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THE UNITED STATES OF AMERICA

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United States Patent and Trademark Office

August 05, 2021

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APPLICATION NUMBER: *13/056,277*
FILING DATE: *January 27, 2011*
PATENT NUMBER: *8630234*
ISSUE DATE: *January 14, 2014*

Certified by

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

Please Direct All Correspondence to Customer Number 20995

SPECIFIC POWER OF ATTORNEY WITH REVOCATION

Applicant	:	Bjorsell et al.
Int'l App. No.	:	PCT/CA2009/001062
Int'l Filing Date	:	July 28m 2009
For	:	MOBILE GATEWAY
Examiner	:	Unassigned
Art Unit	:	Unassigned

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

Dear Sir:

The undersigned is an empowered representative of the Assignee. As of the execution date of the Assignment or the execution date set forth below, whichever is later, the undersigned hereby revokes any previous powers of attorney in the subject application, and hereby appoints the registrants of Knobbe, Martens, Olson & Bear, LLP, **Customer No. 20995**, as its attorneys with full power of substitution and revocation to prosecute the U.S. national phase of the above-identified international application and to transact all business in the U.S. Patent and Trademark Office connected herewith. This appointment is to be to the exclusion of the inventor(s) and his attorney(s) in accordance with the provisions of 37 CFR § 3.71.

Attached is a Statement under 37 CFR § 3.73(b), signed by a registrant of Knobbe, Martens, Olson & Bear, LLP, setting forth a full chain of title for the subject application owned by the Assignee named below.

Please recognize or change the correspondence address for the application identified in the attached Statement to **Customer No. 20995.**

By: _____ Date: 6 JAN 2011

Name: EMIL MALAK Title:

Assignee: DIGIFONICA (INTERNATIONAL) LIMITED
Address: Suite 890, 999 West Hastings Street
Vancouver, BC V6C 2W2 CANADA

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121010

STATEMENT UNDER 37 CFR § 3.73(b)

ESTABLISHMENT OF ASSIGNEE

Applicant	:	Bjorsell et al.
App. No.	:	Unknown
Filed	:	January 27, 2011
Title	:	MOBILE GATEWAY
Examiner	:	Unassigned
Group Art Unit	:	Unassigned

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

Dear Sir:

This document is being filed with a copy of a Power of Attorney signed by the Assignee. This Statement sets forth the chain of title of the above-identified application.

Digifonica (International) Limited, an entity organized under the laws of Canada, is the Assignee of the entire right, title, and interest of the above-referenced application by virtue of:

The attached copy of the Assignment being forwarded to the Recordation Branch concurrently under separate cover.

The undersigned is an agent of Customer Number 20995 and is authorized to act on behalf of the Assignee. Please recognize or change the correspondence address for the above-identified application to **Customer No. 20995.**

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 27 January 2011

By: /John M. Carson/
John M. Carson
Registration No. 34,303
Attorney of Record
Customer No. 20995
(858) 836-9000

10416594\cey\012711

ASSIGNMENT

WHEREAS **Maksym Sobolyev**

of **506 – 210 Eleventh Street**
New Westminster, British Columbia
Canada V3M 4C9

AND **Pentti Kalevi Huttunen**

of **76 – 3180 East 58th Avenue**
Vancouver, British Columbia
Canada V5S 3S8

AND **Johan Emil Viktor Bjorsell**

of **203 – 2288 West Broadway**
Vancouver, British Columbia
Canada V6K 0B3

hereinafter referred to as "Assignors", have invented certain new and useful improvements as described and set forth in United States Provisional Patent Application 61/129,898 filed July 28, 2008.

Title of Invention: **MOBILE GATEWAY**

WHEREAS **DIGIFONICA (INTERNATIONAL) LIMITED**

of **1401, 4710 Kingsway**
Burnaby, British Columbia
Canada V5H 4M2

hereinafter referred to as "ASSIGNEE", is desirous of acquiring an interest in the said invention described in said applications, the applications themselves and in any Patent which may be granted on the same;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN: Be it known that, for good and valuable consideration, receipt and sufficiency of which are hereby acknowledged by Assignors, Assignors have sold, assigned and transferred, and hereby do sell, assign and transfer unto the said Assignee, and Assignee's successors and assigns, all right, title and interest in and to the said invention, the application aforesaid and all International Convention priority rights therewith, and in and to any Patent(s) which may hereafter be granted on the same in all countries throughout the world, the said interest to be held and enjoyed by said Assignee as fully and exclusively as it would have been held and enjoyed by said Assignors had this assignment and transfer not been made, to the full end and term of any Patent which may be granted thereon, or of any division, renewal, continuation in whole or

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in part, substitution, conversion, reissue, prolongation or extension thereof. Assignors represent and warrant that they have not granted and will not grant to others any rights inconsistent with the rights granted herein.

Assignors further agree that they will, without charge to the said Assignee, but at Assignee's expense, cooperate with Assignee in the prosecution of said applications, execute, verify, acknowledge and deliver all such further papers, including applications for Patent and for the reissue thereof, and instruments of assignment and transfer thereof, and will perform such other acts as Assignee lawfully may request, to obtain or maintain Patent(s) for said invention and improvement(s) in any and all countries, and to vest title thereto in said Assignee, or Assignee's successors and assigns.

SIGNED AT Burnaby (City or Town) Canada (Country)

this 16TH day of OCTOBER, 2008.

Witness's Signature

Maksym Sobolyev

JEFF BATES
Witness's Name

225 EAST 17TH STREET
NORTH VANCOUVER BC V7L 2V8
Witness's Address

COPY
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SIGNED AT BURNABY (City or Town) CANADA (Country)

this 16TH day of OCTOBER, 2008.

Witness's Signature

Pentti Kalevi Huttunen

JEFF BATES
Witness's Name

225 EAST 17TH STREET

NORTH VANCOUVER, BC, V7L 2V8
Witness's Address

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SIGNED AT BURNABY (City or Town) CANADA (Country)

this 16TH day of OCTOBER, 2008.

Witness's Signature

Johan ~~Emil~~ Viktor Bjorsell

JEFF BATES
Witness's Name

225 EAST 17TH STREET
NORTH VANCOUVER, BC, V7L 2V8
Witness's Address

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PTO/SB/14 (11-08)
Approved for use through 09/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SMARB19.004APC
	Application Number	
Title of Invention	MOBILE GATEWAY	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

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

Applicant Information:

Applicant 1

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Johan	Emil Viktor	Bjorsell	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Vancouver	Country Of Residence i	CA
Citizenship under 37 CFR 1.41(b) i	SE		

Mailing Address of Applicant:

Address 1	PO Box 29164		
Address 2	RPO South Granville Post		
City	Vancouver	State/Province	BC
Postal Code	V6J 0A6	Country i	CA

Applicant 2

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Maksym		Sobolyev	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	New Westminster	Country Of Residence i	CA
Citizenship under 37 CFR 1.41(b) i	UA		

Mailing Address of Applicant:

Address 1	506-210 Eleventh Street		
Address 2			
City	New Westminster	State/Province	BC
Postal Code	V3M 4C9	Country i	CA

Applicant 3

Applicant Authority	◉ Inventor	○ Legal Representative under 35 U.S.C. 117	○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Pentti	Kalevi	Huttunen	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Vancouver	Country Of Residence i	CA

PTO/SB/14 (11-08)
Approved for use through 09/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SMARB19.004APC
	Application Number	
Title of Invention	MOBILE GATEWAY	

Citizenship under 37 CFR 1.41(b)	CA		
Mailing Address of Applicant:			
Address 1	76-3180 East 58th Avenue		
Address 2			
City	Vancouver	**State/Province**	BC
Postal Code	V5S 3S8	**Country**	CA

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	20995		
Email Address	efiling@kmob.com	Add Email	Remove Email

Application Information:

Title of the Invention	MOBILE GATEWAY		
Attorney Docket Number	SMARB19.004APC	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	17	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

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

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SMARB19.004APC
	Application Number	
Title of Invention	MOBILE GATEWAY	
Customer Number	20995	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	a 371 of international	PCT/CA2009/001062	2009-07-28
Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
PCT/CA2009/001062	non provisional of	61/129898	2008-07-28

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

			Remove
Application Number	Country[i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			○ Yes ◉ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1

If the Assignee is an Organization check here. ☒

Organization Name	DIGIFONICA (INTERNATIONAL) LIMITED		
Mailing Address Information:			
Address 1	Suite #890		
Address 2	999 West Hastings Street		
City	Vancouver	**State/Province**	BC
Country[i] CA		Postal Code	V6C 2W2
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the **Add** button.

PTO/SB/14 (11-08)
Approved for use through 09/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SMARB19.004APC
	Application Number	
Title of Invention	MOBILE GATEWAY	

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/John M. Carson/			Date (YYYY-MM-DD)	2011-01-27
First Name	John	Last Name	Carson	Registration Number	34303

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT

Applicant	:	Bjorsell et al.
App. No.	:	Unknown
Filed	:	January 27, 2011
Title	:	MOBILE GATEWAY
Examiner	:	Unassigned
Art Unit	:	Unassigned
Conf. No.	:	Unassigned

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

Dear Sir:

Enclosed for filing in the above-identified application is a PTO/SB/08 Equivalent listing 3 references, of which 1 is enclosed/submitted.

This Information Disclosure Statement is being filed within three months of the filing date , with an RCE or before receipt of a first office action after an RCE and no fee is required.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 27 January 2011

By: /John M. Carson/
John M. Carson
Registration No. 34,303
Attorney of Record
Customer No. 20995
(858) 836-9000

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT		
	Application No.	Unknown
	Filing Date	Herewith
	First Named Inventor	Johan Emil Viktor Bjorsell
	Art Unit	Unassigned
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 1 OF 1	Attorney Docket No.	SMARB19.004APC

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name of Patentee or Applicant	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	1	2007/0112964 A1	05-17-2007	Guedalia et al.	
	2	2004/0022237 A1	02-05-2004	Elliot et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document *Country Code-Number-Kind Code* Example: JP 1234567 A1	Publication Date MM-DD-YYYY	Name of Patentee or Applicant	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear	T[1]

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	3	A copy of the International Search Report and Written Opinion mailed on March 12, 2010 for corresponding PCT Application No. PCT/CA2009/001062.	

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

T[1] - Place a check mark in this area when an English language Translation is attached.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Johan Emil Viktor Bjorsell et al.
App. No.	:	Unknown
Filed	:	January 27, 2011
Title	:	MOBILE GATEWAY
Examiner	:	Unassigned
Art Unit	:	Unassigned
Conf. No.	:	Unassigned

PRELIMINARY AMENDMENT

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

Dear Sir:

Prior to examination of the above-identified application, Applicant respectfully submits the following amendment.

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

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 16 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please enter the following paragraph after the title:

This application is a national phase entry of PCT/CA2009/001062, filed July 28, 2009, which claims priority to U.S. Provisional Application No. 61/129,898, filed July 28, 2008, both of which are incorporated by reference in their entirety.

AMENDMENTS TO THE CLAIMS

1. (Original) A method of initiating a call to a callee using a mobile telephone, the method comprising:

receiving, from a user of the mobile telephone, a callee identifier associated with the callee;

transmitting an access code request message to an access server, said access code request message including said callee identifier;

receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiating a call with the mobile telephone using said access code to identify the callee.

2. (Original) The method of claim 1 wherein transmitting comprises transmitting said access code request message to said access server on a non-voice network.

3. (Original) The method of claim 1 wherein transmitting comprises transmitting a location identifier of a location associated with the mobile telephone to said access server.

4. (Original) The method of claim 3 wherein transmitting said location identifier comprises transmitting an IP address of the mobile telephone in a wireless IP network.

5. (Original) The method of claim 3 wherein transmitting said location identifier comprises transmitting an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

6. (Original) The method of claim 3 wherein transmitting said location identifier comprises transmitting a user-configured identifier of a location associated with the mobile telephone.

7. (Original) The method of claim 1 wherein receiving said access code reply message comprises receiving said access code reply message from said access server on a non-voice network.

8. (Original) The method of claim 1 wherein receiving said access code reply message comprises receiving, in said access code reply message, said access code temporarily associated with said callee identifier.

9. (Original) The method of claim 1 wherein receiving said access code reply message comprises receiving, in said access code reply message, a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

10. (Original) The method of claim 9 wherein initiating said call comprises engaging a routing controller to route said call on said IP network to the callee.

11. (**Currently amended**) The method of ~~any one of claims 1 to 10~~ claim 1 further comprising:

receiving from the mobile telephone said access code request message;

communicating with a routing controller to obtain from the routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and

transmitting said access code reply message to the mobile telephone.

12. (Original) A mobile telephone apparatus comprising:

means for receiving, from a user of the mobile telephone, a callee identifier associated with the callee;

transmitting means for transmitting an access code request message to an access server, said access code request message including said callee identifier;

means for receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

means for initiating a call using said access code to identify the callee.

13. (Original) The mobile telephone apparatus of claim 12 wherein said transmitting means comprises a non-voice network interface for transmitting said access code request message to said access server on a non-voice network.

14. (Original) The mobile telephone apparatus of claim 12 wherein said access code request message further includes a location identifier of a location associated with the mobile telephone.

15. (Original) The mobile telephone apparatus of claim 14 wherein said location identifier comprises an IP address of the mobile telephone in a wireless IP network.

16. (Original) The mobile telephone apparatus of claim 14 wherein said location identifier comprises an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

17. (Original) The mobile telephone apparatus of claim 14 wherein said location identifier comprises a user-configured identifier of a location associated with the mobile telephone.

18. (Original) The mobile telephone apparatus of claim 12 wherein said means for receiving an access code reply message comprises a non-voice network interface for receiving said access code reply message on a non-voice network.

19. (Original) The mobile telephone apparatus of claim 12 wherein said access code includes a telephone number.

20. (Original) The mobile telephone apparatus of claim 12 wherein said means for initiating comprises a mobile telephone network interface.

21. (**Currently amended**) A system for initiating a call to a callee, the system comprising the mobile telephone apparatus of claim 12 ~~any one of claims 12 – 20,~~ and further comprising: [[;]]

a routing controller; and

an access server comprising:

means for receiving from the mobile telephone said access code request message;

means for communicating with said routing controller to obtain from said routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and

means for transmitting said access code reply message including said access code to the mobile telephone.

22. (Original) A mobile telephone apparatus comprising:

a processor circuit;

a network interface in communication with said processor circuit; and

a computer readable medium in communication with said processor circuit and encoded with codes for directing said processor circuit to:

receive, from a user of the mobile telephone, a callee identifier associated with the callee;

cause an access code request message to be transmitted to an access server, said access code request message including said callee identifier;

receive an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiate a call using said access code to identify the callee.

23. (Original) The mobile telephone apparatus of claim 22 wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to cause said access code request message to be transmitted include codes for directing said processor circuit to cause said access code request message to be transmitted to said access server using said non-voice network interface on a non-voice network.

24. (Original) The mobile telephone apparatus of claim 22 wherein said access code request message further includes a location identifier of a location associated with the mobile telephone.

25. (Original) The mobile telephone apparatus of claim 24 wherein said location identifier comprises an IP address of the mobile telephone in a wireless IP network.

26. (Original) The mobile telephone apparatus of claim 24 wherein said location identifier comprises an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

27. (Original) The mobile telephone apparatus of claim 24 wherein said location identifier comprises a user-configured identifier of a location associated with the mobile telephone.

28. (Original) The mobile telephone apparatus of claim 22 wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to receive an access code reply message include codes for directing said

processor circuit to cause said access code reply message to be received from said access server using said non-voice network interface on a non-voice network.

29. (Original) The mobile telephone apparatus of claim 22 wherein said access code includes a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

30. (Original) The mobile telephone apparatus of claim 22 wherein said network interface comprises a mobile telephone network interface, and wherein said codes for directing said processor circuit to initiate include codes for directing said processor circuit to cause a call to be initiated using said mobile telephone network interface on a mobile telephone network.

31. (**Currently amended**) A system for initiating a call to a callee, the system comprising the mobile telephone of claim 22 ~~any one of claims 22 – 30,~~ and further comprising: [[;]]

a routing controller; and

an access server comprising a processor circuit and a computer readable medium in communication with the processor circuit, the computer readable medium encoded with codes for directing said processor circuit to:

receive from the mobile telephone said access code request message;

communicate with said routing controller to obtain from said routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and

transmit said access code reply message to the mobile telephone.

32. (Original) A computer readable medium encoded with codes for directing a processor circuit to initiate a call to a callee using a mobile telephone, said codes being operable to direct the processor circuit to:

receive, from a user of a mobile telephone, a callee identifier associated with a callee;

transmit an access code request message to an access server, said access code request message including said callee identifier;

receive an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiate a call using said access code to identify the callee.

33. (Original) A method for enabling a mobile telephone to initiate a call to a callee through a channel, the method comprising:

receiving from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicating with a routing controller to obtain from the routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

transmitting an access code reply message including said access code to the mobile telephone.

34. (Original) The method of claim 33 wherein receiving comprises receiving said access code request message on a non-voice network.

35. (Original) The method of claim 33 further comprising causing the routing controller to produce said access code.

36. (Original) The method of claim 35 wherein producing comprises selecting said access code from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

37. (Original) The method of claim 36 further comprising determining a local calling area associated with the mobile telephone.

38. (Original) The method of claim 37 wherein determining comprises accessing a dialing profile associated with the caller, said dialing profile including a location field having contents identifying at least a default location of the caller.

39. (Original) The method of claim 37 wherein determining comprises receiving an IP address of the mobile telephone in a wireless IP network.

40. (Original) The method of claim 37 wherein determining comprises receiving an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

41. (Original) The method of claim 37 wherein determining comprises receiving a user-configured identifier of a location associated with the mobile telephone.

42. (Original) The method of claim 37 wherein selecting comprises selecting an access code in said local calling area associated with the mobile telephone.

43. (Original) The method of claim 36 wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

44. (Original) The method of claim 43 further comprising causing said routing controller to establish communication through said IP network in response to a call received on said channel.

45. (Original) The method of claim 44 wherein producing further comprises storing a caller identifier associated with the mobile telephone in association with said access code.

46. (Original) The method of claim 45 wherein causing said routing controller to establish communication comprises causing said routing controller to establish communication only if said caller identifier associated with said access code identifies the mobile telephone.

47. (Original) The method of claim 36 wherein producing further comprises storing said callee identifier in association with said access code.

48. (Original) The method of claim 47 wherein producing further comprises searching said pool of access codes for an access code associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

49. (Original) The method of claim 35 wherein producing further comprises storing, in association with said access code, a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire.

50. (Original) The method of claim 49 wherein causing said routing controller to establish communication comprises causing said routing controller to establish communication only if the usability of said access code to initiate a call to the callee has not expired.

51. (Original) The method of claim 33 wherein transmitting comprises transmitting said access code reply message on a non-voice network.

52. (Original) A system for enabling a mobile telephone to initiate a call to a callee through a channel, the system comprising:

means for receiving from the mobile telephone an access code request message including a callee identifier associated with the callee;

means for communicating with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

means for transmitting an access code reply message including said access code to the mobile telephone.

53. (Original) The system of claim 52 wherein said means for receiving comprises a non-voice network interface for receiving said access code request message on a non-voice network.

54. (Original) The system of claim 52 further comprising means for producing said access code.

55. (Original) The system of claim 54 wherein said means for producing comprises a processor circuit operably configured to select said access code from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

56. (Original) The system of claim 55 wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone.

57. (Original) The system of claim 56 wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using a dialing profile associated with the caller, said dialing profile including a location field having contents identifying at least a default location of the caller.

58. (Original) The system of claim 56 wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using an IP address of the mobile telephone in a wireless IP network.

59. (Original) The system of claim 56 wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

60. (Original) The system of claim 56 wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using a user-configured identifier of a location associated with the mobile telephone.

61. (Original) The system of claim 56 wherein said processor circuit is operably configured to select an access code in said local calling area associated with the mobile telephone.

62. (Original) The system of claim 55 wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

63. (Original) The system of claim 62 wherein said processor circuit is operably configured to establish communication through said IP network in response to a call received on said channel.

64. (Original) The system of claim 63 wherein said processor circuit is operably configured to store a caller identifier associated with the mobile telephone in association with said access code.

65. (Original) The system of claim 64 wherein said processor circuit is operably configured to cause said routing controller to establish communication only if said caller identifier associated with said access code identifies the mobile telephone.

66. (Original) The system of claim 55 wherein said processor circuit is operably configured to store said callee identifier in association with said access code.

67. (Original) The system of claim 66 wherein said processor circuit is operably configured to search said pool of access codes for an access code associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

68. (Original) The system of claim 54 wherein said processor circuit is operably configured to store, in association with said access code, a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire.

69. (Original) The system of claim 68 wherein said processor circuit is operably configured to establish communication only if the usability of said access code to initiate a call to the callee has not expired.

70. (Original) The system of claim 52 wherein said means for transmitting comprises a non-voice network interface for transmitting said access code reply message on a non-voice network.

71. (Original) A system for enabling a mobile telephone to initiate a call to a callee through a channel, the system comprising:

a processor circuit;

a network interface in communication with said processor circuit; and

a computer readable medium in communication with said processor circuit and encoded with codes for directing said processor circuit to:

receive from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicate with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

cause an access code reply message including said access code to be transmitted to the mobile telephone.

72. (Original) The system of claim 71 wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to receive include codes for directing said processor circuit to cause said access code request message to be received using said non-voice network interface on a non-voice network.

73. (Original) The system of claim 71 wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause said access code to be produced.

74. (Original) The system of claim 73 wherein said codes for directing said processor circuit to cause said access code to be produced cause said access code to be selected from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

75. (Original) The system of claim 74 wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause to be determined a local calling area associated with the mobile telephone.

76. (Original) The system of claim 75 wherein said codes for directing said processor circuit to cause to be determined cause a dialing profile associated with the caller to be accessed, said dialing profile including a location field having contents identifying at least a default location of the caller.

77. (Original) The system of claim 75 wherein said codes for directing said processor circuit to cause to be determined cause to be received an IP address of the mobile telephone in a wireless IP network.

78. (Original) The system of claim 75 wherein said codes for directing said processor circuit to cause to be determined cause to be received an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

79. (Original) The system of claim 75 wherein said codes for directing said processor circuit to cause to be determined cause to be received a user-configured identifier of a location associated with the mobile telephone.

80. (Original) The system of claim 75 wherein said codes for directing said processor circuit to cause said access code to be produced further cause to be selected an access code in said local calling area associated with the mobile telephone.

81. (Original) The system of claim 74 wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

82. (Original) The system of claim 81 wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause communication through said IP network to be established in response to a call received on said channel.

83. (Original) The system of claim 82 wherein said codes for directing said processor circuit to cause said access code to be produced cause a caller identifier associated with the mobile telephone to be stored in association with said access code.

84. (Original) The system of claim 83 wherein said codes for directing said processor circuit to cause communication to be established cause communication to be established only if said caller identifier associated with said access code identifies the mobile telephone.

85. (Original) The system of claim 74 wherein said codes for directing said processor circuit to cause said access code to be produced cause said callee identifier to be stored in association with said access code.

86. (Original) The system of claim 85 wherein said codes for directing said processor circuit to cause said access code to be produced cause said pool of access codes to be searched for an access code associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

87. (Original) The system of claim 73 wherein said codes for directing said processor circuit to cause said access code to be produced cause a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire, to be stored in association with said access code.

88. (Original) The system of claim 87 wherein said codes for directing said processor circuit to cause communication to be established cause communication to be established only if the usability of said access code to initiate a call to the callee has not expired.

89. (Original) The system of claim 71 wherein said network interface comprises a non-voice network interface, and wherein codes for directing said processor circuit to transmit include codes for directing said processor circuit to cause said access code reply message to be transmitted using said non-voice network interface on a non-voice network.

90. (Original) A computer readable medium encoded with codes for directing a processor circuit to enable a mobile telephone to initiate a call to a callee through a channel, the codes being operable to direct the processor circuit:

receive from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicate with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

cause an access code reply message including said access code to be transmitted to the mobile telephone.

