country)	CA/US
Mailing Address:	10440 Oakville Avenue, Cupertino, CA 95014, US		
Full Name of Third/Joint Inventor:	**Tomas G. Lund**	Citizenship:	**Sweden**
Inventor's Signature:	_____	**Date of Signature:**	_____
Residence: (City)	Foster City	(State/Country)	CA/US
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Full Name of Fourth/Joint Inventor:	**William Chan**	Citizenship:	**US**
Inventor's Signature:	_____	**Date of Signature:**	_____
Residence: (City)	San Mateo	(State/Country)	CA/US
Mailing Address:	1341 David Street #314, San Mateo, CA 94403, US		
Full Name of Fifth/Joint Inventor:	**Ramakrishna Chinta**	Citizenship:	**India**
Inventor's Signature:	_____	**Date of Signature:**	_____
Residence: (City)	Sunnyvale	(State/Country)	CA/US
Mailing Address:	874 Flin Way, Sunnyvale, CA 94087, US		
Full Name of Sixth/Joint Inventor:	**Xinbi Chen**	Citizenship:	**China**
Invent r's Signatur :	_____	**Dat f Signatur :**	_____
Residence: (City)	Palo Alto	(State/Country)	CA/US
Mailing Address:	524 Kendall Avenue Apt. 1, Palo Alto, CA 94306, US		

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number: 3399 P103

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	11	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	11 minus 20=	* 0
INDEPENDENT CLAIMS	3 minus 3 =	* 0
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐ OR OTHER THAN SMALL ENTITY

RATE	FEE	OR	RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
X$ 9=		OR	X$18=	0
X42=		OR	X84=	0
+140=		OR	+280=	0
TOTAL		OR	TOTAL	750

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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.