REMARKS

Applicant has amended Claims 11, 21, and 31 to remove multiple dependencies in accordance with U.S. practice. No new matter has been added. Although the present communication includes alterations to the application and claims, Applicant is not conceding in this application that the previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date the previously pending claims or other broader or narrower claims that capture any subject matter supported by the present disclosure. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 27 January 2011

By: /John M. Carson/
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10416993
012711

Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	MOBILE GATEWAY
First Named Inventor/Applicant Name:	Johan Emil Viktor Bjorsell
Filer:	John M Carson/Caity Yaussi
Attorney Docket Number:	SMARB19.004APC
Filed as Small Entity	

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Basic National Stage Fee	2631	1	165	165
Natl Stage Search Fee - Report provided	2642	1	215	215
Natl Stage Exam Fee - all other cases	2633	1	110	110
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**490**

Electronic Acknowledgement Receipt	
EFS ID:	9320921
Application Number:	13056277
International Application Number:	PCT/CA09/01062
Confirmation Number:	2403
Title of Invention:	MOBILE GATEWAY
First Named Inventor/Applicant Name:	Johan Emil Viktor Bjorsell
Customer Number:	20995
Filer:	John M Carson/Shirley Martinez
Filer Authorized By:	John M Carson
Attorney Docket Number:	SMARB19.004APC
Receipt Date:	27-JAN-2011
Filing Date:	
Time Stamp:	17:50:46
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$490
RAM confirmation Number	3696
Deposit Account	111410
Authorized User	KNOBBE MARTENS OLSON AND BEAR

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

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	NPL Documents	Intl_search_report_and_written_opinion.pdf	336655 a1509394529ea04683668f7702d8ef4f450848b6	no	8
Warnings:					
Information:					
2	Documents submitted with 371 Applications	Published_application.pdf	4246948 dfd514e392da2b28ebec4cf2ccea9ba721098da4	no	99
Warnings:					
Information:					
3	Power of Attorney	POA.pdf	45150 aacb8b1a8d5b6da221e5b0f1ddf75d7fa95f0e4f	no	1
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73(b).	373_Statement.pdf	144458 944d8fe1337e34e2ca17de9e10ba6f30619a9f0f	no	5
Warnings:					
Information:					
5	Application Data Sheet	ADS.pdf	240615 ced14555848f8ca2577162224c4a1346252738d6	no	5
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
6		IDS.pdf	59112 54be12b2517b6e4be804039d96620bb4a023f088	yes	2

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	1
Information Disclosure Statement (IDS) Filed (SB/08)	2	2

Warnings:					
Information:					
7		Prelim_amend.pdf	639311 26fa882cb2f11875ebc9ef84c0a31fb5855a150a	yes	16

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Preliminary Amendment	1	1
	Specification	2	2
	Claims	3	15
	Applicant Arguments/Remarks Made in an Amendment	16	16

Warnings:					
Information:					
8	Fee Worksheet (PTO-875)	fee-info.pdf	33337 0fc2c1e1be0adfaa6ba85d40b7d4ae355553cfca	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	5745586		

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.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

RECEIVED

Applicant's or agent's file reference 83636-55	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below
International application No. **PCT/CA2009/001062**	International filing date *(day/month/year)* 28 July 2009 (28-07-2009)	(Earliest) Priority date *(day/month/year)* 28 July 2008 (28-07-2008)
Applicant DIGIFONICA (INTERNATIONAL) LIMITED ET AL		

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

This international search report consists of a total of 3 sheets.

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

1. **Basis of the report**

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

      [X] the international application in the language in which it was filed

      [ ] a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

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

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

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

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

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

   [X] the text is approved as submitted by the applicant

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

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

   [X] the text is approved as submitted by the applicant

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

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

   a. the figure of the **drawings** to be published with the abstract is Figure No. 1

      [X] as suggested by the applicant

      [ ] as selected by this Authority, because the applicant failed to suggest a figure

      [ ] as selected by this Authority, because this figure better characterizes the invention

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2009/001062

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***H04W 76/02*** (2009.01) , ***H04W 88/06*** (2009.01) , ***H04W 88/16*** (2009.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: ***H04W 76/02*** (2009.01) , ***H04W 88/06*** (2009.01) , ***H04W 88/16*** (2009.01)

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Canadian Patent Database, USPTO, Esp@cenet, Delphion, IEEE, Google and keywords such as wireless , mobile, call setup, request, connection, access code, identifier and the like keywords

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20070112964 A1 (Guedalia et al.) 17 May 2007 (17-05-2007) (abstract, par.0011, 0014, 0068, 0115, 0135, 0137 and 0142, claims 1, 15 and 53)	1 to 90
Y	US 20040022237 A1 (Elliot et al.) 05 February 2004 (05-02-2004) (par. 0710, 0711)	1 to 90

[ ] 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
11 January 2010 (11-01-2010)	12 March 2010 (12-03-2010)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Elena Mikhailova (819) 953-5206

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2007112964A1	17-05-2007	AU2006266426A1	11-01-2007
		CA2614090A1	11-01-2007
		CN101253746A	27-08-2008
		EP1915844A2	30-04-2008
		EP2100431A2	16-09-2009
		KR20080058322A	25-06-2008
		US2007112964A1	17-05-2007
		US2007143397A1	21-06-2007
		US2007293207A1	20-12-2007
		WO2007005124A2	11-01-2007
		WO2007005124A3	08-03-2007
		WO2008073980A2	19-06-2008
		WO2008073980A3	25-09-2008
		WO2008106509A2	04-09-2008
		WO2008106509A3	23-10-2008
US2004022237A1	05-02-2004	AU1631900A	13-06-2000
		CA2352961A1	02-06-2000
		EP1131926A1	12-09-2001
		EP1131926A4	31-08-2005
		US6614781B1	02-09-2003
		US2004022237A1	05-02-2004
		US7564840B2	21-07-2009
		US2008013531A1	17-01-2008
		US2008025294A1	31-01-2008
		US2008025295A1	31-01-2008
		WO0031933A1	02-06-2000

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
SMART & BIGGAR
Box 11560 Vancouver Centre
2200 - 650 W. Georgia Street
VANCOUVER, British Columbia
Canada, V6B 4N8

RECEIVED
2010 MAR 22 A 9:51
2200-650 WEST GEORGIA ST.
VANCOUVER, B.C.

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	12 March 2010 (12-03-2010)
Applicant's or agent's file reference 83636-55	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/CA2009/001062	28 July 2009 (28-07-2009)	28 July 2008 (28-07-2008)

International Patent Classification (IPC) or both national classification and IPC
IPC: ***H04W 76/02*** (2009.01), ***H04W 88/06*** (2009.01), ***H04W 88/16*** (2009.01)

Applicant
DIGIFONICA (INTERNATIONAL) LIMITED ET AL

1. This opinion contains indications relating to the following items :

- [X] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [X] Box No. V Reasoned statement under Rule 43*bis*.1(a)(I) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [X] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**
If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/CA	Date of completion of this opinion	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	12 March 2010 (12-03-2010)	Elena Mikhailova (819) 953-5206

Box No. I **Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:

   [X] the international application in the language in which it was filed

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

2. [ ] This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      [ ] on paper

      [ ] in electronic form

   b. (time)

      [ ] the international application as filed.

      [ ] together with the international application in electronic form

      [ ] subsequently to this Authority for the purposes of search

4. [ ] In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments :

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(I) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1 to 90	YES
	Claims	None	NO
Inventive step (IS)	Claims	None	YES
	Claims	1 to 90	NO
Industrial applicability (IA)	Claims	1 to 90	YES
	Claims	None	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: US 20070112964 A1 (Guedalia et al.) 17 May 2007 (17-05-2007)
D2: US 20040022237 A1 (Elliot et al.) 05 February 2004 (05-02-2004)

The present application relates to initiating a long distance call using a mobile telephone. The application is concerned with providing a technique (other than using a "calling card") for avoiding long distance charges when the mobile telephone is roaming in another mobile telephone service provider's network. To achieve the above object the following technique is suggested: the user of the mobile telephone provides a callee identifier and requests an access code from an access server. Upon receiving the access code, which is different from the callee identifier, a call to the callee is initiated using the access code. Claim 1, which defines a method of initiating a call to a callee using a mobile telephone, is directed to the above described technique. D1 discloses systems and methods for establishing and maintaining communications between two or more devices coupled to different communication networks. In particular, D1 teaches a method of initiating a call to a callee *using a mobile telephone* (abstract, claims 15, 53, par. 0014, 0115) including the steps of receiving from a user of the mobile phone a callee identifier associated with the callee (claim 1, par. 0068), transmitting an access code request message including the callee identifier (claim 1, par. 0011, 0014, 0068, 0142), receiving an access code reply message (par. 0135, 0142), and initiating a call with the mobile telephone using the access code to identify the callee (par. 0137). Although D1 does not explicitly mention that the access code reply message includes an access code different from the callee identifier and associated with the callee identifier, the mentioned technical feature is well known in the art, and disclosed in D2. D2 describes a toll-free Service Control Point (SCP) which can translate a toll free number to a final routing destination based on a flexible set of options selected by a subscriber which include NPA or NPA-XXX of a calling party. The SCP can have several possible responses to a routing request. One of the responses includes returning *a circuit identifier* associated with a called party to connect the call (par. 0710 and 0711). Therefore, D1 in combination with D2 discloses the subject matter of claim 1. As independent claims 12, 21, 22, 31, 32, 33, 52, 71 and 90 are all directed to the same subject matter as claim 1 the above arguments also apply to claims 12, 21, 22, 31, 32, 33, 52, 71 and 90.

It appears that dependent claims 2 to 11, 13 to 20, 23 to 30, 34 to 51, 53 to 70 and 72 to 89 fail to introduce any inventive limitation.

Article 33(2) PCT - Novelty

As none of the cited references taken alone discloses the technical features of claims 1 to 90, the subject matter of the claimed invention is considered to be novel thus meeting the requirements of **Article 33(2) PCT.**

Article 33(3) PCT - Inventive step

For the reason indicated in the above discussion the subject matter of claims 1 to 90 is not considered is not considered to involve inventive step thus failing to fulfill the requirements of **Article 33(3) PCT.**

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made :

Article 6

In claims 52, 71 and 90 the term *said routing controller* lacks the antecedent.

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**

Continuation of: Box V on page 3

Article 33(4) PCT - Industrial Applicability

As the present application relates to a well established field of wireless communication, the subject matter of claims 1 to 90 is considered to be industrially applicable under **Article 33(4) PCT.**

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Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

[Continued on next page]

(54) Title: MOBILE GATEWAY

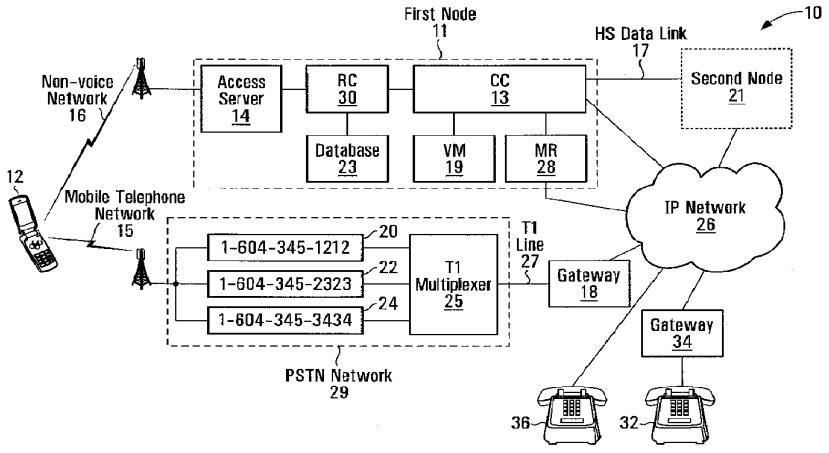


FIG. 1

(57) Abstract: A method of initiating a call to a callee using a mobile telephone involves: receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting an access code request message to an access server, said access code request message including said callee identifier; receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and initiating a call with the mobile telephone using said access code to identify the callee.

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T-Mobile Exhibit 1002
Part 1 of 6

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T-Mobile Exhibit 1002
Part 1 of 6

MOBILE GATEWAY

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates generally to telecommunication, and more particularly to methods, systems, apparatuses, and computer readable media for initiating or enabling a call with a mobile telephone to a callee.

2. Description of Related Art

Mobile telephone service providers often charge significant fees for long distance telephone calls, particularly when the mobile telephone is roaming in another mobile telephone service provider's network.

One known technique for avoiding the long distance charges of mobile telephone service providers is to use a "calling card". A "calling card" may permit the user of the mobile telephone to place a call to a local telephone number or to a less-expensive telephone number (such as a toll-free number, for example) instead of placing the call directly to the callee. The user may thus avoid the long distance charges of the mobile telephone service provider, which may be higher than the charges for using the "calling card". However, this technique can be cumbersome and undesirable, because it may require the user of the mobile telephone to follow a number of complicated or cumbersome steps in order to initiate a call to the callee, for example.

SUMMARY OF THE INVENTION

In accordance with one aspect of the invention there is provided a method of initiating a call to a callee using a mobile telephone. The method involves receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting an access code request message to an access server, the access code request message including the callee identifier; receiving an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated

with the callee identifier; and initiating a call with the mobile telephone using the access code to identify the callee.

Transmitting may involve transmitting the access code request message to the access server on a non-voice network.

Transmitting may involve transmitting a location identifier of a location associated with the mobile telephone to the access server.

Transmitting the location identifier may involve transmitting an IP address of the mobile telephone in a wireless IP network.

Transmitting the location identifier may involve transmitting an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Transmitting the location identifier may involve transmitting a user-configured identifier of a location associated with the mobile telephone.

Receiving the access code reply message may involve receiving the access code reply message from the access server on a non-voice network.

Receiving the access code reply message may involve receiving, in the access code reply message, an access code temporarily associated with the callee identifier.

Receiving the access code reply message may involve receiving, in the access code reply message, a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

Initiating the call may involve engaging a routing controller to route the call on the IP network to the callee.

The method may further involve: receiving from the mobile telephone the access code request message; communicating with a routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmitting the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes: provisions for receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting provisions for transmitting an access code request message to an access server, the access code request message including the callee identifier; provisions for receiving an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and provisions for initiating a call using the access code to identify the callee.

The transmitting provisions may include a non-voice network interface for transmitting the access code request message to the access server on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The provisions for receiving an access code reply message may include a non-voice network interface for receiving the access code reply message on a non-voice network.

The access code may include a telephone number.

The means for initiating may involve a mobile telephone network interface.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes the mobile telephone, a routing controller, and an access server. The access server includes: provisions for receiving from the mobile telephone the access code request message; provisions for communicating with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and provisions for transmitting the access code reply message including the access code to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive, from a user of the mobile telephone, a callee identifier associated with the callee; cause an access code request message to be transmitted to an access server, the access code request message including the callee identifier; receive an access code reply message from the access server in response to the access code request message, the access code reply message including an access

code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to cause the access code request message to be transmitted may include codes for directing the processor circuit to cause the access code request message to be transmitted to the access server using the non-voice network interface on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive an access code reply message may include codes for directing the processor circuit to cause the access code reply message to be received from the access server using the non-voice network interface on a non-voice network.

The access code may include a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The network interface may include a mobile telephone network interface, and the codes for directing the processor circuit to initiate may include codes for

directing the processor circuit to cause a call to be initiated using the mobile telephone network interface on a mobile telephone network.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes: the mobile telephone; a routing controller; and an access server comprising a processor circuit and a computer readable medium in communication with the processor circuit. The computer readable medium is encoded with codes for directing the processor circuit to: receive from the mobile telephone the access code request message; communicate with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmit the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive, from a user of a mobile telephone, a callee identifier associated with a callee; transmit an access code request message to an access server, the access code request message including the callee identifier; receive an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

In accordance with another aspect of the invention, there is provided a method for enabling a mobile telephone to initiate a call to a callee through a channel. The method involves: receiving from the mobile telephone an access code request message including a callee identifier associated with the callee; communicating with a routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to

initiate a call to the callee using the channel; and transmitting an access code reply message including the access code to the mobile telephone.

Receiving may involve receiving the access code request message on a non-voice network.

The method may further involve causing the routing controller to produce the access code.

Producing may involve selecting the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The method may further involve determining a local calling area associated with the mobile telephone.

Determining may involve accessing a dialing profile associated with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

Determining may involve receiving an IP address of the mobile telephone in a wireless IP network.

Determining may involve receiving an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Determining may involve receiving a user-configured identifier of a location associated with the mobile telephone.

Selecting may involve selecting an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The method may further involve causing the routing controller to establish communication through the IP network in response to a call received on the channel.

Producing may further involve storing a caller identifier associated with the mobile telephone in association with the access code.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

Producing may further involve storing the callee identifier in association with the access code.

Producing may further involve searching the pool of access codes for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

Producing may further involve storing, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

Transmitting may involve transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes: provisions for receiving from the mobile telephone an access code request message including a callee identifier associated with the callee; provisions for communicating with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and provisions for transmitting an access code reply message including the access code to the mobile telephone.

The provisions for receiving may include a non-voice network interface for receiving the access code request message on a non-voice network.

The system may further include provisions for producing the access code.

The provisions for producing may include a processor circuit operably configured to select the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a dialing profile associated with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an IP address of the mobile telephone in a wireless IP network.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a user-configured identifier of a location associated with the mobile telephone.

The processor circuit may be operably configured to select an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The processor circuit may be operably configured to establish communication through the IP network in response to a call received on the channel.

The processor circuit may be operably configured to store a caller identifier associated with the mobile telephone in association with the access code.

The processor circuit may be operably configured to cause the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

The processor circuit may be operably configured to store the callee identifier in association with the access code.

The processor circuit may be operably configured to search the pool of access codes for an access code associated with the callee identifier to

identify the channel usable by the mobile telephone to initiate a call to the callee.

The processor circuit may be operably configured to store, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

The processor circuit may operably configured to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

The provisions for transmitting may include a non-voice network interface for transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive may include codes for directing the processor circuit to cause the access code request message to be received using the non-voice network interface on a non-voice network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause the access code to be produced.

The codes for directing the processor circuit to cause the access code to be produced may cause the access code to be selected from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause to be determined a local calling area associated with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause a dialing profile associated with the caller to be accessed, the dialing profile including a location field having contents identifying at least a default location of the caller.

The codes for directing the processor circuit to cause to be determined may cause to be received an IP address of the mobile telephone in a wireless IP network.

The codes for directing the processor circuit to cause to be determined may cause to be received an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause to be received a user-configured identifier of a location associated with the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may further cause to be selected an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause communication through the IP network to be established in response to a call received on the channel.

The codes for directing the processor circuit to cause the access code to be produced may cause a caller identifier associated with the mobile telephone to be stored in association with the access code.

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the caller identifier associated with the access code identifies the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may cause the callee identifier to be stored in association with the access code.

The codes for directing the processor circuit to cause the access code to be produced may cause the pool of access codes to be searched for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

The codes for directing the processor circuit to cause the access code to be produced may cause a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire, to be stored in association with the access code.

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the usability of the access code to initiate a call to the callee has not expired.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to transmit include codes for directing the processor circuit to cause the access code reply message to be transmitted using the non-voice network interface on a non-voice network.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the invention,

Figure **1** is a block diagram of a system for enabling a mobile telephone to initiate a call through a channel to a callee in accordance with a first embodiment in the invention;

Figure **2** is a block diagram of mobile telephone shown in Figure **1**;

Figure **3** is a flow chart of a process executed by the mobile telephone shown in Figure **1**;

Figure **4** is a schematic representation of an access code request message transmitted between the mobile telephone and an access server shown in Figure **1**;

Figure **5** is a schematic representation of an access code reply message transmitted between the mobile telephone and the access server shown in Figure **1**;

Figure **6** is a block diagram of the access server shown in Figure **1**;

Figure **7** is a flow chart of a process executed by the access server shown in Figure **1**;

Figure **8** is a block diagram of a routing controller shown in Figure **1**;

Figure **9** is a tabular representation of a dialing profile stored in a database accessible by the routing controller illustrated in Figure **1**;

Figure **10** is a tabular representation of an access code association table stored in memory accessible by the routing controller shown in Figure **1**;

Figure **11** is a schematic representation of a DID bank table record stored in a database shown in Figure **1**;

Figure **12** is a flow chart of a process executed by the routing controller illustrated in Figure **1**;

Figure **13** is a block diagram of a gateway shown in Figure **1**;

Figure **14** is a tabular representation of an SIP invite message transmitted between the gateway and a call controller illustrated in Figure **1**;

Figure **15** is a block diagram of the call controller illustrated in Figure **1**;

Figure **16** is a flow chart of a process executed by the call controller illustrated in Figure **1**;

Figure **17** is a tabular representation of an RC request message transmitted between the call controller and the routing controller illustrated in Figure **1**

Figures **18A–18C** are a flow chart of a process executed by the routing controller illustrated in Figure **1**; and

Figure **19** is a tabular representation of a gateway node association table stored in the database illustrated in Figure **1**.

DETAILED DESCRIPTION

Referring to Figure **1**, a system for enabling a mobile telephone to initiate a call to a callee is shown generally at **10**. The system **10** includes a first node **11**, a second node **21**, and a mobile telephone **12**.

The first and second nodes **11** and **21** in the illustrated embodiment may support "voice-over-IP" (VoIP) calls between telephones and/or videophones using the internet protocol (IP), as described in PCT Publication No. WO **2008/052340**, which is hereby incorporated by reference in its entirety herein. In the embodiment shown, the first node **11** is located in a geographical area, such as Vancouver, British Columbia, Canada, for example, and the second node **21** is located in London, England, for example. Different nodes may be located in different geographical regions throughout the world to provide telephone/videophone service to subscribers in respective regions. These nodes may be in communication with each other by high speed/high data throughput links including optical fiber, satellite, and/or cable links illustrated generally at **17**, forming a backbone to the system. These nodes may alternatively, or in addition, be in communication with each other through conventional internet services.

In the embodiment shown, the first node **11** provides telephone/videophone service to western Canadian customers from Vancouver Island to Ontario. Another node (not shown) may be located in Eastern Canada to provide services to subscribers in that area, for example.

Other nodes of the type shown may also be employed within the geographical area serviced by a node to provide for call load sharing, for example, within a region of the geographical area serviced by the node. However, in general, all nodes may be similar and have the properties described in connection with the first node **11**.

In this embodiment, the first node **11** includes a call controller (CC) **13**, an access server **14**, a routing controller (RC) **30,** a database **23**, a voicemail server **19,** and a media relay **28**. Each of these may be implemented as separate modules on a common computer system or by separate computers, for example. The voicemail server **19** need not be included in the node and can be provided by a third party service provider. Although the access server **14** is illustrated as being part of the first node **11**, access servers in alternative embodiments may be separate from the node and may be in communication with one or more nodes, for example.

The mobile telephone **12** is configured to place calls over a mobile telephone network, illustrated generally at **15**, in a manner well-known in the art. Furthermore, the mobile telephone **12** and the access server **14** are configured to communicate with each other, preferably on a non-voice network illustrated generally at **16**, such as a "WiFi" wireless IP network or a General Packet Radio Service (GPRS) network, for example. However, in alternative embodiments, the mobile telephone **12** and the access server **14** may communicate with each other over other networks, such as a mobile telephone network using Short Message Service (SMS) messages, for example.

The system **10** further includes a gateway **18** in communication with at least one, and preferably a plurality of, channels, which are illustrated schematically at **20, 22,** and **24,** to which the mobile telephone **12** may initiate a call over the mobile telephone network **15**. The channels **20**, **22**, and **24** maybe telephone lines in a Public Switched Telephone Network (PSTN) **29**. The channels **20**, **22**, and **24** maybe associated with PSTN telephone numbers in a local calling area associated with the mobile telephone **12**, and thus these channels preferably depend on a geographical location of the mobile telephone. The expression "local calling area" herein refers generally to a set of telephone numbers, typically defined by a geographical region, to which telephone calls may be placed by callers within the local calling area at either no additional charge or at a lower additional charge than would be required for calls to

numbers that are outside of the local calling area. However, it will be appreciated that in other embodiments, the gateway **18** may be in communication with any number of channels, which need not be PSTN telephone lines. Also, in the illustrated embodiment, the channels **20**, **22**, and **24** are associated with telephone numbers for Vancouver, British Columbia, Canada and the surrounding area, although it will be appreciated that these channels may include PSTN telephone lines associated with other areas, for example, which may not necessarily be in a local calling area associated with the mobile telephone **12**.

In the illustrated embodiment, each of the channels **20**, **22**, and **24** is configured by a PSTN service provider (which, in Canada, may be Bell Canada or Telus, for example) to direct calls that are received on the channels to the gateway **18**. In the illustrated embodiment, the PSTN service provider has configured the channels **20**, **22**, and **24** to communicate with a T**1** multiplexer **25**, which multiplexes the channels **20**, **22**, and **24** in a manner known in the art onto one or more T**1** lines **27** that are in communication with the gateway **18**. The gateway **18** is in communication with an IP network shown generally at **26**. The channels **20**, **22**, and **24** are thus configured to cooperate with the IP network **26** (via the gateway **18** in the illustrated embodiment) to cause a call involving the mobile telephone **12** and the callee to be routed through the IP network in response to a call received at one of the channels.

Also, in the illustrated embodiment, the access server **14** is in communication with the routing controller **30** of the first node **11**, and the routing controller **30** is configurable to associate a callee identifier with one of the channels **20**, **22**, and **24**, as described below. A callee identifier associated with one of the channels **20**, **22**, and **24** may be a telephone number of a PSTN telephone **32** that is in communication with the IP network **26** through a gateway **34**, or it may be a telephone number of a VoIP telephone **36** that is directly in communication with the IP network **26**, for example. Other routing controllers **30** of other nodes, such as the second node **21**, for example, may also

associate callee identifiers with other channels that are in communication with other gateways (not shown).

Mobile Telephone

Referring to Figure **2**, in this embodiment, the mobile telephone (**12**) includes a processor circuit shown generally at **50**. The processor circuit **50** includes a microprocessor **52**, a program memory **54**, an input/output (I/O) port **56**, parameter memory **58**, and temporary memory **60**. The program memory **54**, I/O port **56**, parameter memory **58**, and temporary memory **60** are all in communication with the microprocessor **52**. The processor circuit **50** may alternatively include a plurality of processors, a plurality of program memories, a plurality of temporary memories, and/or a plurality of I/O ports, or these components may alternatively be combined into a single device. However, for simplicity, the components of the processor circuit **50** are illustrated as shown in the example of Figure **2**.

In the illustrated embodiment, the I/O port **56** includes a dialing input **62** for receiving a callee identifier from a key pad, for example, or from a voice recognition unit, or from pre-stored callee identifiers stored in the parameter memory **58**, for example. For illustration purposes only, a myriad of possible dialing functions for providing a callee identifier are represented by the block entitled dialing function **64**. A callee identifier may be a telephone number of a callee, for example.

The I/O port **56** also includes a handset interface **66** for receiving and producing signals to and from a handset **68** that may be placed close to the user's ear and mouth, for producing and receiving audible signals for and from the user. It will be appreciated that alternatively, the handset **68** may include a camera and video screen, for example, and that video or other types of signals may be transmitted additionally or alternatively to audible signals.

The I/O port **56** also includes a non-voice network interface **70** for transmitting information to, and receiving information from, the non-voice network **16**

illustrated in Figure **1**, for example, and preferably interfaces with a high-speed internet connection.

The I/O port **56** in the illustrated embodiment further includes a mobile telephone network interface **72** for transmitting signals to and receiving signals from a mobile telephone service provider over a network such as a Global System for Mobile communications (GSM) or a Code Division Multiple Access (CDMA) network, such as the mobile telephone network **15** illustrated in Figure **1**, for example. Again, for simplicity, a mobile telephone network interface is illustrated, although it will be appreciated that video signals or other signals may be handled similarly when the mobile telephone (**12**) is facilitating communication of one or more of these types of signals. It will also be appreciated that alternatively, the non-voice network interface **70** and mobile telephone network interface **72** need not be distinct, but may be a single interface for communication over a single network, for example, or may be configured to communicate over a plurality of different networks, for example.

In the illustrated embodiment, the parameter memory **58** includes a username field **74** and a password field **76**, although it will be appreciated that the username and password may not be necessary, or may be input by the user as required, for example. The parameter memory **58** in the illustrated embodiment also includes a caller identifier field **78** for storing a caller identifier, which may be a telephone number associated with the mobile telephone (**12**) for identifying a "channel" such as a telephone line assigned to the mobile telephone that may be used to call back to the mobile telephone, for example. Generally, the contents of the username field **74**, the password field **76**, and the caller identifier field **78** are set once when the user first subscribes to the system.

The usernames referred to herein, such as the username in the username field **74**, preferably include a twelve digit number such as **2001 1050 8667**, for example, wherein the left-most digit is a continent code (such as "**2**" to

indicate North America, for example), followed by a three-digit country code (such as "**001**" to indicate Canada and the United States, for example), a four-digit dealer code (such as "**1050**", for example), and a unique four-digit number code (such as "**8667**", for example), as discussed more generally in PCT Publication No. **2008/052340**. Therefore, a prefix of a username referred to herein preferably indicates a geographical region associated with the user, or with the access code, and more preferably indicates a node associated with the user or access code.

The program memory **54** stores blocks of codes for directing the microprocessor **52** to carry out the functions of the mobile telephone (**12**), which are illustrated by example below.

Referring to Figures **2** and **3**, a flow chart representing functions performed by blocks of code that direct the microprocessor **52** to initiate a call with the mobile telephone **12** to a callee is shown generally at **100**. The blocks shown in Figure **3** generally represent codes that may be stored in the program memory **54** for example, for directing the microprocessor **52** to perform various functions relating to initiating a call with the mobile telephone (**12**) to a callee. The actual code to implement each block may be written in any suitable programming language, such as Java, C, and/or C++, for example.

The process **100** begins at **102**, in response to an interrupt produced at or for the microprocessor **52** by the dialing function **64**. Upon initiation of the process **100**, block **104** directs the microprocessor **52** to obtain a callee identifier from the dialing function **64** at the dialing input **62** of the I/O port **56** in the illustrated embodiment. The callee identifier is associated with a desired callee, and may be a telephone number of the callee, for example. The microprocessor **52** thus receives, from a user of the mobile telephone (**12**), a callee identifier associated with a callee.

Block **106** directs the microprocessor **52** to transmit, using the non-voice network interface **70** in the illustrated embodiment, an access code request

message, the access code request message including the callee identifier obtained at block **104**, to the access server **14** (illustrated in Figure **1**). In general, preferably block **106** directs the microprocessor **52** to cause an access code request message to be transmitted to the access server **14** over a non-voice network, such as an internet, using WiFi or GPRS technology for example. However, it will be appreciated that block **106** may direct the microprocessor **52** to transmit an access code request message to the access server **14** using any suitable technique, which may alternatively include a voice network, for example.

Referring to Figure **4**, an exemplary access code request message is shown generally at **110**. The access code request message **110** includes a username field **112**, a password field **114**, a callee identifier field **116**, and a caller identifier field **118**. In the illustrated embodiment, values for the username, password, and caller identifier fields **112**, **114**, and **118** are retrieved from the username, password, and caller identifier fields **74**, **76**, and **78** respectively in the parameter memory **58** of the processor circuit **50** (illustrated in Figure **2**), and a value for the callee identifier field **116** is obtained from the dialing function **64** in block **104**, and may be stored in the temporary memory (**60**), for example. It will be appreciated that the username field **112**, password field **114**, and caller identifier field **118** are not essential, although these fields are preferable in order to identify the user of the mobile telephone for billing purposes, for example.

Referring to Figures **1** and **4**, it will be appreciated that in order to minimize charges from the mobile telephone service provider of the mobile telephone **12**, the channels **20**, **22**, **24** will preferably be local or relatively inexpensive telephone lines associated with a geographical location, more particularly a pre-defined local calling area, associated with the mobile telephone **12**. Therefore, the exemplary access code request message **110** further includes a location identifier field **119**. The location identifier stored in the location identifier field **119** preferably identifies a location of the mobile telephone **12**

for use in determining a local calling area associated with the mobile telephone **12**.

For example, the location identifier in the location identifier field **119** may include an IP address of the mobile telephone **12** in a wireless IP network, such as the non-voice network **16** to which the non-voice network interface **70** shown in Figure **2** is connected, because this IP address may be an indicator of a geographical location of the mobile telephone **12**. The location identifier may also or alternatively include an identifier of a wireless voice signal station in wireless communication with the mobile telephone. In the illustrated embodiment, the wireless voice signal station is part of the mobile telephone network **15** that is in communication with the mobile telephone **12** through the mobile telephone network interface **72** illustrated in Figure **2**. In still other embodiments, the location identifier may include a user-configured identifier of a geographical location or local calling area where the mobile telephone **12** is or may be situated. The location identifier may thus be pre-determined and stored in the parameter memory **58** shown in Figure **2** or may be acquired from non-voice network or wireless voice signal station or from user input, for example. Therefore, in summary, the location identifier in the location identifier field **119** may include one or more of an IP address of the mobile telephone **12** in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier.

As described below, the location identifier in the location identifier field **119** may be used to determine a local calling area associated with the mobile telephone **12**, within which local calling area channels (illustrated as **20**, **22**, and **24** in Figure **1**) are available to the mobile telephone **12** for the lowest cost to the user. However, it will be appreciated that the location identifier may only approximately identify a local calling area, and may not necessarily identify the lowest cost channel (illustrated as **20**, **22**, and **24** in Figure **1**) for the mobile telephone **12**. It will also be appreciated that in other embodiments, the location identifier field **119** may be omitted.

Referring back to Figure **3**, the process **100** continues at block **130**, which directs the microprocessor (**52**) to receive an access code reply message from the access server (**14**) in response to the access code request message that was transmitted at block **106**.

Referring to Figure **5**, an exemplary access code reply message is shown generally at **140**. The access code reply message **140** includes an access code field **142** and a timeout field **144**. In the illustrated embodiment, the access code field **142** stores an access code which is a telephone number associated with a telephone line associated with one of the channels **20**, **22**, or **24** in Figure **1**. It will be appreciated that the access code is different from the callee identifier in the callee identifier field **116** shown in Figure **4**, in that the access code identifies a channel, other than that provided by the callee identifier provided by the dialing function **64** in Figure **2**, that the mobile telephone (**12**) can use to initiate a call to the callee. It will be appreciated that use of the access code facilitates avoidance of long distance or roaming charges that a mobile telephone service provider would charge for a call placed directly using the callee identifier using conventional calling processes, for example.

Still referring to Figure **5**, the timeout field **144** in the illustrated embodiment stores a value that indicates a period of time, for example a number of minutes, during which the access code in the access code field **142** is associated with the callee identifier in the callee identifier field **116** of the exemplary access code request message **110** illustrated in Figure **4**, such that the access code is only temporarily associated with the callee identifier. In one embodiment, the value stored in the timeout field **144** indicates **10** minutes, for example. It will be appreciated that in other embodiments, the timeout field **144** may not be necessary, but preferably it is included.

In the illustrated embodiment, the program codes in block **130** direct the microprocessor **52** to receive the access code reply message over a non-

voice network, such as a WiFi or GPRS network (illustrated at **16** in Figure **1**) via the non-voice network interface **70** shown in Figure **2**. However, it will be appreciated that the access code reply message may be received on any suitable network, even a voice network, for example.

Referring back to Figures **2** and **3**, block **149** directs the microprocessor **52** to initiate a call with the mobile telephone (**12**) on the mobile telephone network **15** (illustrated in Figure **1**) using the access code received in the access code field **142** of the access code reply message **140** (shown in Figure **5**) to identify the callee. In the illustrated embodiment, the codes in block **149** direct the microprocessor **52** to initiate a call to the channel (**20**, **22**, or **24**) identified by the access code, using the mobile telephone network interface **72** of the I/O port **56** of the mobile telephone (**12**), to engage the mobile telephone network (**15**).

Referring to Figure **1**, in the embodiment shown, the access code in the access code field (**142**) is a telephone number identifying a channel **20**, **22**, or **24** that is in communication with the gateway **18** to the IP network **26**. Through the gateway **18**, the channel **20**, **22**, or **24** is thus operably configured to cooperate with the IP network **26** to cause a call from the mobile telephone **12** to the callee to be routed through the IP network. Routing the call through the IP network may involve engaging the routing controller **30** to route the call on the IP network **26** to the callee, as described below. However, it will be appreciated that in other embodiments, the access code need not be a telephone number, but may be any code identifying a channel through which the mobile telephone **12** can initiate a call. Alternatively, if the mobile telephone is capable of voice over IP communications, the access code may be used to identify an IP address in the IP network to which the call is routed. In this embodiment, the IP address may act as the access code. The process **100** shown in Figure **3** is then ended.

Access Server

Referring to Figure **6**, the access server (**14**) includes a processor circuit shown generally at **150**. The processor circuit **150** includes a microprocessor **152**, program memory **154**, an I/O port **156**, parameter memory **158**, and temporary memory **160**. The program memory **154**, I/O port **156**, parameter memory **158**, and temporary memory **160** are all in communication with the microprocessor **152**. The processor circuit **150** may alternatively include a plurality of microprocessors or I/O ports, for example, and the components of the illustrated processor circuit **150** may also alternatively be combined into a single device.

The program memory **154** stores blocks of codes for directing the microprocessor **152** to carry out the functions of the access server **14**. The I/O port **156** includes a non-voice network interface **162** for communicating with the non-voice network **16** illustrated in Figure **1**. The I/O port **156** also includes a routing controller interface **164** for interfacing with the routing controller **30** illustrated in Figure **1**.

Referring to Figures **6** and **7**, a flow chart of blocks of code for directing the microprocessor **152** of the access server (**14**) to provide an access code to the mobile telephone (**12**) is shown generally at **190**. The blocks **190** in Figure **7** generally represent codes that may be stored in the program memory **154** for directing the microprocessor **152** to perform various functions to provide the access to the mobile telephone (**12**) to enable the mobile telephone to place a call through a channel (**20**, **22**, or **24**).

The process **190** begins at **192**, in response to an interrupt created by or for the microprocessor **152** when it receives an access code request message **110** (as illustrated in Figure **4**) from the mobile telephone (**12**). In the illustrated embodiment, the access code request message (**110**) is received via the non-voice network interface **162** through a non-voice network (**16**) such as a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may use different techniques for receiving the access code request message (**110**) from the mobile telephone (**12**).

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The process **190** continues at block **196**, which directs the microprocessor **152** to communicate with the routing controller **30** to obtain from the routing controller an access code identifying a channel (illustrated as **20**, **22**, or **24** in Figure **1**) in communication with the gateway (**18**), wherein the access code is different from the callee identifier in the callee identifier field **116** (shown in Figure **4**) and is usable by the mobile telephone (**12**) to initiate a call to the callee using the channel, as further described below. Therefore, block **196** preferably causes an access code to be produced by retransmitting the access code request message **110** illustrated in Figure **4** that was received at **192** from the mobile telephone (**12**), to the routing controller **30** through the routing controller interface **164** of the I/O port **156**.

The process **190** continues at block **198**, which directs the microprocessor **152** to transmit an access code reply message (**140**), including the access code obtained by block **196**, to the mobile telephone (**12**). An exemplary access code reply message is shown in Figure **5**. In the illustrated embodiment, an access code reply message (**140**) is produced by the routing controller **30** in a manner described below in response to the access code request message (**110**) that was transmitted to the routing controller at block **196**, and the access code reply message (**140**) is received from the routing controller through the routing controller interface **164** of the I/O port **156**. Block **198** then causes the access code reply message that was received from the routing controller to be retransmitted to the mobile telephone (**12**). In the illustrated embodiment, the codes in block **198** direct the microprocessor **152** to transmit the access code reply message (**140**) using the non-voice network interface **162** to the non-voice network **16**, which may be a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may employ other types of networks for communicating the access code reply message (**140**) to the mobile telephone (**12**). The process **190** is then ended.

In summary, referring to Figure **1**, the access server **14** generally acts as an interface to the routing controller **30** for relaying access code request

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messages and access code reply messages between the mobile telephone **12** and the routing controller. Therefore, it will be appreciated that in alternative embodiments, the access server **14** and the routing controller **30** need not be separate, but may, for example, be combined in a single component.

Routing Controller (RC)

Referring to Figure **1**, generally, the routing controller **30** executes a process to facilitate communication between callers and callees. The function of a routing controller generally in a VoIP system is described in PCT Publication No. WO **2008/052340**.

Referring to Figure **8**, the routing controller (**30**) includes a processor circuit shown generally at **230**. The processor circuit **230** includes a microprocessor (or more generally a processor) **232**, program memory **234**, an I/O port **236**, table memory **238**, temporary memory **240**, and a clock **244**. The program memory **234**, I/O port **236**, table memory **238**, temporary memory **240**, and clock **244** are all in communication with the processor **232**. The processor circuit **230** may include a plurality of microprocessors, for example, and the aforementioned components of the processor circuit **230** may be combined, for example. The program memory **234** includes blocks of code for directing the processor **232** to carry out the functions of the routing controller (**30**), and the I/O port **236** includes an access server interface **242** for communicating with the access server **14**.

In the illustrated embodiment as described above, the access server (**14**) transmits (at block **196** illustrated in Figure **7**) an access code request message (**110**) to the routing controller (**30**) in order to obtain from the routing controller (**30**) an access code. When an access code request message (**110**) is received at the access server interface **242**, the processor **232** preferably stores certain values from the access code request message in stores in the temporary memory **240** for ease of retrieval. In particular, the temporary memory **240** includes a callee identifier store **246** for storing the callee

identifier from the callee identifier field **116** in the access code request message **110** illustrated in Figure **4**, a caller identifier store **248** for storing the caller identifier that was stored in the caller identifier field **118** of the access code request message **110** illustrated in Figure **4**, a caller username store **249** for storing the caller username that was stored in the caller username field **112** of the access code request message **110** illustrated in Figure **4**, and an access code store **250** for storing an access code that is selected when the routing controller (**30**) receives an access code request message (**110**). The temporary memory **240** also includes a local calling area identifier store **245** for storing an identifier of a local calling area associated with the mobile telephone (**12**). The clock **244** generally maintains and stores a representation of a current date and time.

The I/O port **236** further includes a database request port **256** through which a request to the database (**23** in Figure **1**) can be made, and also includes a database response port **258** for receiving a reply from the database (**23**). The I/O port **236** further includes a routing controller (RC) request message input **260** for receiving an RC request message (illustrated in Figure **17**) from the call controller (**13** in Figure **1**) and includes a routing message output **262** for sending a routing message back to the call controller **13**. The I/O port **236** thus acts to receive a caller identifier and a callee identifier contained in an RC request message from the call controller, the RC request message being received in response to initiation of a call by a subscriber of the system, as described below.

The program memory **234** includes blocks of codes for directing the processor **232** to carry out various functions of the routing controller (**30**). One of these blocks includes an RC request message handler **380** which directs the routing controller (**30**) to produce a routing message in response to a received RC request message, an example of which is illustrated in Figure **17**. The RC request message handler process is shown in greater detail at **380** in Figures **18**A through **18**C. Another of these blocks in the program memory **234** includes an access code generator, which is described at **270** in Figure **12**,

and which directs the routing controller (**30**) to produce an access code as directed by the program codes in block **196** shown in Figure **7**. Yet another of these blocks in the program memory **234** includes a local calling area identifier generator, which directs the routing controller (**30**) to produce a local calling area identifier using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**.

Local Calling Area Identifier Generator

Referring to Figure **1**, it will be appreciated that preferably, a call made by the mobile telephone **12** using the access code obtained from the access server **14** will be a local call for the mobile telephone **12**, based on a geographical location of the mobile telephone. Therefore, blocks in the program memory **234** include a local calling area identifier generator, which directs the routing controller **30** to produce a local calling area identifier.

For example, the local calling area identifier generator may direct the microprocessor **152** to access a dialing profile associated with the caller. The dialing profile may be identified using the username in the username field **112** in the access code request message **110** illustrated in Figure **4**, and to store in the local calling area identifier field **245** a default location of the caller retrieved from the dialing profile associated with the caller.

Referring to Figure **9**, an exemplary dialing profile is illustrated generally at **200** and includes a username field **202**, a domain field **204**, and calling attributes comprising a national dialing digits (NDD) field **206**, an international dialing digits (IDD) field **208**, a country code field **210**, a local area codes field **212**, a caller minimum local number length field **214**, a caller maximum local number length field **216**, a reseller field **218**, a maximum number of concurrent calls field **220**, a current number of concurrent calls field **222**, and a default local calling area identifier field **224**. Therefore, in some embodiments, the local calling area identifier generator directs the

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microprocessor **152** to determine a local calling area associated with the mobile telephone (**12**) by retrieving the default local calling area identifier from the default local calling area identifier field **224** of the dialing profile **200**.

Effectively, the dialing profile **200** is a record identifying calling attributes of the caller identified by the username in the username field **202.** More generally, dialing profiles **200** represent calling attributes of respective users, and are discussed in more detail in PCT publication No. WO **2008/052340**. As described in PCT publication No. WO **2008/052340**, a dialing profile of the type shown in Figure **9**, and also other records such as direct-in-dial (DID) records, call blocking records, call forwarding records, and voicemail records, may be created whenever a user registers with the system or agrees to become a subscriber to the system.

Alternatively, the local calling area identifier generator may generate a local calling area identifier to be stored in the local calling area identifier store **245** using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**. As described above, the location identifier field (**119**) may store one or more of an IP address of the mobile telephone (**12**) in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier. One or more of these values may be used to identify a local calling area that is or is likely to be associated with the mobile telephone (**12**) in order to generate a local calling area identifier to be stored in the local calling area identifier store **245**.

For example, it has been found that services available from web sites such as http://www.ip2location.com/ and http://www.serviceobjects.com/products/dots_ipgeo.asp, for example, can produce a name of a location, and also latitude and longitude values, associated with an IP address. Using this information derived from an IP address, or other information from the location identifier field (**119**), a local calling area may be identified by hierarchical jurisdictional designations (such as country, province, and city in Canada or

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country, state, and city in the United States) and encoded as codes identifying the local calling area. These codes may then be stored in the local calling area identifier store **245**.

Access Code Association Table

In the illustrated embodiment, the table memory **238** (shown in Figure **8**) includes an access code association table **170**, an example of which is illustrated in Figure **10**, for associating access codes with callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps. Although the routing controller (**30**) is illustrated in this embodiment as a separate component from the access server (**14**), it will be appreciated that in other embodiments, the routing controller (**30**) may be part of or integrated with the access server (**14**), and in these other embodiments, the access code association table **170** may be part of or integrated with the access server.

Referring to Figures **1** and **10**, the access code association table **170** generally includes a plurality of records, each having an access code field **173** storing an access code. The access codes in the access code association table **170** may thus form a pool of access codes, where each access code may identify a respective telephone number. In the illustrated embodiment, the access codes in the access code fields **173** of records of the access code association table **170** identify respective channels (illustrated by example only as **20**, **22**, and **24**) that are operably configured to cooperate with the IP network **26** via the gateway **18** to cause a call involving the mobile telephone **12** to be routed through the IP network.

Referring to Figure **10**, the exemplary access code association table **170** includes records **172**, **174**, **176**, **178**, and **180**, each having respective fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175**, a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**. Generally, a record in the access code association table **170** will be created for each access code that identifies a channel (such as the channels **20**, **22**, and **24** illustrated in Figure **1**) that is

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configured or configurable to establish communication through a gateway (such as the gateway **18** illustrated in Figure **1**) to an IP network (**26** in Figure **1**) in response to a call received at the channel. When a record is created in respect of a channel, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel, the access code field **173** is preferably initialized with an access code associated with the channel, and the channel identifier field **175** is preferably initialized with an identifier of the channel. The remaining fields (for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**) are preferably initialized with default "null" values when a record is created. The fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175** preferably remain generally constant during ordinary operation of the access code association table **170**, although the values stored in the fields for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may vary as described below. It will be appreciated that in some embodiments, one or more of the fields for storing a local calling area identifier **171**, a channel identifier **175**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may not be required and be omitted.

As noted above, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel. The local calling area identifier field **171** preferably stores codes that are encoded in the same manner as the codes in the local calling area identifier store **245**, as described above, so that an access code in the local calling area identified by the codes in the local calling area identifier store **245** may be identified by searching the access code association table **170** for an access code associated with a local calling area identifier in the associated local calling area identifier field **171** that matches the local calling area identifier in the local calling area identifier store **245**. It has been found that information available from web sites such as http://en.wikipedia.org/wiki/List_of_NANP_area_codes, and services available from web sites such as

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http://www.serviceobjects.com/demos/PhoneExchangeDemo.asp, for example, may be used to determine a local calling area identifier associated with a given access code where, for example, the access code is a PSTN telephone number.

In the exemplary access code association table **170**, the access codes in the access code fields **173** are telephone numbers for PSTN lines, three of which are in the **604** area code in Vancouver, British Columbia, Canada, and two of which are in the **416** area code in Toronto, Ontario, Canada. It will be appreciated that the access code association table **170** is an example only, and other access code association tables may include any number of access codes, which need not be PSTN telephone numbers, and which need not be limited to particular geographical areas.

In the exemplary access code association table **170**, the access code field **173** in the record **174** stores an access code **1-604-345-2323**, which may be a local telephone number for Vancouver, British Columbia, Canada, and the callee identifier field **177** of the record **174** stores a callee identifier **1-403-789-1234**, which may be a telephone number for a callee in Calgary, Alberta, Canada for example, thereby associating the callee identifier **1-403-789-1234** with the access code **1-604-345-2323**. Furthermore, the caller identifier field **179** of the record **174** stores a caller identifier **1-416-444-1441** and the caller username field **183** stores a caller username **2001 1050 8667**, thereby associating the caller identifier **1-416-444-1441** and caller username **2001 1050 8667** with the aforementioned access code and callee identifier. The caller identifier **1-416-444-1441** may be associated with a mobile telephone normally geographically located in Toronto, Ontario, Canada, but which may be in Vancouver and is therefore using a Vancouver-based access code to place a call to a Calgary-based number, for example. In the example record **174**, the timestamp field **182** indicates that the callee identifier **1-403-789-1234**, the caller identifier **1-416-444-1441**, and the caller username **2001 1050 8667** were associated with the access code **1-604-345-2323** on June **15**,

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2008 at **10:31** am, and the timeout field **181** indicates that this association is to expire **10** minutes after the time indicated in the timestamp field.

Likewise, the exemplary record **178** indicates that the callee identifier **1-604-321-1234**, the caller identifier **1-416-444-1234**, and the caller username **2001 1050 4141** were associated with the access code **1-416-234-4646** on June **15, 2008** at **2:21** pm, and the timeout field **181** of the record **178** indicates that this association is to expire within **10** minutes of the time in the timestamp field **182**.

It will also be appreciated that the access code association table **170** may, in other embodiments, be substituted with other data structures or storage media. For example, in alternative embodiments, as described below, a DID record of the type shown at **370** in Figure **11** may associate an access code with a callee identifier and with other information such as a caller identifier, a timeout value, and a timestamp value, additionally or alternatively to the access code association table **170**.

DID Bank Table Records

As described in PCT Publication No. **2008/052340**, a DID bank table record may be created and stored in a DID bank table in the database (**23** in Figure **1**) when a user registers with the system, to associate the username of the user and a host name of the node with which the user is associated, with a number on the PSTN network formatted in compliance with the **E.164** standard set by the International Telecommunication Union (ITU). However, as explained below, DID records may, in some embodiments, also associate usernames and host names with respective access codes, and may also associate access codes with respective callee identifiers and with other information such as caller identifiers, timeout values, and timestamp values.

Referring to Figure **11**, an exemplary DID bank table record is shown generally at **370**, and includes a username field **371**, a user domain field **372**, and a DID field **373**. The username field **371** may store a username of a user

of the system, in which case the user domain field **372** stores a host name of the node with which the user is associated, and the DID field **373** stores an E.**164** number on the PSTN network associated with the user. Exemplary host names stored in the user domain field **372** include sp.yvr.digifonica.com for Vancouver, British Columbia, Canada and sp.lhr.digifonica.com for London England, for example, as described in PCT Publication No. **2008/052340**. If the user has multiple telephone numbers, then multiple records of the type shown at **370** would be included in the DID bank table, each having the same username and user domain, but different DID field **373** contents reflecting the different telephone numbers associated with that user.

However, DID fields **373** of DID bank table records **370** may also store access codes, in which case the username field **371** may store a username associated with the access code. In these DID bank table records **370**, the user domain field **372** stores a host name of the node with which the access code is associated. Therefore, DID bank table records **370** may, in some embodiments, associate usernames and host names with respective access codes.

The exemplary DID bank table record **370** further includes a callee identifier field **374**, a caller identifier field **375**, a timeout field **376**, a timestamp field **377**, a local calling area identifier field **378**, a channel identifier field **379**, and a caller username field **381**, which may be used in an analogous manner to the callee identifier field **177**, the caller identifier field **179**, the timeout field **181**, the timestamp field **182**, the local calling area identifier field **171**, the channel identifier field **175**, and the caller username field **183** respectively of the access code association table **170** illustrated in Figure **10**. The DID bank table records **370** may thus associate access codes with respective local calling area identifiers, callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps, although the caller identifier field **375**, timeout field **376**, timestamp field **377**, local calling area identifier field **378**, channel identifier field **379**, and caller username field **381** may not be necessary, and one or more of these fields may be omitted in some embodiments.

Furthermore, it will be appreciated that the callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may be omitted for DID table records that are not in respect of access codes, but rather are in respect of telephone numbers of users of the system, for example, as described in PCT Publication No. **2008/052340**. The callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may also be omitted in embodiments where the access code association table **170** includes records with these types of fields.

For simplicity, the following description is directed to embodiments wherein an access code association table **170** associates access codes with respective callee identifiers, caller identifiers, timeout values, and timestamp values. However, it will be appreciated that the processes described herein for records in the access code association table **170** may additionally or alternatively be applied to DID bank table records **370** in an analogous manner.

Access Code Generator

Referring back to Figures **1**, **4**, and **8** in the illustrated embodiment as described above, the access server **14** transmits (at block **196** illustrated in Figure **7**) an access code request message **110** to the routing controller **30** in order to obtain from the routing controller **30** an access code. When an access code request message **110** is received at the access server interface **242**, the processor **232** preferably authenticates the user by making various enquiries of databases to which it has access, to determine whether or not the password in the password field **114** of the access code request message **110** matches a password stored in the database in association with the username in the username field **112**. Various functions may be used to pass encryption keys or hash codes back and forth to ensure that the transmittal of passwords is secure. If the user is successfully authenticated, the processor **232** then preferably produces an access code.

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Referring to Figures **8** and **12**, a process for producing an access code is shown generally at **270**. Essentially the process **270** determines whether the access code in a given record (referred to below as the "currently addressed record") in the access code association table shown at **170** in Figure **10** is within the local calling area identified by the local calling area identifier store **245**, and whether the access code is currently available for association with a callee identifier. In order to produce an access code in response to receiving an access code request message (**110**) from the access server (**14**), the processor **232** of the routing controller (**30**) preferably searches the pool of access codes in the access code association table (**170**) to identify an access code identifying a channel usable by the mobile telephone (**12**) to initiate a call to the callee, using the process **270** until an available access code in the local calling area identified by the local calling area identifier store **245** is identified. The access code generator thus preferably selects an access code from the pool of access codes in the access code association table (**170**), and preferably selects an access code in a local calling area associated with the mobile telephone (**12**).

Starting with the first record in the access code association table, the process **270** begins at block **272**, which directs the processor **232** of the routing controller (**30**) to determine whether the access code in the currently addressed record of the access code association table **170** is associated with the same local calling area as the mobile telephone (**12**) as identified by the contents of the local calling area identifier store **245**. If at block **272** the access code of the currently addressed record is not associated with the same local calling area as the mobile telephone (**12**), the process **270** ends, the next record in the access code association table **170** is addressed, and the process is repeated for the next record in the access code association table.

However, if at block **272** the access code of the currently addressed record is associated with the same local calling area as the mobile telephone (**12**), or if the access code request message **110** (illustrated in Figure **4**) did not include

a local calling area identifier, then the process **270** continues at block **274**, which directs the processor **232** to determine whether the access code of the currently addressed record is associated with a callee identifier. To do this, the processor **232** determines whether the callee identifier field (**177**) of the currently addressed record stores a "null" value that was assigned to it on initialization, or whether the callee identifier field instead stores a callee identifier. In other words the processor checks to see whether the currently addressed record has already been in use.

If at block **274** the callee identifier field (**177**) of the currently addressed record in the access code association table (**170**) does store a callee identifier and not the "null" value that was assigned to the callee identifier field on initialization (for example, records **174** and **178** in Figure **10**), then the access code of that record is associated with a callee identifier, and the process **270** continues at block **278**, which directs the processor **232** to determine whether the association of the callee identifier with the access code has expired. In the illustrated embodiment, the codes at block **278** direct the processor **232** to determine whether the sum of the contents of the timestamp field (**182**) and of the timeout field (**181**) in the currently addressed record of the access code association table **170** (shown in Figure **10**) is less than the current time represented by the clock **244**. If at block **278** the sum of the timeout and timestamp fields in the currently addressed record of the access code association table **170** is less than the time represented by the clock **244**, then the association of the callee identifier with the access code is not expired and the process **270** ends, the next record in the access code association table (**170**) is addressed, and the process **270** is repeated for the next record in the access code association table.

However, if at block **278** the sum of the contents of the timeout and timestamp fields (**181** and **182**) in the currently addressed record of the access code association table (**170**) is not less than the time represented by the clock **244**, then the association of the callee identifier with the access code has expired, and the process **270** continues at block **276** which directs the processor **232**

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to store the contents of the access code field **173** of the currently addressed record in the access code store **250** of the temporary memory **240** of the routing controller **30**.

Referring to Figures **8, 10**, and **12**, if at block **274** the callee identifier field in the currently addressed record does not store a callee identifier but stores instead the "null" value that was assigned to the callee identifier field on initialization (for example, records **172**, **176**, and **180**), then the access code of that record is not associated with a callee identifier, and the process **270** continues at block **276**, which directs the processor **232** to store the access code from the access code field **173** of the currently addressed record, in the access code store **250** in the temporary memory **240**.

After the selected access code is stored in the access code store **250** at block **276**, the process **270** continues at block **280**, which directs the processor **232** to store the callee identifier from the callee identifier store **246** in the callee identifier field **177** of the currently addressed record, thereby creating an association of the callee identifier with the selected access code.

The process **270** then continues at block **282**, which directs the processor **232** to store the caller identifier from the caller identifier store **248** (which identifies the mobile telephone **12** shown in Figure **1**) in the caller identifier field **179** of the currently addressed record of the access code association table **170**, thereby also storing the caller identifier in association with the selected access code.

The process **270** then continues at block **283**, which directs the processor **232** to store the caller username from the caller username store **249** in the caller username field **183** of the currently addressed record of the access code association table **170**, thereby also storing the caller username in association with the selected access code.

The process **270** then continues at block **284**, which directs the processor **232** to store timeout and timestamp values in the timeout and timestamp fields **181** and **182** of the currently addressed record of the access code association table **170**, thus further storing, in association with the selected access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire. A default value, such as **10** minutes, for example may be stored in the timeout field **181** of the currently addressed record. Also, the current time indicated by the clock **244** is preferably stored in the timestamp field **182** of the currently addressed record.

In alternative embodiments, the access code association table (**170**) might not include fields for a caller identifier, caller username, a timeout, or a timestamp. In these embodiments, one or more of blocks **282**, **283**, and **284** described above are not necessary, and one or more of the caller identifier store **248** and the caller username store **249** may be omitted.

In summary, the access code generator in the illustrated embodiment responds to receiving an access code request message **110** illustrated in Figure **4** from the access server (**14**) by first authenticating the user, and then by searching through a pool of access codes, using the process **270** shown in Figure **12**, to identify an access code that is associated with the local calling area identified by the local calling area identifier store (**245**) and that is not previously and validly associated with another callee identifier. It will be appreciated that in alternative embodiments, different data structures and algorithms may be preferable for identifying an access code that meets the aforementioned criteria. For example, in accordance with conventional database design that is well-known in the art, the records illustrated in the access code association table **170** illustrated in Figure **10** may alternatively be organized in a binary tree according to the value in the local calling area identifier field **171**, or in separate tables for respective local calling area identifiers, for example, in order to enable a more efficient search of the access code association table for an access code that satisfies the aforementioned criteria. Therefore, the access code association table (**170**)

and the process **270** illustrated in Figure **12** are examples only, and one of ordinary skill in the art will readily appreciate numerous alternative data structures and algorithms.

Gateway

Referring to Figure **13**, in this embodiment, the gateway (**18**) includes a processor circuit shown generally at **300**, which includes a microprocessor **302**. The processor circuit **300** also includes a program memory **304**, a memory **305**, and an I/O port **306**, all of which are in communication with the microprocessor **302**. The processor circuit **300** may include multiple processors etc., and the aforementioned components of the processor circuit **300** may alternatively be combined.

The I/O port **306** includes a channel interface **308**, which, in the illustrated embodiment, is in communication with the channels **20**, **22**, and **24** that were also illustrated in Figure **1**. Where, as in the illustrated embodiment, the channels **20**, **22**, and **24** are PSTN telephone lines in the PSTN network **29**, the channel interface **308** may, for example, be a T**1** port for communication with one or more T**1** lines (illustrated at **27** in Figure **1**) of a PSTN service provider, in a manner well-known in the art. The I/O port in the illustrated embodiment also includes an internet interface **309** for interfacing with the IP network **26** illustrated in Figure **1**. The program memory **304** stores blocks of codes for directing the microprocessor **302** to carry out the functions of the gateway (**18**). It has been found that the AS**5350** Universal Gateway available from Cisco Systems, Inc. of San Jose, California may, for example, be suitable as the gateway (**18**).

Referring back to Figure **1**, and also still to Figure **13**, when a call is received on one of the channels **20**, **22**, or **24**, the microprocessor **302** causes the I/O port **306** to use the internet interface **309** to send a Session Initiation Protocol (SIP) Invite message to a pre-determined node with which the gateway **18** is associated, which in the illustrated embodiment is the first node **11**. Generally, the gateway **18** will be associated with a node that is geographically closest to

the gateway, in order to minimize transmission times over the IP network **26**. In response to the SIP Invite message, the call controller **13** sends an RC request message to the routing controller **30** which makes various enquiries of the database **23** to produce a routing message that is sent back to the call controller **13**. The call controller **13** then communicates with the media relay **28** to cause a communications link including an audio path (and a videopath if a videophone call) to be established through the media relay to the same node, a different node, or to a communications supplier gateway as shown generally at **34** to carry audio, and where applicable, video traffic to the call recipient or callee.

Referring to Figure **14**, an exemplary SIP Invite message is shown generally at **310** and includes a caller identifier field **312**, a callee identifier field **314**, a digest parameter field **315**, a call identifier field **316**, an IP address field **317**, and a gateway UDP port field **318**. Examples of values for the fields in the SIP Invite message **310** are shown for illustration purposes only in Figure **14**. The caller identifier in the caller identifier field **312** is preferably in the form of the telephone number of the caller followed by the "@" symbol, which in turn is followed by the IP address of the gateway (**18**) in the IP network (**26**). The caller identifier may be determined by retrieving calling line identification (CLID) information from the signal provided by the PSTN network (**29**) to the gateway (**18**) for example. Where the caller identification information is not available to the gateway (**18**), the caller identifier in the caller identifier field **312** preferably includes a pre-assigned number (such as **11111**, for example) indicating that the caller identification information was not available, followed by the "@" symbol and then by the IP address of the gateway (**18**).

The callee identifier in the callee identifier field **314** is the access code identifying the channel (**20**, **22**, or **24** in the example of Figure 1) on which the call was placed, and which was received from the access server (**14**). In the illustrated example, the access code is the PSTN telephone number **1-604-345-1212** corresponding to the channel **20** illustrated in Figure **1**, and to the

access code stored in the access code field **173** of the record **172** in the exemplary access code association table **170** illustrated in Figure **10**.

The digest parameter in the digest parameter field **315** is generated by the gateway (**18**) and may uniquely identify the SIP session that is initiated with the SIP Invite message **310**.

The call identifier in the call identifier field **316** is, in the illustrated embodiment, a four-digit hexadecimal number generated by the gateway (**18**) to identify the call, followed by the "@" symbol, which in turn is followed by the IP address of the gateway.

The IP address in the IP address field **317** is the IP address of the gateway (**18**) in the IP network (**26**), and the gateway UDP port number in the gateway UDP port field **318** includes a UDP port identifier identifying a UDP port at which the audio/video path will be terminated at the gateway (**18**).

It should be noted that throughout the description of the embodiments of this invention, the IP/UDP addresses of all elements such as the gateway (**18**) will be assumed to be valid IP/UDP addresses directly accessible via the Internet or a private IP network, for example, depending on the specific implementation of the system. As such, it will be assumed, for example, that the gateway (**18**) will have an IP/UDP address directly accessible by the call controllers and the media relays on their respective nodes, and those addresses will not be obscured by Network Address Translation (NAT) or similar mechanisms. In other words, the IP/UDP information contained in SIP messages (for example the SIP Invite message or the RC Request message which will be described below) will match the IP/UDP addresses of the IP packets carrying these SIP messages.

It will be appreciated that in many situations, the IP addresses assigned to various elements of the system may be in a private IP address space, and thus not directly accessible from other elements. Furthermore, it will also be

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appreciated that NAT is commonly used to share a "public" IP address between multiple devices, for example between home PCs and IP telephones sharing a single Internet connection. For example, the gateway (**18**) may be assigned an IP address such as **192.168.0.5**. This address is located in so called "non-routable" (IP) address space and cannot be accessed directly from the Internet. In order for this device to communicate with other computers located on the Internet, the IP address has to be converted into a "public" IP address, for example **24.14.102.5** assigned by the Internet Service Provider, by a device performing NAT, typically a router. In addition to translating the IP address, NAT typically also translates UDP port numbers, for example an audio path originating at the gateway (**18**) and using a UDP port **12378** at its private IP address, may have be translated to a UDP port **23465** associated with the public IP address of the NAT device. In other words, when a packet originating from the gateway (**18**) arrives at an Internet-based node, the source IP/UDP address contained in the IP packet header will be **24.14.102.5:23465**, whereas the source IP/UDP address information contained in the SIP message inside this IP packet will be **192.168.0.5:12378**. The mismatch in the IP/UDP addresses may cause a problem for SIP-based VoIP systems because, for example, a node will attempt to send messages to a private address but the messages will never get there.

Call Controller

Referring to Figure **15**, the call controller (**13**) includes a processor circuit shown generally at **320**. The processor circuit **320** includes a microprocessor **322**, program memory **324**, and an I/O port **326**. The program memory **324** and the I/O port **326** are in communication with the microprocessor **322**. The processor circuit **320** may include a plurality of microprocessors, a plurality of program memories, and a plurality of I/O ports to be able to handle a large volume of calls. However, for simplicity, the processor circuit **320** will be described as having only one microprocessor **322**, program memory **324**, and I/O port **326**, it being understood that there may be more.

Generally, the I/O port **326** includes an input **328** for receiving messages such as the SIP Invite message from the gateway (**18**) or from a VoIP telephone (**36** in Figure **1**, for example). The I/O port **326** also has an RC request message output **330** for transmitting an RC request message to the routing controller **30** of Figure **1**, an RC message input **332** for receiving routing messages from the routing controller **30**, a gateway output **334** for transmitting messages to the gateway **18** and/or **34** shown in Figure **1** to advise the gateway **18** and/or **34** to establish an audio path, for example, and a gateway input **336** for receiving messages from the gateway **18** and/or **34**. The I/O port **326** further includes a SIP output **338** for transmitting messages to the gateway (**18** and/or **34**) or VoIP telephone (**36**, for example) to advise the gateway **18** and/or **34** or IP telephone of the IP addresses of the gateways which will establish the audio/video path. The I/O port **326** further includes a voicemail server input and output **340** and **342** respectively for communicating with the voicemail server **19** shown in Figure **1**.

While certain inputs and outputs have been shown as separate, it will be appreciated that some may be a single IP address and IP port. For example, the messages sent to the routing controller (**30**) and received from the routing controller (**30**) may be transmitted and received on the same single IP port.

The program memory **324** includes blocks of code for directing the microprocessor **322** to carry out various functions of the call controller (**13**). For example, these blocks of code include a first block **344** for causing the processor circuit **320** to execute a SIP Invite to RC Request process to produce an RC Request Message in response to a received SIP Invite message. In addition, there is a Routing Message to Gateway message block **346** which causes the processor circuit **320** of the call controller to produce a gateway query message in response to a received routing message from the routing controller (**30**).

Referring to Figures **15** and **16**, the SIP Invite to RC Request process is shown in more detail at **344**. On receipt of a SIP Invite message of the type

shown in Figure **14**, block **350** directs the processor circuit **320** to produce an RC Request Message. Block **352** then directs the processor circuit **320** to cause the RC Request Message to be sent to the routing controller **30** illustrated in Figure **1**.

Referring to Figure **17**, an exemplary RC request message is shown generally at **360** and includes a caller identifier field **362**, a callee identifier field **364**, a digest parameters field **366**, and a call identifier field **368**. These fields may be populated with the contents of the caller identifier field **312**, callee identifier field **314**, digest parameter field **315**, and call identifier field **316** respectively of the SIP Invite message **310** illustrated in Figure **14**. In other embodiments, the RC request message may further include a type field (not shown) containing a type code to indicate whether the call is from a third party or from a system subscriber. Other variations of an RC request message are explained in PCT Publication No. WO **2008/052340**. A type field (not shown) in the RC request message **360** may be advantageous in embodiments where SIP Invite messages may also be received from an IP telephone that is using VoIP software to make a voice call. However, in the embodiments that are illustrated herein, SIP Invite messages originate from the gateway (**18**), and therefore a type designation is not necessary and may be omitted from the RC request message **360**. In embodiments where a SIP Invite message may be received from an IP telephone, the SIP invite to RC request process shown in Figure **16** may require additional steps, as illustrated in Figure **5** of PCT Publication No. WO **2008/052340**.

RC Request Message Handler

As illustrated in Figure **8**, the program memory **234** includes an RC request message handler **380** which directs the routing controller (**30**) to produce a routing message in response to a received RC request message (**360**). Referring to Figure **18A**, the RC request message handler **380** begins with a first block **382** that directs the RC processor circuit (**230**) to separately store the contents of the callee identifier field **364** and caller identifier field **362** of

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the RC request message (**360**) in the callee identifier store **246** and the caller identifier store **248** respectively of Figure **8**.

Block **384** then directs the RC processor circuit (**230**) to use the contents of the caller username store **249** to locate and retrieve from the database (**23**) a dialing profile **200** associated with the caller, as described above and illustrated in Figure **9**, for example. The retrieved dialing profile may then be stored in the temporary memory **240**, for example.

The RC request message handler **380** continues at block **386**, which directs the processor circuit (**230**) of the routing controller to determine whether the contents of the current number of concurrent calls field **222** of the dialing profile **200** shown in Figure **9** are less than the contents of the maximum number of concurrent calls field **220** of the dialing profile for the caller and, if so, block **388** directs the processor circuit to increment the contents of the current number of concurrent calls field **222** and the processor circuit (**230**) is directed to point A in Figure **18**B. If the contents of the current number of concurrent calls field **222** are equal to or greater than the contents of the maximum number of concurrent calls field **220**, then block **390** directs the processor circuit (**230**) to send an error message back to the call controller (**13**) to cause the call controller to notify the caller that the maximum number of concurrent calls has been reached and no further calls can exist concurrently, including the presently requested call.

Assuming that block **386** allows the call to proceed, the RC processor circuit (**230**) is directed to perform certain checks on the callee identifier in the callee identifier field **246** in Figure **8**. These checks are shown in greater detail in Figure **18**B.

Referring to Figure **18**B, the RC processor circuit (**230**) is directed to a first block **392** that causes it to determine whether a digit pattern of the callee identifier includes a pattern that matches the contents of the international dialing digits (IDD) field **208** in the dialing profile **200** (shown in Figure **9**)

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associated with the caller. If so, then block **394** directs the RC processor circuit (**230**) to set a call type code identifier variable maintained by the processor to indicate that the call is an international call, and block **396** directs the processor to produce a reformatted callee identifier by reformatting the callee identifier into a predefined digit format. In this embodiment, this is done by removing the pattern of digits matching the IDD field contents (**208**) of the caller dialing profile **200** to effectively shorten the callee identifier. Then, block **398** directs the RC processor circuit (**230**) to determine whether or not the callee identifier has a length which meets criteria establishing it as a number compliant with the E.**164** Standard set by the ITU. If the length does not meet these criteria, then block **400** directs RC processor circuit (**230**) to send back to the call controller (**13**) a message indicating the length is not correct. The process **380** is then ended. At the call controller **13**, routines (not shown) stored in the program memory **324** may direct the processor circuit (**320** of Figure **15**) to respond to the incorrect length message by transmitting a message back to the mobile telephone (**12** shown in Figure **1**) to indicate that an invalid number has been dialled.

If the length of the amended callee identifier meets the criteria set forth at block **398**, then block **402** directs the RC processor circuit (**230**) to make a database request to the database (**23**) to determine whether or not the amended callee identifier is found in the DID field (**373**) of a record such as shown in Figure **11** in the DID bank table. If at block **402** the RC processor circuit (**230**) receives a response from the database (**23**) indicating that the reformatted callee identifier produced at block **396** is found in the DID field (**373**) of a record in the DID bank table, then the callee is a subscriber to the system and the call is classified as a private network call by directing the processor to block **404**, which directs the RC processor circuit (**230**) to copy the contents of the corresponding username field (**371** in Figure **11**) from the callee DID bank table record (**370** in Figure **11**) into the callee identifier store (**246** in Figure **8**). Thus, the RC processor circuit (**230**) locates a subscriber username associated with the reformatted callee identifier. The processor (**232**) is then directed to point B in Figure **18**A.

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Calls to Subscribers in Different Nodes

Referring back to Figure **1**, as noted above, the gateway **18** is preferably associated with a pre-determined node, which in the illustrated embodiment is the first node **11**. Referring back to Figure **18**A, block **406** directs the processor (**232** of Figure **8**) to execute a process to determine whether or not the node associated with the reformatted callee identifier in the callee identifier store (**246** in Figure **8**, which, at block **404**, was set to be a username of the callee) is the same node that is associated with the gateway **18** illustrated in Figure **1**.

To do this, the processor (**232**) may, for example, identify a node associated with the gateway (**18**) by using an IP address associated with the gateway to determine a node identifier of the gateway. An IP address associated with the gateway (**18**) may, for example, be obtained from either the caller identifier field **362** or the call identifier field **368** of the RC request message **360** illustrated in Figure **17**, as each of these fields includes a portion following an "@" symbol that indicates an IP address of the gateway. In order to determine a node identifier associated with the gateway (**18**) using the IP address associated with gateway (**18**), the processor **232** (illustrated in Figure **8**) may access a gateway node association table stored in the database **23** (illustrated in Figure **1**).

Referring to Figure **19**, an exemplary gateway node association table is shown generally at **480**. The exemplary gateway node association table **480** includes first and second records **482** and **484**, each having a respective gateway IP address field **486** and a respective node identifier field **488**. It will be appreciated that the exemplary gateway node association table **480** is an example for illustration purposes only. The values in the gateway IP address fields **486** are preferably initialized when a gateway (such as the gateway **18** illustrated in Figure **1**) is installed as part of the system (**10**), and are preferably updated as the IP addresses of the respective gateways may change from time to time. The values in the node identifier fields **488** are also

preferably initialized when a gateway (such as the gateway **18** illustrated in Figure **1**) is installed as part of the system (**10**).

As indicated above, the reformatted callee identifier in the callee identifier store (**246** in Figure **8**) was set at block **404** in Figure **18**B to be a username of the callee from the username field **371** (illustrated in Figure **11**), and in this embodiment, a prefix of the username of the callee preferably indicates a node associated with the callee. In the illustrated embodiment, the left-most digit in the username of the callee is a continent code, which is a sufficient prefix to identify a node associated with the callee. However, it will be appreciated that in other embodiments, other prefixes or other information may identify the associated node. Preferably, the values in the node identifier fields **488** correspond to the prefixes of the usernames in the username fields **371** (illustrated in Figure **11**), so that the node associated with the callee is the same node that is associated with the gateway **18** illustrated in Figure **1** if the prefix of the username of the callee matches the node identifier associated with the gateway (**18**). Therefore, in the illustrated embodiment, if the reformatted callee identifier in the callee identifier store (**246** in Figure **8**) is **2001 1050 8667**, for example, then in the example of Figure **19**, the node associated with the callee is the same node as the node identified by the continent code "**2**" that is associated with the gateway associated with the IP address **20.14.102.5** in the record **482**, but is not the same node as the node identified by the continent code "**5**" that is associated with the gateway associated with the IP address **104.12.131.12** in the record **484**.

Referring back to Figure **18**A, if at block **406** the prefix of the username of the callee does not match the node identifier associated with the gateway (**18**), then the call is a "cross-domain" call, and block **408** in Figure **18**A directs the processor (**232** in Figure **8**) to set a call type flag in the temporary memory (**240** in Figure **8**) to indicate the call is a cross-domain call. Then, block **410** of Figure **18**A directs the processor (**232** of Figure **8**) to produce a routing message identifying an address on the private network with which the callee identified by the contents of the callee ID buffer is associated and to set a time

to live for the call at a maximum value of **99999**, for example. Routing messages and time to live values, and also a method of determining the node in the system with which the callee is associated, are further described in PCT Publication No. WO **2008/052340**. Once a routing message is produced at block **410**, block **412** directs the processor (**232** in Figure **8**) to cause the routing message to be sent to the call controller **13** shown in Figure **1**, and the process ends.

Referring back to Figure **18B**, if at block **392**, the callee identifier stored in the callee identifier store (**246** in Figure **8**) does not begin with an international dialing digit, then block **414** directs the processor (**232**) to determine whether or not the callee identifier begins with the same national dial digit code as assigned to the caller. To do this, the processor (**232**) is directed to refer to the retrieved caller dialing profile as shown in Figure **9**. In Figure **9**, the national dialing digit code **206** is the number **1**. Thus, if the callee identifier begins with the number **1**, then the processor (**232**) is directed to block **416** in Figure **18B**.

Block **416** directs the processor (**232** of Figure **8**) to examine the callee identifier to determine whether or not the digits following the NDD digit identify an area code that is the same as any of the area codes identified in the local area codes field **212** of the caller dialing profile **200** shown in Figure **9**. If not, block **418** of Figure **18B** directs the processor (**232**) to set the call type flag to indicate that the call is a national call. If the digits following the NDD digit identify an area code that is the same as a local area code associated with the caller as indicated by the caller dialing profile, block **420** directs the processor (**232**) to set the call type flag to indicate a local call, national style. After executing block **418** or **420**, block **422** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a re-formatted callee identifier by removing the national dialled digit and prepending a caller country code identified by the country code field **210** of the caller dialing profile shown in Figure **9**. The processor (**232**) is then

directed to block **398** of Figure **18B** to perform other processing as already described above.

If at block **414**, the callee identifier does not begin with a national dialled digit, block **424** directs the processor (**232**) to determine whether the callee identifier begins with digits that identify the same area code as the caller. Again, the reference for this is the retrieved caller dialing profile shown in Figure **9**. The processor (**232**) determines whether or not the first few digits of the callee identifier identify an area code corresponding to the contents of any area code identifier stored in the local area code field **212** of the retrieved caller dialing profile **200** (illustrated in Figure **9**). If so, then block **426** directs the processor (**232**) to set the call type flag to indicate that the call is a local call. It should be noted that the call will not necessarily be a local call in every case where the first few digits of the callee identifier identify an area code corresponding to the contents of an area code identifier stored in the local area code field **212** (illustrated in Figure **9**), and other determinations of when a call is to be considered local may be appropriate. However, it has been found that the determination described above for block **424** is satisfactory for some purposes. Next, block **428** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a reformatted callee identifier by prepending the caller country code to the callee identifier, the caller country code being determined from the country code field **210** of the retrieved caller dialing profile **200** shown in Figure **9**. The processor (**232**) is then directed to block **398** for further processing as described above.

If at block **424**, the callee identifier does not start with the same area code as the caller, block **430** directs the processor (**232** of Figure **8**) to determine whether the number of digits in the callee identifier, *i.e.* the length of the callee identifier, is within the range of digits indicated by the caller minimum local number length field **214** and the caller maximum local number length field **216** of the retrieved caller dialing profile **200** shown in Figure **9**, and whether there is more than one area code identifier stored in the local area code field **212** of the retrieved caller dialing profile. If the number of digits in the callee identifier

is within the aforementioned range and there is only one area code identifier stored in the local area code field (**212**), then block **432** directs the processor (**232**) to set the call type flag to indicate a local call and block **434** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a reformatted callee identifier by prepending to the callee identifier the caller country code (as indicated by the country code field **210** of the retrieved caller dialing profile **200** shown in Figure **9**) followed by the caller area code as indicated by the local area code stored in the local area code field **212** of the caller dialing profile **200** shown in Figure **9**. The processor (**232**) is then directed to block **398** of Figure **18**B for further processing as described above.

If at block **430**, the callee identifier has a length that does not fall within the range specified by the caller minimum local number length field (**214** in Figure **9**) and the caller maximum local number length field (**216** in Figure **9**), or if there is more than one area code identifier stored in the local area code field **212** of the retrieved caller dialing profile **200** illustrated in Figure **9**, then block **436** directs the processor (**232**) to send an error message back to the call controller (**13**), and the process ends.

In alternative embodiments, such as those illustrated in PCT Publication No. WO **2008/052340**, an additional block (**402** in Figure **8**B of PCT Publication No. WO **2008/052340**) may determine whether the callee identifier is a valid username. However, in the embodiment disclosed herein, the callee identifier is assumed to be a telephone number of the callee, and not a username.

From Figure **18**B, it will be appreciated that there are certain groups of blocks of codes that direct the processor **232** in Figure **8** to determine whether the callee identifier has certain features such as an international dialing digit, a national dialing digit, an area code and a length that meet certain criteria, and cause the processor **232** to reformat the callee identifier stored in the callee identifier store **246** in Figure **8**, as necessary into a predetermined target format including only a country code, area code, and a normal telephone number, for example, to cause the callee identifier to be compatible with the

E.**164** number plan standard in this embodiment. This enables block **402** in Figure **18**B to have a consistent format of callee identifiers for use in searching through the DID bank table records **370** of the type shown in Figure **11** to determine how to route calls to subscribers on the same system. Effectively, therefore blocks **392**, **414**, **424**, and **430** establish call classification criteria for classifying the call as a public network call or a private network call. Block **402** classifies the call, depending on whether or not the formatted callee identifier has a DID bank table record, and this depends on how the call classification criteria are met.

Calls to Non-Subscribers

Not all calls will be to subscribers, and this will be detected by the processor **232** of Figure **8** when it executes block **402** in Figure **18**B, and does not find a DID bank table record (**370** illustrated in Figure **11**) that is associated with the callee, in the DID bank table. When this occurs, the call is classified as a public network call, by directing the processor (**232**) to point C in Figure **18**C.

Referring to Figure **18**C, block **438** directs the processor (**232**) to determine whether the formatted callee identifier in the callee identifier store **246** in Figure **8** corresponds to an access code in the access code field **173** of a record in the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier. Because the callee identifier in the callee identifier store **246** in Figure **8** has been formatted as described above with reference to Figure **18**B, block **438** may involve determining whether an access code in the access code field **173** of a record of the access code association table **170** (illustrated in Figure **10**) matches the formatted callee identifier in the callee identifier store **246** in Figure **8**, and also whether a callee identifier (as opposed to the "null" value assigned on initialization) is stored in the callee identifier field **177** in association with the access code. As noted above, for simplicity, this description is directed to embodiments wherein an access code association table **170** associates access codes with respective callee identifiers, caller identifiers, timeout values, and timestamp values, although it will be appreciated that the processes described herein for

records in the access code association table **170** may additionally or alternatively be applied to DID bank table records **370** in an analogous manner.

If at block **438** the formatted callee identifier in the callee identifier store **246** in Figure **8** is the same as an access code in the access code field (**173**) of a record of the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier, then block **440** directs the processor (**232**) to determine whether the caller identifier in the caller identifier store **248** (illustrated in Figure **8**) is the same as the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**), and thus whether the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**) identifies the mobile telephone identified by the caller identifier in the caller identifier store **248**. If not, then block **442** directs the processor (**232**) to send an error message to the call controller (**13**), and the process ends.

But if at block **440** the caller identifier in the caller identifier store **248** (illustrated in Figure **8**) corresponds to the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**), then the routing controller (**30**) will produce a routing message that will cause the call controller to establish communication through the IP network (**26**) to the callee in response to a call received at a channel (**20**, **22**, or **24**). Preferably, block **444** includes codes that direct the processor (**232**) to determine whether the association of the access code with the callee identifier has expired, and thus whether the usability of the access code to initiate a call to the callee has expired, in the manner described above for block **278** in Figure **12**. If at block **444** the association of the access code with the callee identifier has expired, then block **442** directs the processor (**232**) to send an error message to the call controller (**13**), and the process ends. Thus the routing controller produces a routing message that causes the call controller to establish the call only when the association of the access code with the callee identifier has not expired.

It will be appreciated that in alternative embodiments, one or more of the caller identifier, timeout, and timestamp fields **179**, **181**, and **182** may be omitted from the access code association table **170** illustrated in Figure **10**, and in these embodiments, one or more of the blocks **440**, **442**, and **444** may also be omitted.

If at block **444** the association of the access code with the callee identifier has not expired, or if one or both of blocks **440** and **444** is omitted, then block **446** directs the processor (**232**) to store the callee identifier from the callee identifier field **177** of the record of the access code association table (**170**) in the callee identifier store **246** illustrated in Figure **8**. The processor (**232**) is then directed to point A in Figure **18**B to repeat the steps illustrated in Figure **18**B using the callee identifier retrieved from the callee identifier field (**177**) in the record of the access code association table (**170**).

However, if at block **438** the formatted callee identifier in the callee identifier store **246** in Figure **8** does not correspond to an access code in a record of the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier, then block **448** of Figure **18**B causes the processor (**232**) to set the contents of the callee identifier store **246** of Figure **8** to be the newly formatted callee identifier, i.e., a number compatible with the E.**164** standard. Then, block **450** of Figure **18**B directs the processor (**232**) to generate a routing message identifying a gateway to the public network usable by the call controller (**13**) to establish a "public system" call. In one embodiment, block **450** includes codes that, for example, direct the processor (**232**) to search a database of route or master list records and to search a database of supplier records to identify at least one supplier operable to supply a communications link for the call, and to load a routing message buffer with supplier information, time to live values, and timeout values. An example of an implementation of these steps is described with reference to blocks **410**, **412**, **560**, **562**, **563**, **564**, **566**, and **571** in Figures **8**B and **8**D in PCT Publication No. WO **2008/052340**. Next, block **452** directs the processor

232 of Figure **10** to send the routing message to the call controller **13** in Figure **1**, and the process ends.

Calls to Subscribers Within the Same Node

Referring back to Figure **18**A, if at block **406**, the prefix of the username of the callee matches the node identifier associated with the gateway (**18**), then the call is on one domain, and block **454** directs the processor (**232**) to use the callee identifier in the callee identifier store **246** illustrated in Figure **8** (which, at block **404**, was set to be a username of the callee) to locate and retrieve a dialing profile for the callee. The dialing profile may be of the type shown in Figure **9**, for example. Block **456** of Figure **18**A then directs the processor **232** of Figure **8** to get call block, call forward, and voicemail records from the database **23** of Figure **1**, based on the username identified in the callee dialing profile retrieved by the processor at block **454**. Exemplary call block, call forward, and voicemail records are described in PCT Publication No. WO **2008/052340**.

Then block **458** directs the processor **232** of Figure **8** to determine whether or not the caller identifier received in the RC request message matches a block pattern stored in the call block record associated with the callee and retrieved at block **454**. If the caller identifier matches a block pattern, then block **460** directs the processor to send a drop call or non-completion message to the call controller (**13**) and the process is ended. If the caller identifier does not match a block pattern associated with the callee, then block **462** directs the processor (**232**) to determine whether or not call forwarding is required, as described in PCT Publication No. WO **2008/052340**.

If at block **462**, the call forwarding record for the callee indicates that no call forwarding is required, then the processor (**232**) is directed to block **464**, which directs the processor (**232**) to generate a routing message identifying an address on the private network, associated with the callee for a "private system" call. In one embodiment, block **464** includes codes that, for example, direct the processor (**232**) to store, in a routing message buffer, a username

and domain of the callee, time to live values, and an IP address of the current node, to determine whether or not the user identified by the callee identifier has paid for voicemail service and if so, to store voicemail information in the routing message buffer. An example of an implementation of these steps is described with reference to blocks **609**, **620**, **640**, **642**, and **644** in Figures **8**A and **8**C in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference. Next, block **466** directs the processor **232** of Figure **8** to cause the routing message to be sent to the call controller **13** in Figure **1**, and the process ends.

But if at block **462**, the call forwarding record for the callee indicates that call forwarding is required, then block **468** directs the processor (**232**) to search a dialing profile table to find a dialing profile record as shown in Figure **9**, for the user identified by the destination number field of the call forward record, as illustrated in PCT Publication No. WO **2008/052340**. The processor (**232**) is further directed to store the username and domain for that user and a time to live value in a routing message buffer, an example of which is described in PCT Publication No. WO **2008/052340**. This process is repeated for each call forwarding record associated with the callee identified by the callee identifier store **246** in Figure **8** to add to the routing message buffer all call forwarding usernames and domains associated with the callee.

Referring to Figures **1**, **18**A, and **18**C, the routing message sent at one of blocks **412**, **452**, and **466** is received at the call controller **13** and the call controller interprets the receipt of the routing message as a request to establish a call. Referring to Figure **15**, the program memory **324** of the call controller **13** includes a routing to gateway routine depicted generally at **346**.

Where a routing message received at the call controller **13** is of the type produced at block **464** shown in Figure **18**A, indicating that the callee is a system subscriber on the same node as the gateway (**18**) (such as a user of the VoIP telephone **36** illustrated in Figure **1**), the routing to gateway routine **346** may direct the microprocessor **322** to cause a message to be sent back

through the IP network **26** shown in Figure **1** to the VoIP telephone (**36**), using the IP address of the VoIP telephone (**36**) that is available from the callee username.

Alternatively, if the routing message received at the call controller **13** is of the type produced at block **410** shown in Figure **18**A, identifying a domain associated with another node in the system, the call controller **13** may send a SIP invite message along the high speed/high data throughput link **17** in communication with the other node. The other node may function as explained above and in PCT Publication No. WO **2008/052340**, in response to receipt of a SIP invite message.

If the routing message received at the call controller **13** is of the type produced at block **450** shown in Figure **18**C, indicating that the callee is not a subscriber to the system (such as a user of the PSTN telephone **32** that is in communication with the IP network **26** through the gateway **34** as illustrated in Figure **1**), the call controller sends one or more SIP invite messages to the suppliers identified in the routing message to identify the IP address of a supplier that is able to carry the call, such as the IP address of the gateway **34** illustrated in the example of Figure **1**. A process for identifying the IP address of a supplier that is able to carry the call is given in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference. In some cases, the gateway of the supplier that is able to carry the call will be the gateway **18** illustrated in Figure **1**, that is, the same gateway through which the caller telephone (**12**) initiated the call. For simplicity, the following description assumes that the gateways **18** and **34** are distinct gateways. It will be understood that in some cases, they may be the same gateway, but in these cases, the following steps may still be applied.

Referring to Figure **1**, the IP address of the gateway **34** is sent in a message from the call controller **13** to the media relay **28**, which responds with a message indicating an IP address to which the gateway **18** should send its audio/video traffic, and an IP address to which the gateway **34** should send its

audio/video for the call. The call controller conveys the IP address at which the media relay **28** expects to receive audio/video from the gateways **18** and **34**, to the gateways **18** and **34** in one or more messages. The gateway **18** replies to the call controller **13** with an IP address at which it would like to receive audio/video, and the call controller conveys that IP address to the media relay **28**. The call may then be conducted between the caller and callee through the media relay **28** and the gateways **18** and **34**.

If the call controller **13** receives a routing message of the type produced at block **464** shown in Figure **18**A, indicating that the callee is a system subscriber on the same node as the gateway (**18**) (such as a user of the VoIP telephone **36** illustrated in Figure **1**), and which has at least one call forwarding number and/or a voicemail number, the call controller attempts to establish a call to the callee VoIP telephone **36** by seeking from the callee telephone a message indicating an IP address to which the media relay **28** should send audio/video. If no such message is received from the callee telephone, no call is established. If no call is established within a pre-determined time, the call controller **13** attempts to establish a call with the next user identified in the call routing message in the same manner. This process is repeated until all call forwarding possibilities have been exhausted, in which case the call controller communicates with the voicemail server **19** identified in the routing message to obtain an IP address to which the media relay **28** should send audio/video and the remainder of the process mentioned above for establishing IP addresses at the media relay and the caller telephone is carried out to establish audio/video paths to allowing the caller to leave a voicemail message with the voicemail server.

When an audio/video path through the media relay **28** is established, a call timer maintained by the call controller **13** preferably logs the start date and time of the call and logs the call ID and an identification of the route (i.e., audio/video path IP address) for later use in billing.

Terminating the Call

Referring back to Figure **1**, in the event that the caller terminates a call, the gateway **18** sends a SIP bye message to the call controller **13**. Similarly, in the event that the callee terminates the call, the gateway **34** or the VoIP telephone **36** of the callee sends a SIP bye message to the call controller **13**. Exemplary SIP bye messages are described in PCT Publication No. WO **2008/052340**. The SIP bye message is received at the call controller **13**, and the call controller executes a process that involves decrementing the contents of the current number of concurrent calls field **222** dialing profile **200** of the caller as illustrated in Figure **9**, generating an RC call stop message (not shown), sending the RC call stop message to the routing controller **30**, and sending a "bye" message to the party that did not terminate the call. An exemplary RC call stop message, and an example of how these steps may be implemented, are described in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference.

When the routing controller **30** receives the RC call stop message from the call controller **13**, the routing controller executes an RC call stop message process that involves making various updates to subscriber, reseller, and supplier account records (not shown) following the call. Examples of subscriber, reseller, and supplier account records, and of updates to subscriber, reseller, and supplier account records, are described in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference.

While specific embodiments of the invention have been described and illustrated, such embodiments should be considered illustrative of the invention only and not as limiting the invention.

What is claimed is:

1. A method of initiating a call to a callee using a mobile telephone, the method comprising:

receiving, from a user of the mobile telephone, a callee identifier associated with the callee;

transmitting an access code request message to an access server, said access code request message including said callee identifier;

receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiating a call with the mobile telephone using said access code to identify the callee.

2. The method of claim **1** wherein transmitting comprises transmitting said access code request message to said access server on a non-voice network.

3. The method of claim **1** wherein transmitting comprises transmitting a location identifier of a location associated with the mobile telephone to said access server.

4. The method of claim **3** wherein transmitting said location identifier comprises transmitting an IP address of the mobile telephone in a wireless IP network.

5. The method of claim **3** wherein transmitting said location identifier comprises transmitting an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

6. The method of claim **3** wherein transmitting said location identifier comprises transmitting a user-configured identifier of a location associated with the mobile telephone.

7. The method of claim **1** wherein receiving said access code reply message comprises receiving said access code reply message from said access server on a non-voice network.

8. The method of claim **1** wherein receiving said access code reply message comprises receiving, in said access code reply message, said access code temporarily associated with said callee identifier.

9. The method of claim **1** wherein receiving said access code reply message comprises receiving, in said access code reply message, a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

10. The method of claim **9** wherein initiating said call comprises engaging a routing controller to route said call on said IP network to the callee.

11. The method of any one of claims **1** to **10** further comprising:

receiving from the mobile telephone said access code request message;

communicating with a routing controller to obtain from the routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to

cause the routing controller to establish a call to the callee using the channel; and

transmitting said access code reply message to the mobile telephone.

12. A mobile telephone apparatus comprising:

means for receiving, from a user of the mobile telephone, a callee identifier associated with the callee;

transmitting means for transmitting an access code request message to an access server, said access code request message including said callee identifier;

means for receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

means for initiating a call using said access code to identify the callee.

13. The mobile telephone apparatus of claim **12** wherein said transmitting means comprises a non-voice network interface for transmitting said access code request message to said access server on a non-voice network.

14. The mobile telephone apparatus of claim **12** wherein said access code request message further includes a location identifier of a location associated with the mobile telephone.

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15. The mobile telephone apparatus of claim **14** wherein said location identifier comprises an IP address of the mobile telephone in a wireless IP network.

16. The mobile telephone apparatus of claim **14** wherein said location identifier comprises an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

17. The mobile telephone apparatus of claim **14** wherein said location identifier comprises a user-configured identifier of a location associated with the mobile telephone.

18. The mobile telephone apparatus of claim **12** wherein said means for receiving an access code reply message comprises a non-voice network interface for receiving said access code reply message on a non-voice network.

19. The mobile telephone apparatus of claim **12** wherein said access code includes a telephone number.

20. The mobile telephone apparatus of claim **12** wherein said means for initiating comprises a mobile telephone network interface.

21. A system for initiating a call to a callee, the system comprising:

the mobile telephone apparatus of any one of claims **12** – **20**, and further comprising;

a routing controller; and

an access server comprising:

T-Mobile Exhibit 1002
Part 1 of 6

means for receiving from the mobile telephone said access code request message;

means for communicating with said routing controller to obtain from said routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and

means for transmitting said access code reply message including said access code to the mobile telephone.

22. A mobile telephone apparatus comprising:

a processor circuit;

a network interface in communication with said processor circuit; and

a computer readable medium in communication with said processor circuit and encoded with codes for directing said processor circuit to:

receive, from a user of the mobile telephone, a callee identifier associated with the callee;

cause an access code request message to be transmitted to an access server, said access code request message including said callee identifier;

receive an access code reply message from the access server in response to said access code request message,

said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiate a call using said access code to identify the callee.

23. The mobile telephone apparatus of claim **22** wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to cause said access code request message to be transmitted include codes for directing said processor circuit to cause said access code request message to be transmitted to said access server using said non-voice network interface on a non-voice network.

24. The mobile telephone apparatus of claim **22** wherein said access code request message further includes a location identifier of a location associated with the mobile telephone.

25. The mobile telephone apparatus of claim **24** wherein said location identifier comprises an IP address of the mobile telephone in a wireless IP network.

26. The mobile telephone apparatus of claim **24** wherein said location identifier comprises an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

27. The mobile telephone apparatus of claim **24** wherein said location identifier comprises a user-configured identifier of a location associated with the mobile telephone.

28. The mobile telephone apparatus of claim **22** wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to receive an access code

reply message include codes for directing said processor circuit to cause said access code reply message to be received from said access server using said non-voice network interface on a non-voice network.

29. The mobile telephone apparatus of claim **22** wherein said access code includes a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

30. The mobile telephone apparatus of claim **22** wherein said network interface comprises a mobile telephone network interface, and wherein said codes for directing said processor circuit to initiate include codes for directing said processor circuit to cause a call to be initiated using said mobile telephone network interface on a mobile telephone network.

31. A system for initiating a call to a callee, the system comprising:

the mobile telephone of any one of claims **22** – **30**, and further comprising;

a routing controller; and

an access server comprising a processor circuit and a computer readable medium in communication with the processor circuit, the computer readable medium encoded with codes for directing said processor circuit to:

receive from the mobile telephone said access code request message;

communicate with said routing controller to obtain from said routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and

transmit said access code reply message to the mobile telephone.

32. A computer readable medium encoded with codes for directing a processor circuit to initiate a call to a callee using a mobile telephone, said codes being operable to direct the processor circuit to:

receive, from a user of a mobile telephone, a callee identifier associated with a callee;

transmit an access code request message to an access server, said access code request message including said callee identifier;

receive an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiate a call using said access code to identify the callee.

33. A method for enabling a mobile telephone to initiate a call to a callee through a channel, the method comprising:

receiving from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicating with a routing controller to obtain from the routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

transmitting an access code reply message including said access code to the mobile telephone.

34. The method of claim **33** wherein receiving comprises receiving said access code request message on a non-voice network.

35. The method of claim **33** further comprising causing the routing controller to produce said access code.

36. The method of claim **35** wherein producing comprises selecting said access code from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

37. The method of claim **36** further comprising determining a local calling area associated with the mobile telephone.

38. The method of claim **37** wherein determining comprises accessing a dialing profile associated with the caller, said dialing profile including a location field having contents identifying at least a default location of the caller.

39. The method of claim **37** wherein determining comprises receiving an IP address of the mobile telephone in a wireless IP network.

40. The method of claim **37** wherein determining comprises receiving an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

41. The method of claim **37** wherein determining comprises receiving a user-configured identifier of a location associated with the mobile telephone.

42. The method of claim **37** wherein selecting comprises selecting an access code in said local calling area associated with the mobile telephone.

43. The method of claim **36** wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

44. The method of claim **43** further comprising causing said routing controller to establish communication through said IP network in response to a call received on said channel.

45. The method of claim **44** wherein producing further comprises storing a caller identifier associated with the mobile telephone in association with said access code.

46. The method of claim **45** wherein causing said routing controller to establish communication comprises causing said routing controller to establish communication only if said caller identifier associated with said access code identifies the mobile telephone.

47. The method of claim **36** wherein producing further comprises storing said callee identifier in association with said access code.

48. The method of claim **47** wherein producing further comprises searching said pool of access codes for an access code associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

49. The method of claim **35** wherein producing further comprises storing, in association with said access code, a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire.

50. The method of claim **49** wherein causing said routing controller to establish communication comprises causing said routing controller to establish communication only if the usability of said access code to initiate a call to the callee has not expired.

51. The method of claim **33** wherein transmitting comprises transmitting said access code reply message on a non-voice network.

52. A system for enabling a mobile telephone to initiate a call to a callee through a channel, the system comprising:

means for receiving from the mobile telephone an access code request message including a callee identifier associated with the callee;

means for communicating with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

means for transmitting an access code reply message including said access code to the mobile telephone.

53. The system of claim **52** wherein said means for receiving comprises a non-voice network interface for receiving said access code request message on a non-voice network.

54. The system of claim **52** further comprising means for producing said access code.

55. The system of claim **54** wherein said means for producing comprises a processor circuit operably configured to select said access code from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

56. The system of claim **55** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone.

57. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using a dialing profile associated with the caller, said dialing profile including a location field having contents identifying at least a default location of the caller.

58. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using an IP address of the mobile telephone in a wireless IP network.

59. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

60. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using a user-configured identifier of a location associated with the mobile telephone.

61. The system of claim **56** wherein said processor circuit is operably configured to select an access code in said local calling area associated with the mobile telephone.

62. The system of claim **55** wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

63. The system of claim **62** wherein said processor circuit is operably configured to establish communication through said IP network in response to a call received on said channel.

64. The system of claim **63** wherein said processor circuit is operably configured to store a caller identifier associated with the mobile telephone in association with said access code.

65. The system of claim **64** wherein said processor circuit is operably configured to cause said routing controller to establish communication only if said caller identifier associated with said access code identifies the mobile telephone.

66. The system of claim **55** wherein said processor circuit is operably configured to store said callee identifier in association with said access code.

67. The system of claim **66** wherein said processor circuit is operably configured to search said pool of access codes for an access code

associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

68. The system of claim **54** wherein said processor circuit is operably configured to store, in association with said access code, a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire.

69. The system of claim **68** wherein said processor circuit is operably configured to establish communication only if the usability of said access code to initiate a call to the callee has not expired.

70. The system of claim **52** wherein said means for transmitting comprises a non-voice network interface for transmitting said access code reply message on a non-voice network.

71. A system for enabling a mobile telephone to initiate a call to a callee through a channel, the system comprising:

a processor circuit;

a network interface in communication with said processor circuit; and

a computer readable medium in communication with said processor circuit and encoded with codes for directing said processor circuit to:

receive from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicate with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

cause an access code reply message including said access code to be transmitted to the mobile telephone.

72. The system of claim **71** wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to receive include codes for directing said processor circuit to cause said access code request message to be received using said non-voice network interface on a non-voice network.

73. The system of claim **71** wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause said access code to be produced.

74. The system of claim **73** wherein said codes for directing said processor circuit to cause said access code to be produced cause said access code to be selected from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

75. The system of claim **74** wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause to be determined a local calling area associated with the mobile telephone.

76. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause a dialing profile associated with

the caller to be accessed, said dialing profile including a location field having contents identifying at least a default location of the caller.

77. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause to be received an IP address of the mobile telephone in a wireless IP network.

78. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause to be received an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

79. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause to be received a user-configured identifier of a location associated with the mobile telephone.

80. The system of claim **75** wherein said codes for directing said processor circuit to cause said access code to be produced further cause to be selected an access code in said local calling area associated with the mobile telephone.

81. The system of claim **74** wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

82. The system of claim **81** wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause communication through said IP network to be established in response to a call received on said channel.

83. The system of claim **82** wherein said codes for directing said processor circuit to cause said access code to be produced cause a caller

identifier associated with the mobile telephone to be stored in association with said access code.

84. The system of claim **83** wherein said codes for directing said processor circuit to cause communication to be established cause communication to be established only if said caller identifier associated with said access code identifies the mobile telephone.

85. The system of claim **74** wherein said codes for directing said processor circuit to cause said access code to be produced cause said callee identifier to be stored in association with said access code.

86. The system of claim **85** wherein said codes for directing said processor circuit to cause said access code to be produced cause said pool of access codes to be searched for an access code associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

87. The system of claim **73** wherein said codes for directing said processor circuit to cause said access code to be produced cause a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire, to be stored in association with said access code.

88. The system of claim **87** wherein said codes for directing said processor circuit to cause communication to be established cause communication to be established only if the usability of said access code to initiate a call to the callee has not expired.

89. The system of claim **71** wherein said network interface comprises a non-voice network interface, and wherein codes for directing said processor circuit to transmit include codes for directing said processor

circuit to cause said access code reply message to be transmitted using said non-voice network interface on a non-voice network.

90. A computer readable medium encoded with codes for directing a processor circuit to enable a mobile telephone to initiate a call to a callee through a channel, the codes being operable to direct the processor circuit:

receive from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicate with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

cause an access code reply message including said access code to be transmitted to the mobile telephone.

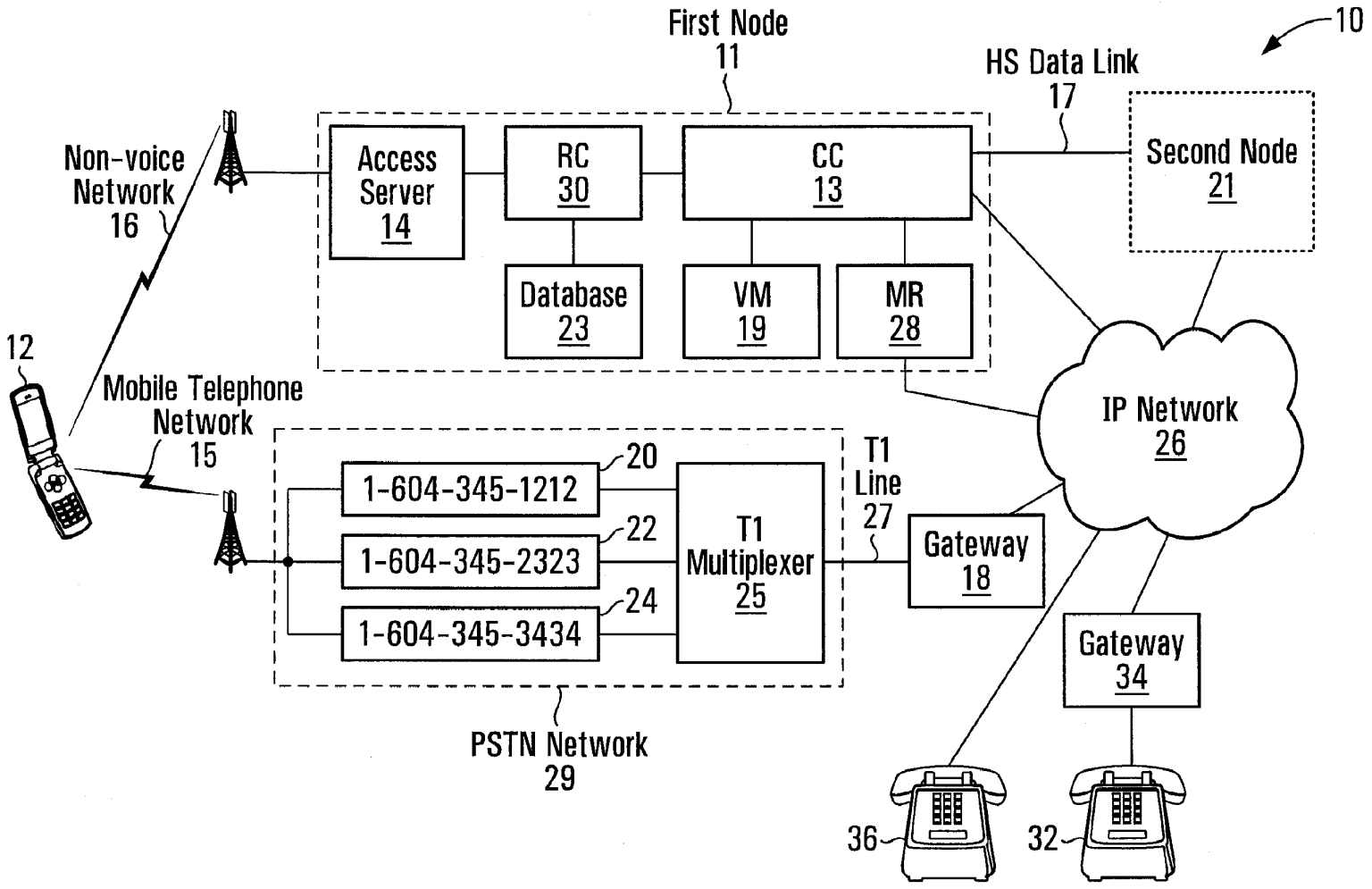

First Node
11
10
HS Data Link
17
Second Node
21
Non-voice
Network
16
Access
Server
14
RC
30
CC
13
Database
23
VM
19
MR
28
12
Mobile Telephone
Network
15
IP Network
26
20
1-604-345-1212
22
1-604-345-2323
24
1-604-345-3434
T1
Multiplexer
25
T1
Line
27
Gateway
18
Gateway
34
PSTN Network
29
36
32

FIG. 1

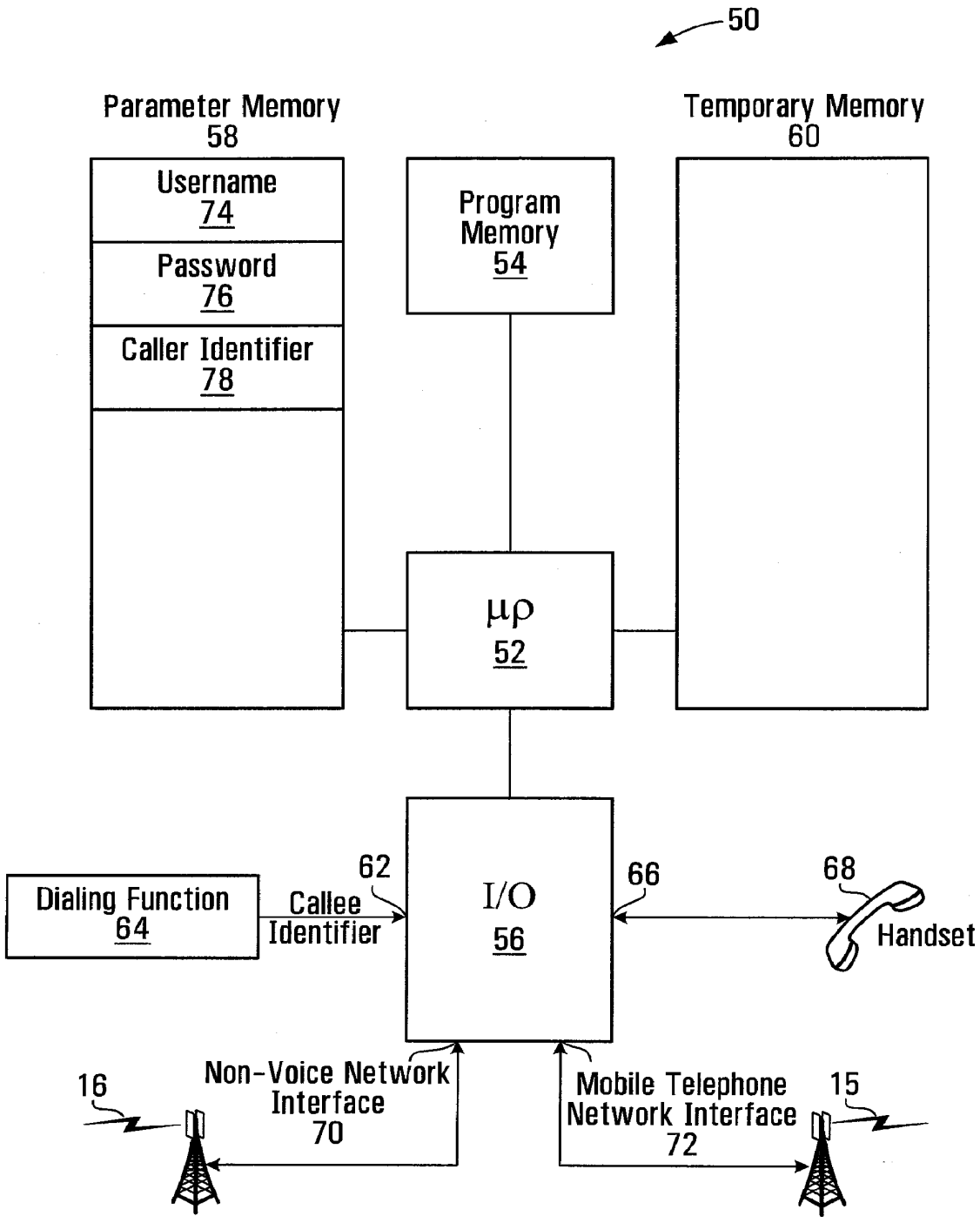

Mobile Telephone (12)
50
Parameter Memory
58
Username
74
Password
76
Caller Identifier
78
Program Memory
54
Temporary Memory
60
μρ
52
I/O
56
62
Callee Identifier
Dialing Function
64
66
68
Handset
16
Non-Voice Network Interface
70
Mobile Telephone Network Interface
72
15

FIG. 2

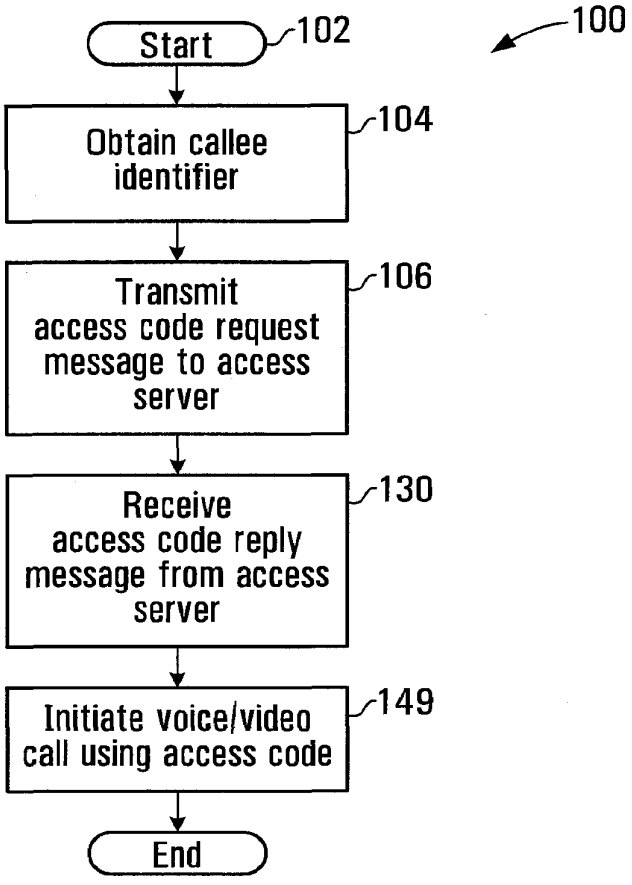


FIG. 3

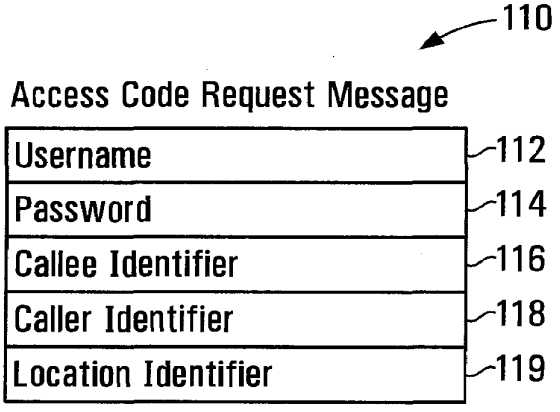


FIG. 4

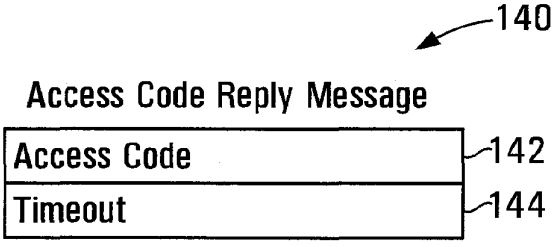


FIG. 5

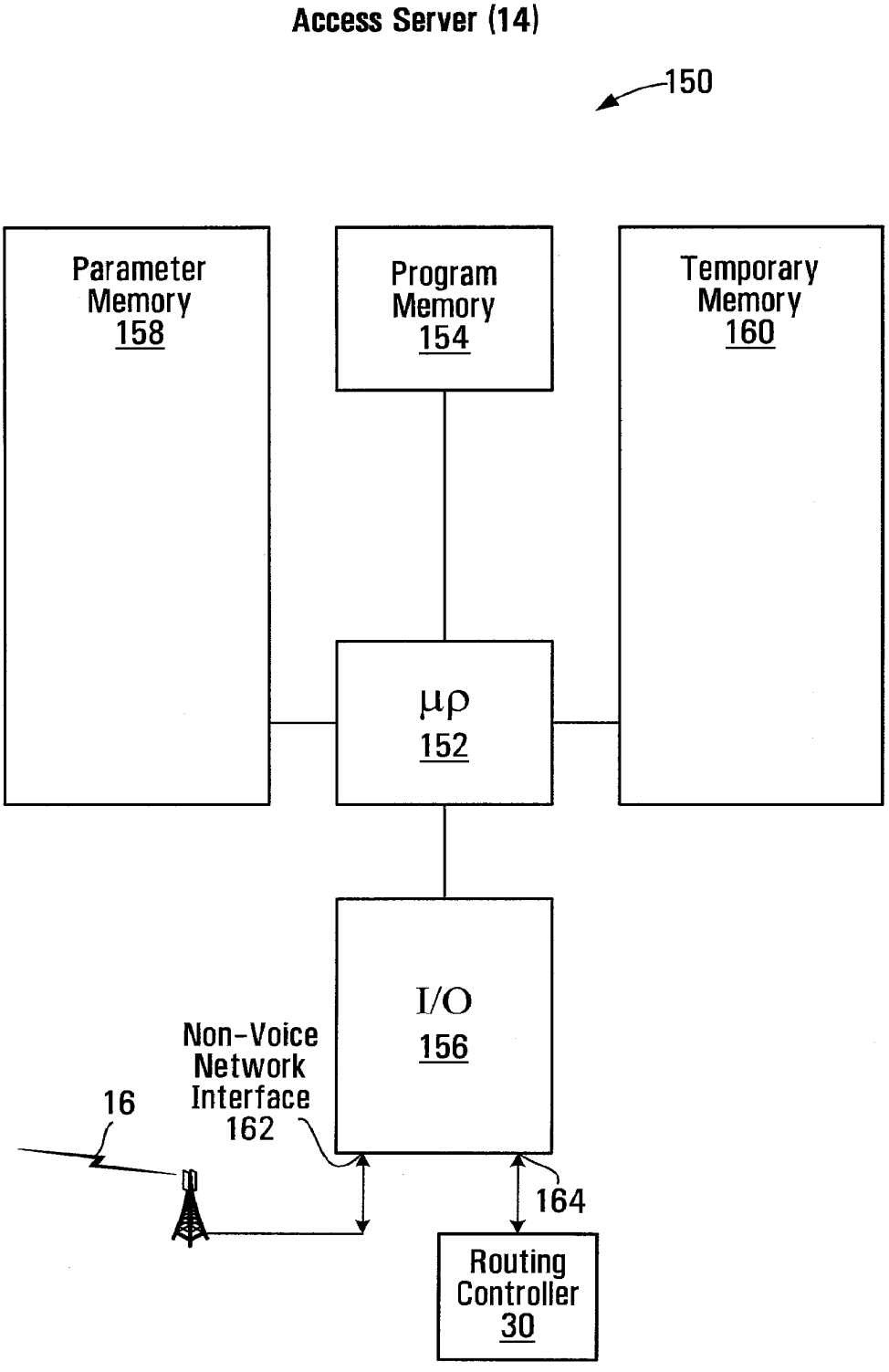

Access Server (14)
150
Parameter Memory 158
Program Memory 154
Temporary Memory 160
μρ 152
I/O 156
Non-Voice Network Interface 162
16
164
Routing Controller 30

FIG. 6

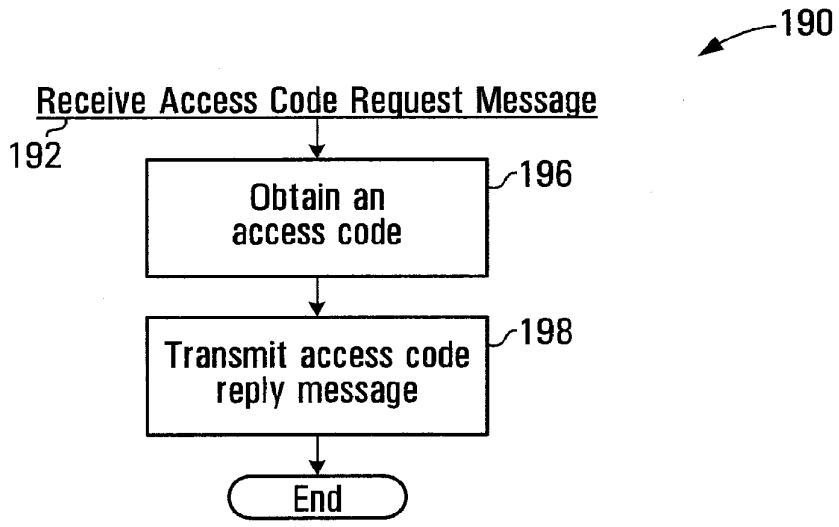

190
Receive Access Code Request Message
192
Obtain an access code
196
Transmit access code reply message
198
End

FIG. 7

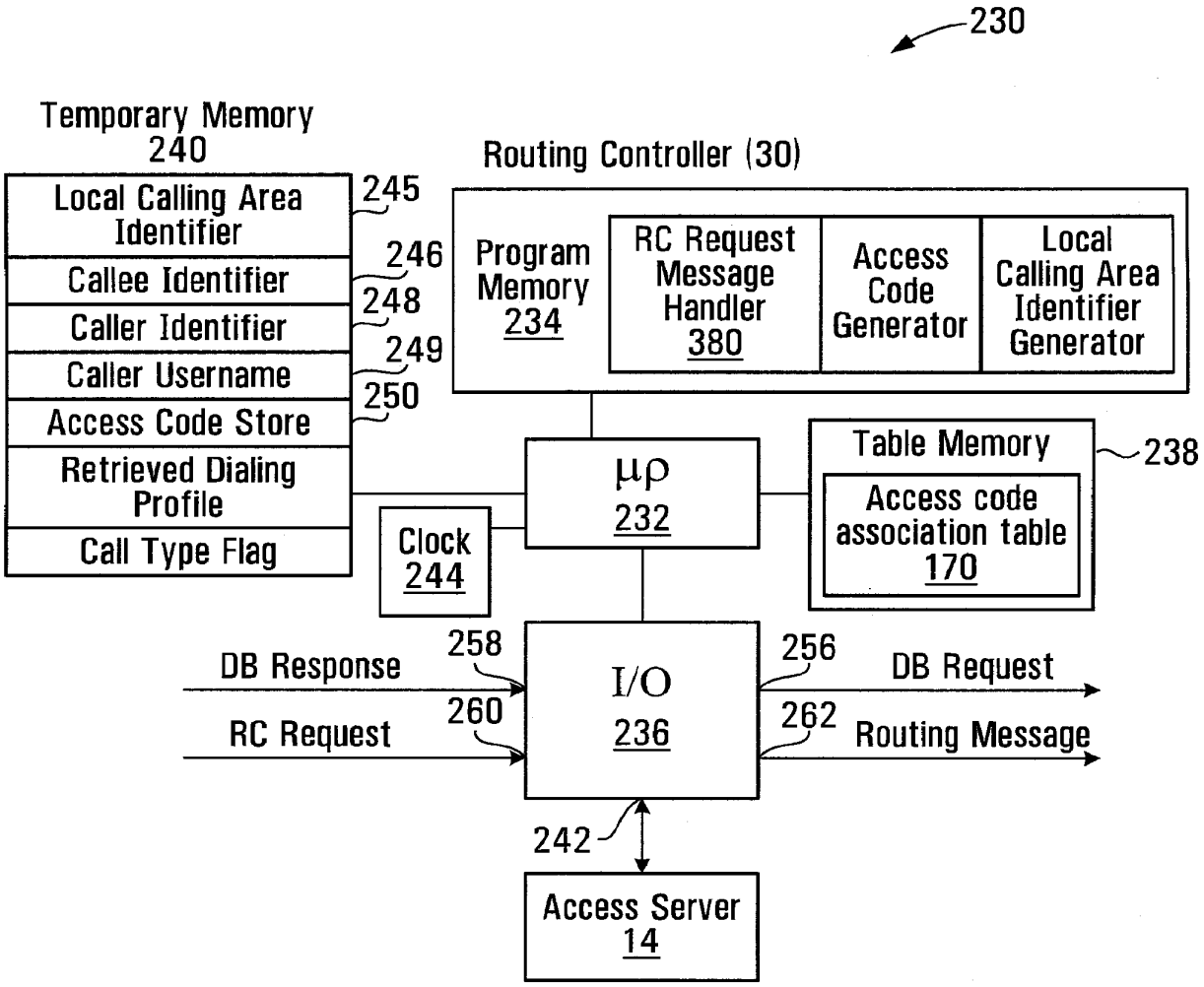

230
Temporary Memory
240
Local Calling Area Identifier
Callee Identifier
Caller Identifier
Caller Username
Access Code Store
Retrieved Dialing Profile
Call Type Flag
245
246
248
249
250
Routing Controller (30)
Program Memory 234
RC Request Message Handler 380
Access Code Generator
Local Calling Area Identifier Generator
μρ 232
Clock 244
Table Memory
238
Access code association table 170
DB Response
RC Request
258
260
I/O 236
256
262
DB Request
Routing Message
242
Access Server 14

FIG. 8

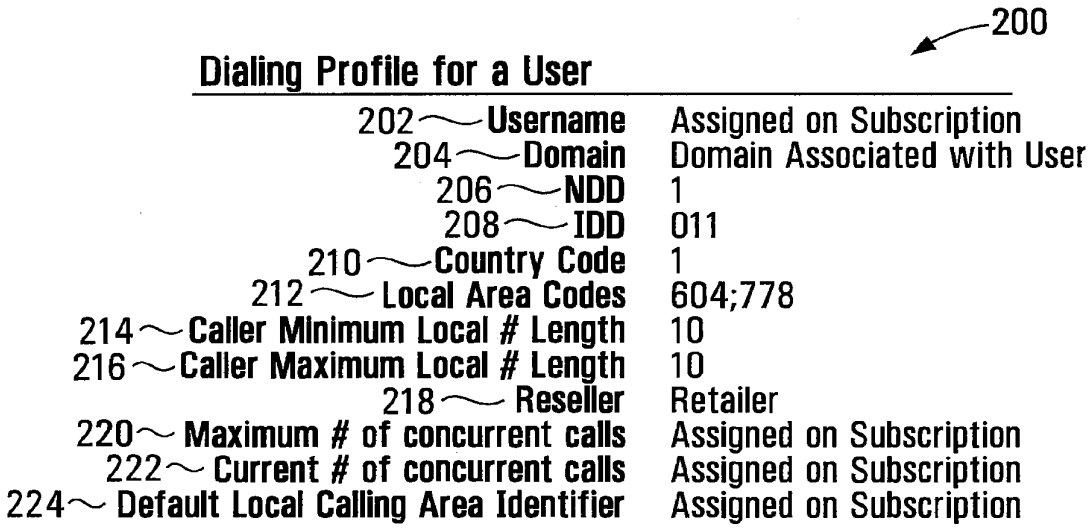

200
Dialing Profile for a User
202 Username
Assigned on Subscription
204 Domain
Domain Associated with User
206 NDD
1
208 IDD
011
210 Country Code
1
212 Local Area Codes
604;778
214 Caller Minimum Local # Length
10
216 Caller Maximum Local # Length
10
218 Reseller
Retailer
220 Maximum # of concurrent calls
Assigned on Subscription
222 Current # of concurrent calls
Assigned on Subscription
224 Default Local Calling Area Identifier
Assigned on Subscription

FIG. 9

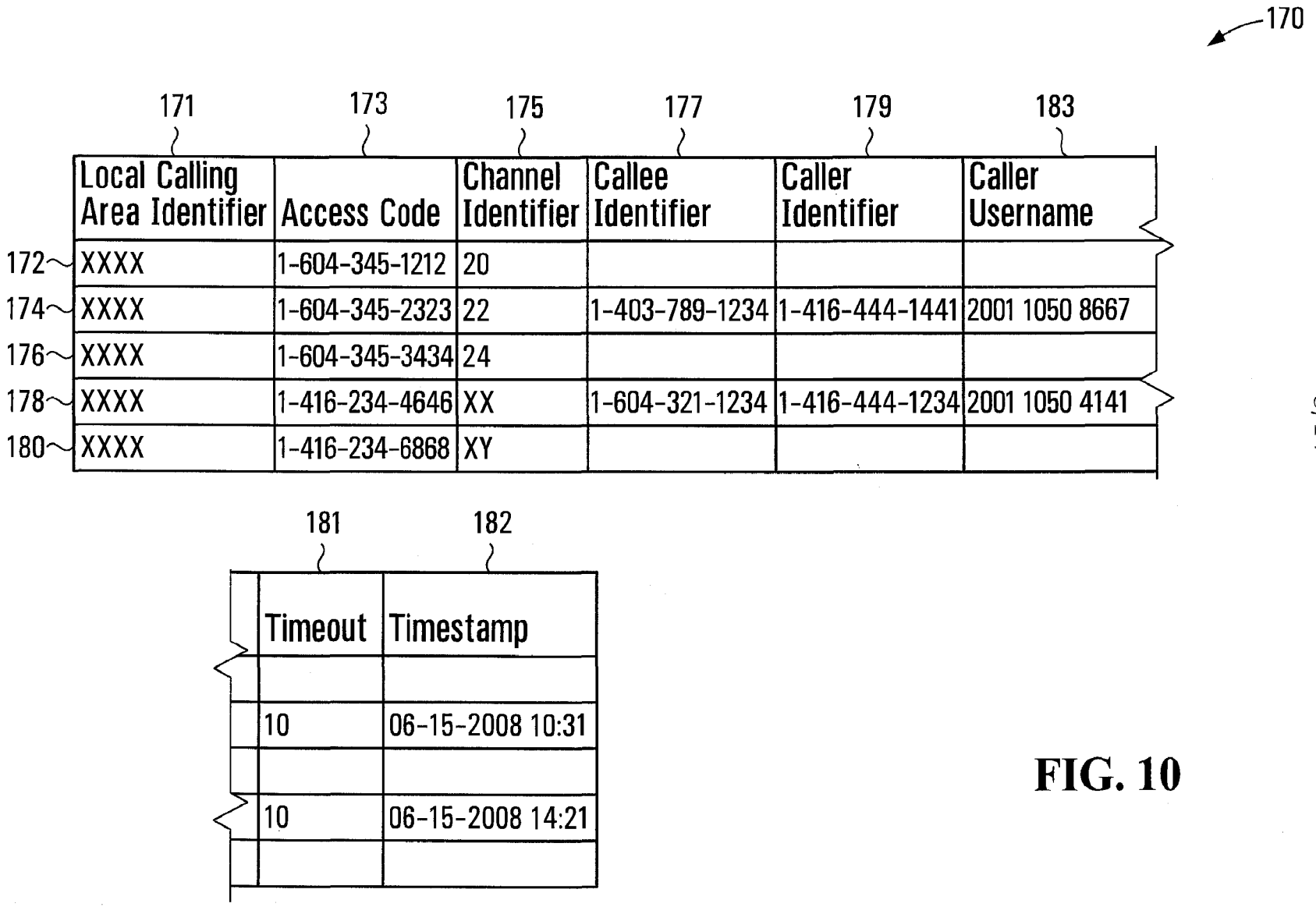

170
171
173
175
177
179
183
Local Calling Area Identifier
Access Code
Channel Identifier
Callee Identifier
Caller Identifier
Caller Username
172
XXXX
1-604-345-1212
20
174
XXXX
1-604-345-2323
22
1-403-789-1234
1-416-444-1441
2001 1050 8667
176
XXXX
1-604-345-3434
24
178
XXXX
1-416-234-4646
XX
1-604-321-1234
1-416-444-1234
2001 1050 4141
180
XXXX
1-416-234-6868
XY
181
182
Timeout
Timestamp
10
06-15-2008 10:31
10
06-15-2008 14:21

FIG. 10

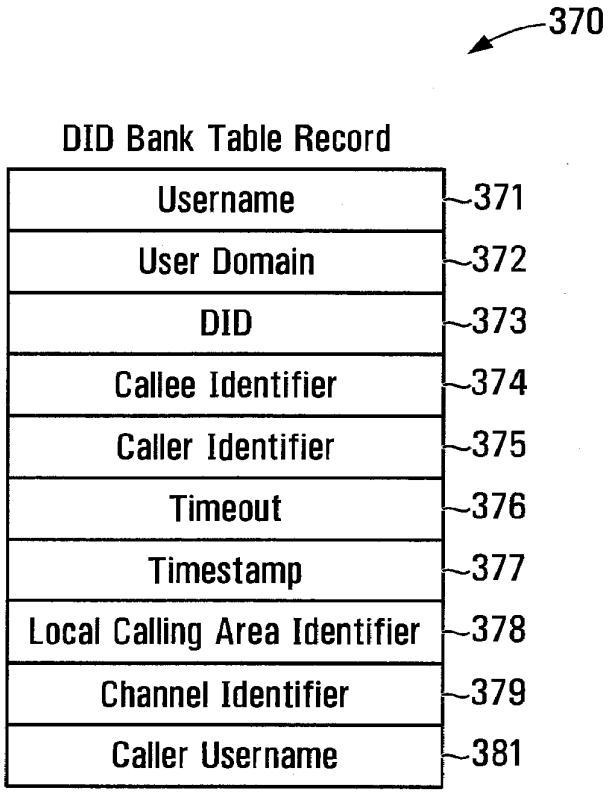

370
DID Bank Table Record
Username
371
User Domain
372
DID
373
Callee Identifier
374
Caller Identifier
375
Timeout
376
Timestamp
377
Local Calling Area Identifier
378
Channel Identifier
379
Caller Username
381

FIG. 11

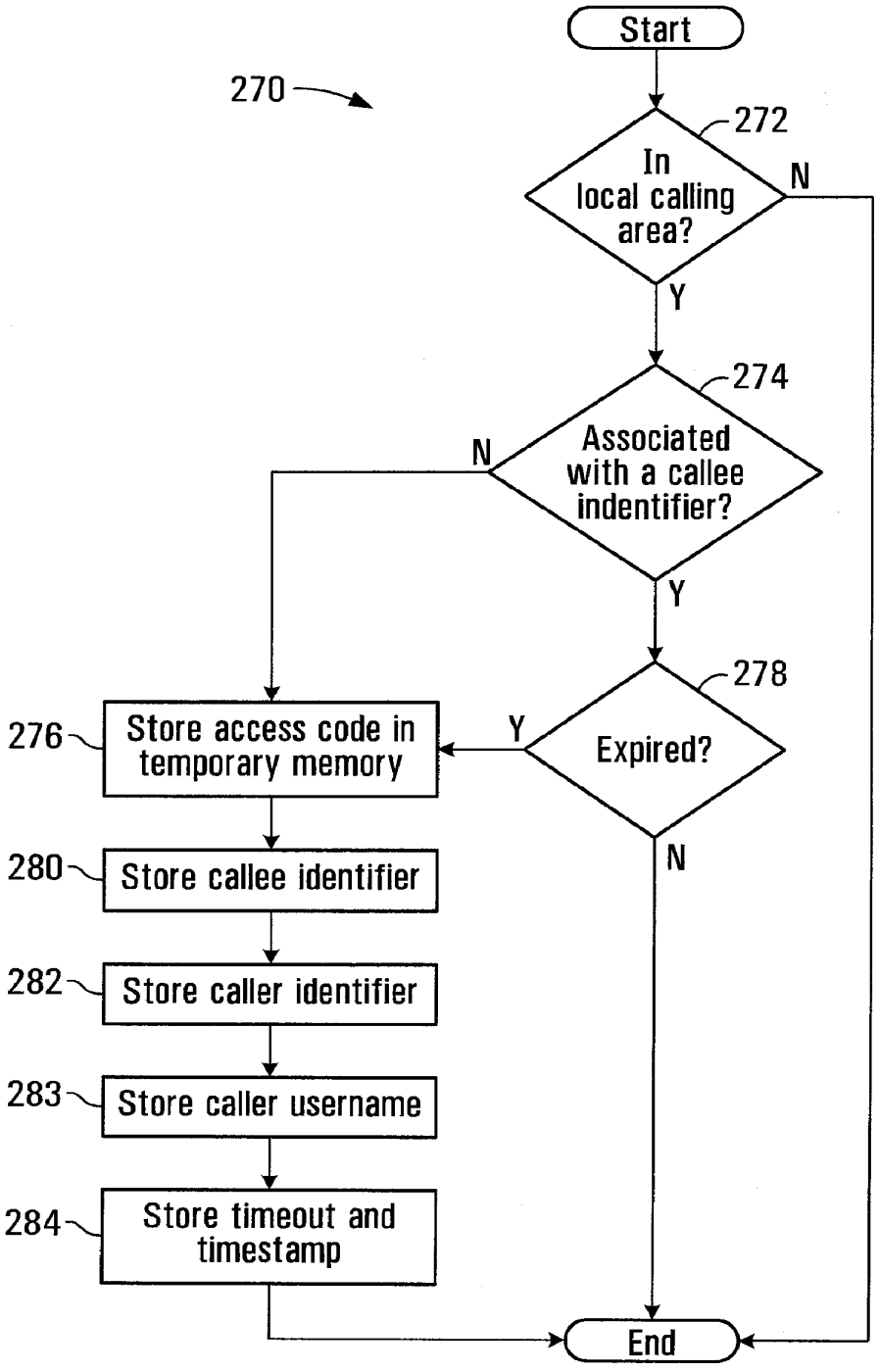

Start
270
272
In local calling area?
N
Y
274
Associated with a callee indentifier?
N
Y
278
Expired?
Y
N
276
Store access code in temporary memory
280
Store callee identifier
282
Store caller identifier
283
Store caller username
284
Store timeout and timestamp
End

FIG. 12

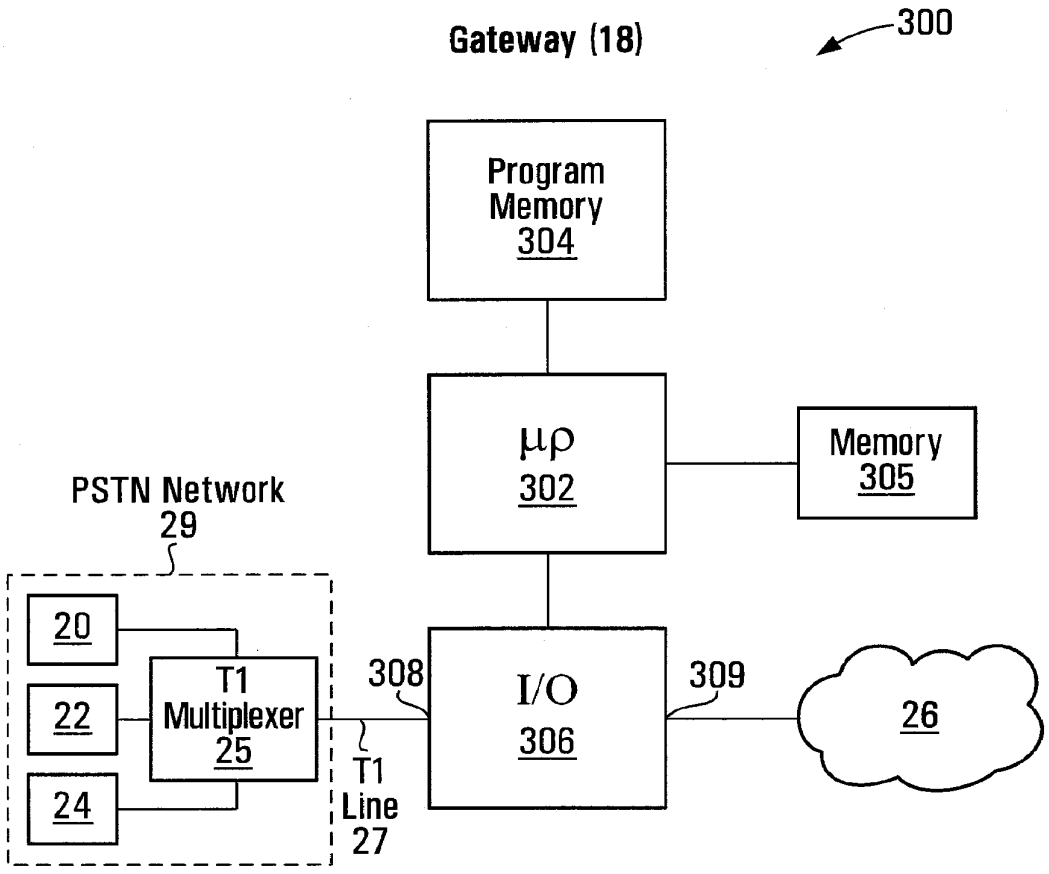


FIG. 13

310

SIP Invite Message

312	Caller Identifier	1-604-678-1234@20.14.102.5
314	Callee Identifier	1-604-345-1212
315	Digest Parameter	XXXXXXX
316	Call Identifer	FF10@20.14.102.5
317	IP Address	20.14.102.5
318	Gateway UDP Port	12378

FIG. 14

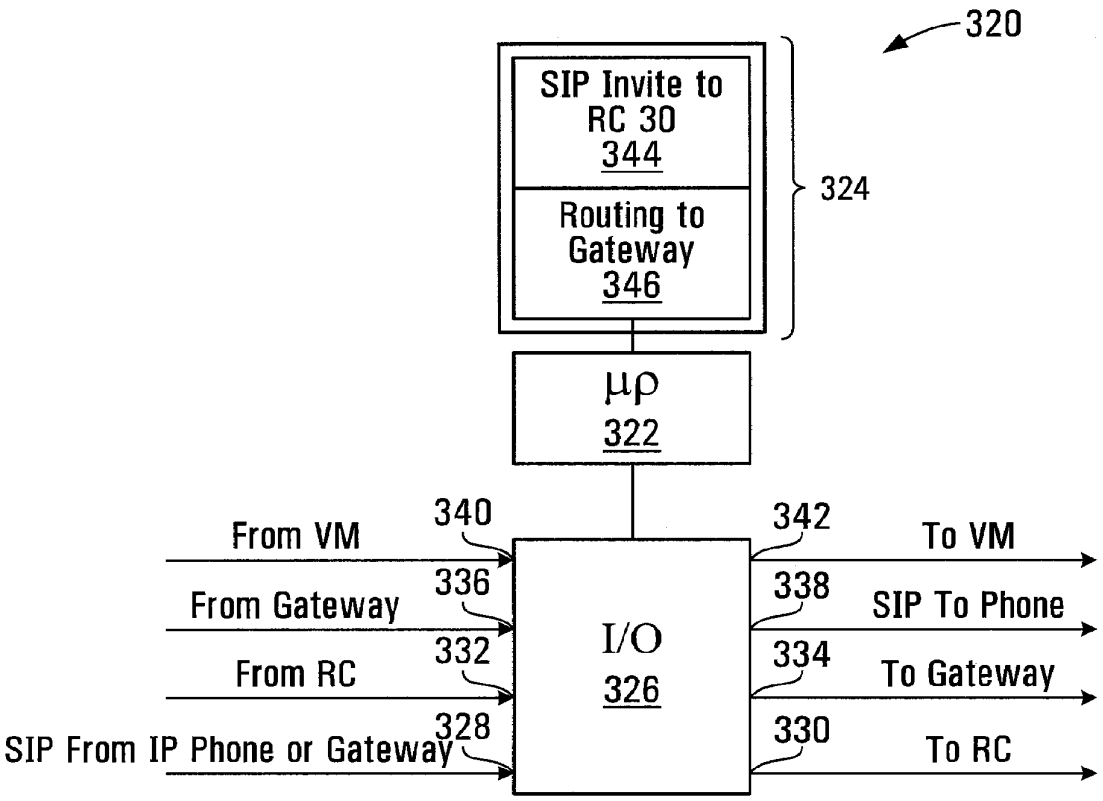

Call Controller (13)
320
SIP Invite to RC 30 344
Routing to Gateway 346
324
μρ 322
From VM
340
From Gateway
336
From RC
332
SIP From IP Phone or Gateway
328
I/O 326
342
To VM
338
SIP To Phone
334
To Gateway
330
To RC

FIG. 15

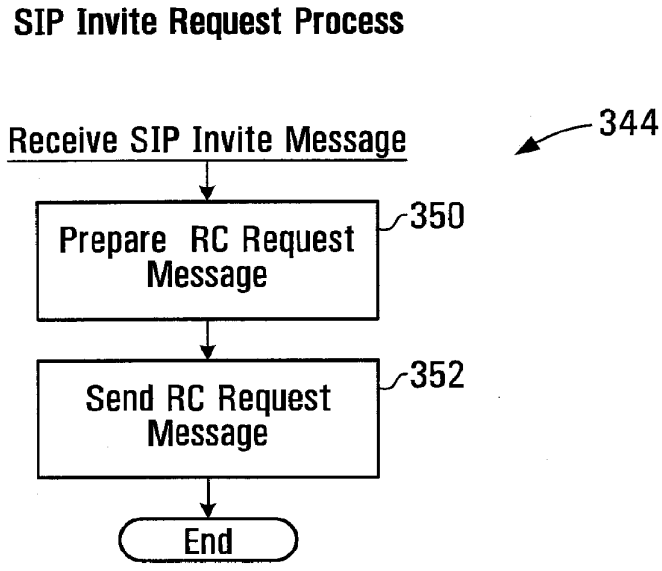

SIP Invite Request Process
Receive SIP Invite Message
344
Prepare RC Request Message
350
Send RC Request Message
352
End

FIG. 16

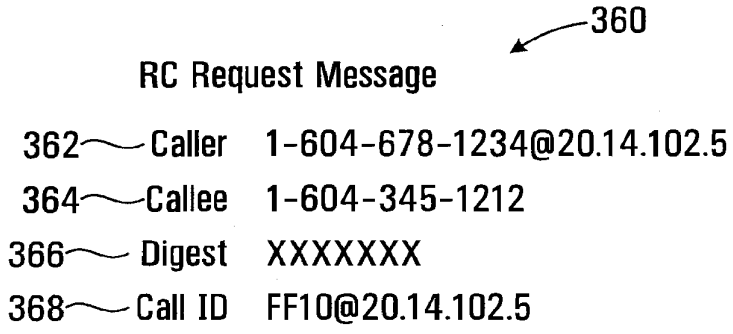

360
RC Request Message
362 Caller 1-604-678-1234@20.14.102.5
364 Callee 1-604-345-1212
366 Digest XXXXXXX
368 Call ID FF10@20.14.102.5

FIG. 17

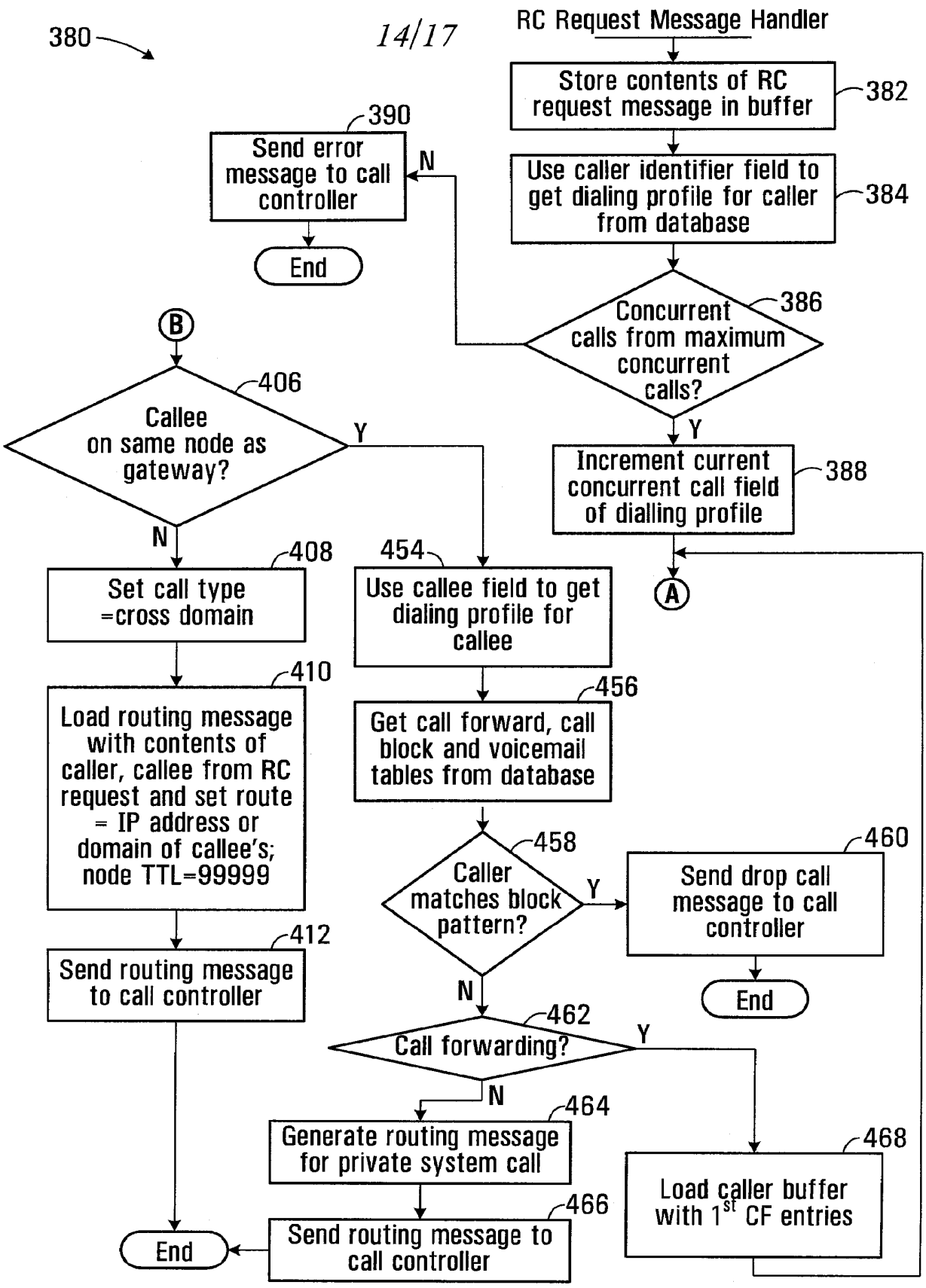

380
RC Request Message Handler
Store contents of RC request message in buffer
382
Use caller identifier field to get dialing profile for caller from database
384
Concurrent calls from maximum concurrent calls?
386
N
Y
Send error message to call controller
390
End
Increment current concurrent call field of dialling profile
388
A
B
Callee on same node as gateway?
406
Y
N
Set call type =cross domain
408
Load routing message with contents of caller, callee from RC request and set route = IP address or domain of callee's; node TTL=99999
410
Send routing message to call controller
412
454
Use callee field to get dialing profile for callee
456
Get call forward, call block and voicemail tables from database
Caller matches block pattern?
458
Y
N
Send drop call message to call controller
460
End
Call forwarding?
462
Y
N
Generate routing message for private system call
464
Load caller buffer with 1st CF entries
468
Send routing message to call controller
466
End

FIG. 18A

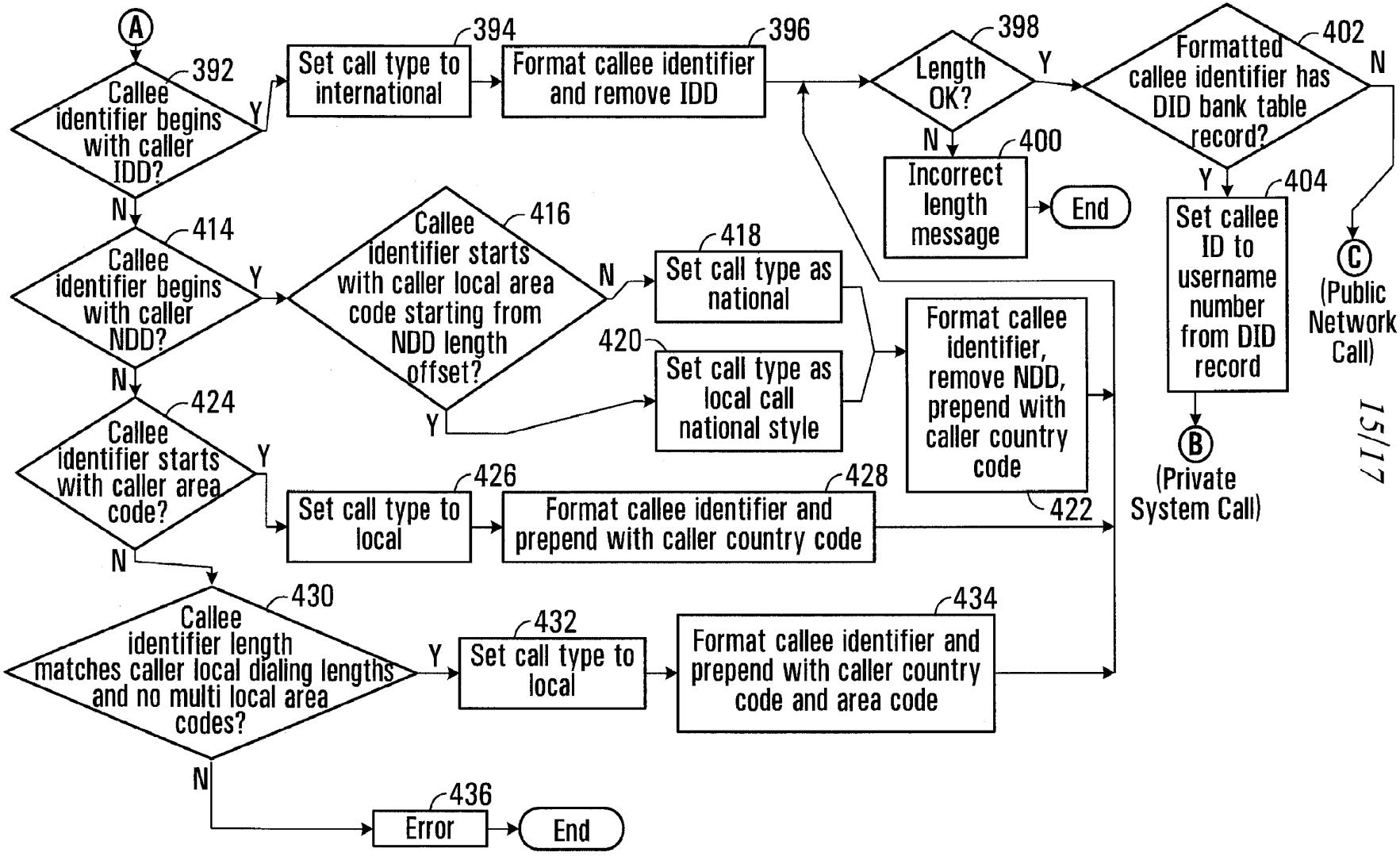

A
392
Callee identifier begins with caller IDD?
Y
394
Set call type to international
396
Format callee identifier and remove IDD
398
Length OK?
Y
N
400
Incorrect length message
End
402
Formatted callee identifier has DID bank table record?
N
Y
404
Set callee ID to username number from DID record
C
(Public Network Call)
B
(Private System Call)
N
414
Callee identifier begins with caller NDD?
Y
416
Callee identifier starts with caller local area code starting from NDD length offset?
N
418
Set call type as national
420
Set call type as local call national style
Y
Format callee identifier, remove NDD, prepend with caller country code
422
N
424
Callee identifier starts with caller area code?
Y
426
Set call type to local
428
Format callee identifier and prepend with caller country code
N
430
Callee identifier length matches caller local dialing lengths and no multi local area codes?
Y
432
Set call type to local
434
Format callee identifier and prepend with caller country code and area code
N
436
Error
End

FIG. 18B

15/17

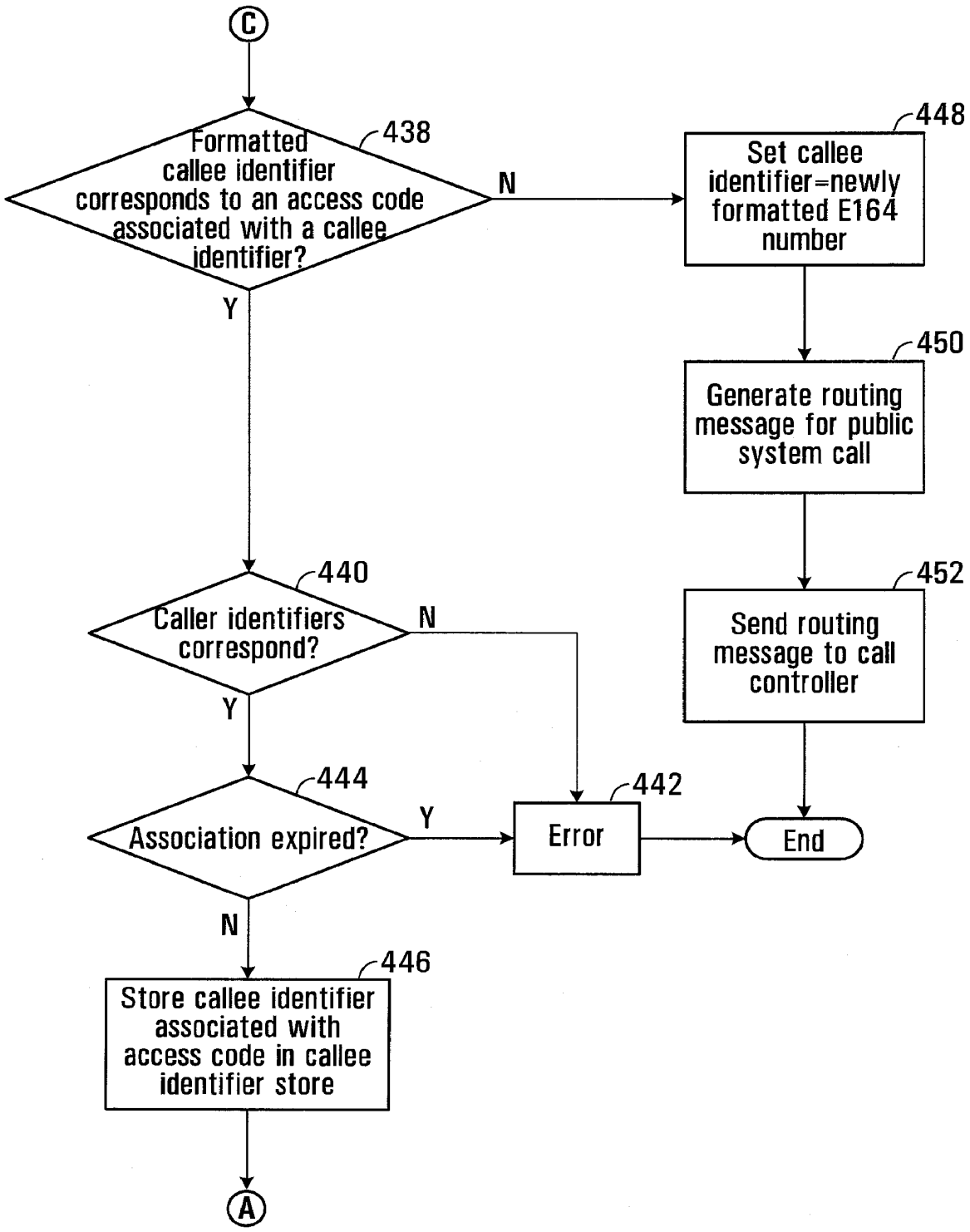

C
Formatted callee identifier corresponds to an access code associated with a callee identifier?
438
N
Y
448
Set callee identifier=newly formatted E164 number
450
Generate routing message for public system call
452
Send routing message to call controller
440
Caller identifiers correspond?
N
Y
444
Association expired?
Y
442
Error
End
N
446
Store callee identifier associated with access code in callee identifier store
A

FIG. 18C

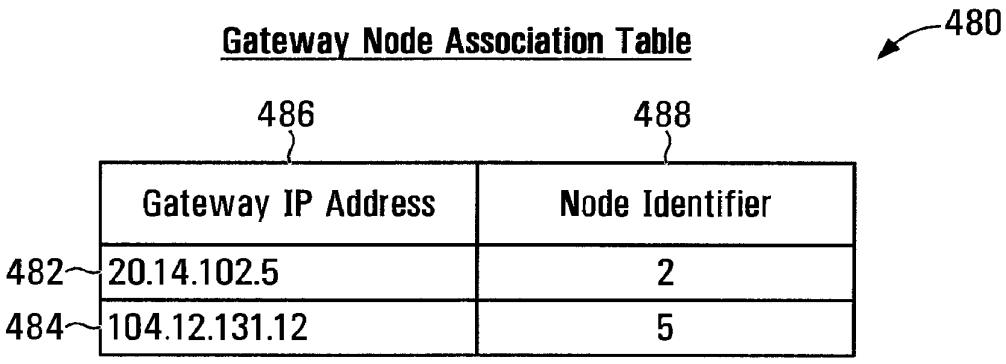

Gateway Node Association Table
480
486
488
Gateway IP Address
Node Identifier
482
20.14.102.5
2
484
104.12.131.12
5

FIG. 19

Electronic Acknowledgement Receipt	
EFS ID:	9320921
Application Number:	13056277
International Application Number:	PCT/CA09/01062
Confirmation Number:	2403
Title of Invention:	MOBILE GATEWAY
First Named Inventor/Applicant Name:	Johan Emil Viktor Bjorsell
Customer Number:	20995
Filer:	John M Carson/Shirley Martinez
Filer Authorized By:	John M Carson
Attorney Docket Number:	SMARB19.004APC
Receipt Date:	27-JAN-2011
Filing Date:	
Time Stamp:	17:50:46
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$490
RAM confirmation Number	3696
Deposit Account	111410
Authorized User	KNOBBE MARTENS OLSON AND BEAR

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

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	NPL Documents	Intl_search_report_and_written_opinion.pdf	336655 a1509394529ea04683668f7702d8ef4f450848b6	no	8
Warnings:					
Information:					
2	Documents submitted with 371 Applications	Published_application.pdf	4246948 dfd514e392da2b28ebec4cf2ccea9ba721098da4	no	99
Warnings:					
Information:					
3	Power of Attorney	POA.pdf	45150 aacb8b1a8d5b6da221e5b0f1ddf75d7fa95f0e4f	no	1
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73(b).	373_Statement.pdf	144458 944d8fe1337e34e2ca17de9e10ba6f30619a9f0f	no	5
Warnings:					
Information:					
5	Application Data Sheet	ADS.pdf	240615 ced14555848f8ca2577162224c4a1346252738d6	no	5
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
6		IDS.pdf	59112 54be12b2517b6e4be804039d96620bb4a023f088	yes	2

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	1
Information Disclosure Statement (IDS) Filed (SB/08)	2	2

Warnings:					
Information:					
7		Prelim_amend.pdf	639311 26fa882cb2f11875ebc9ef84c0a31fb5855a150a	yes	16

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Preliminary Amendment	1	1
	Specification	2	2
	Claims	3	15
	Applicant Arguments/Remarks Made in an Amendment	16	16

Warnings:					
Information:					
8	Fee Worksheet (PTO-875)	fee-info.pdf	33337 0fc2c1e1be0adfaa6ba85d40b7d4ae355553cfca	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	5745586		

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.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/CA2009/001062
International Application No.

28 JULY 2009 28.07.2009
International Filing Date

RO/CA
Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* 83636-55

Box No. I TITLE OF INVENTION

MOBILE GATEWAY

Box No. II APPLICANT ☐ This person is also inventor

Name and address: ***(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)***

Digifonica (International) Limited
Suite #890
999 West Hastings Street
Vancouver, British Columbia
Canada V6C 2W2

Telephone No.
604-638-7357

Facsimile No.
604-430-3591

Applicant's registration No. with the Office

State *(that is, country)* of nationality: CA

State *(that is, country)* of residence: CA

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

KNOX, John W.; CRAMER, Owen W.; FERANCE, Stephen J.; GILEFF, David A.; KINGWELL, Brian G.; ROBINSON, J. Christopher

SMART & BIGGAR
2200-650 West Georgia Street
Vancouver, British Columbia
Canada V6B 4N8

Telephone No.
604-682-7780

Facsimile No.
604-682-0274

Agent's registration No. with the Office

☐ **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Sheet No. . . . 2 . . . .

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

BJORSELL, Johan Emil Viktor
PO Box 29164
RPO South Granville Post
Vancouver, British Columbia
Canada V6J 0A6

This person is:
- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office:

State *(that is, country)* of nationality: SE

State *(that is, country)* of residence: CA

This person is applicant: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

SOBOLYEV, Maksym
506-210 Eleventh Street
New Westminster, British Columbia
Canada V3M 4C9

This person is:
- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office:

State *(that is, country)* of nationality: UA

State *(that is, country)* of residence: CA

This person is applicant for the: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

HUTTUNEN, Pentti Kalevi
76-3180 East 58th Avenue
Vancouver, British Columbia
Canada V5S 3S8

This person is:
- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office:

State *(that is, country)* of nationality: CA

State *(that is, country)* of residence: CA

This person is applicant for the: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office:

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Form PCT/RO/101 (continuation sheet) (April 2007) *See Notes to the request form*
LegalStar 2007, Form PCTREQ

Box No.V DESIGNATIONS

The filing of this request **constitutes under Rule 4.9(a), the designation** of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.

However,

☐ DE Germany **is not designated** for any kind of national protection

☐ JP Japan **is not designated** for any kind of national protection

☐ KR Republic of Korea **is not designated** for any kind of national protection

☐ RU Russian Federation **is not designated** for any kind of national protection

(The check-boxes above may only be used to exclude (irrevocably) the designations concerned if, at the time of filing or subsequently under Rule 26bis.1, the international application contains in Box No. VI a priority claim to an earlier national application filed in the particular State concerned, in order to avoid the ceasing of the effect, under the national law, of this earlier national application.)

Box No. VI PRIORITY CLAIM

The priority of the following earlier application(s) is hereby claimed:

	Filing date of earlier application *(day/month/year)*	Number of earlier application	Where earlier application is:		
			national application: country or Member	regional application: regional Office	international application: receiving Office
item (1)	28/07/2008 28-July-2008	61/129,898	US		
item (2)					
item (3)					

☐ Further priority claims are indicated in the Supplemental Box.

Transmit certified copy: the receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office)* identified above as:

☐ all items ☐ item (1) ☐ item (2) ☐ item (3) ☐ other, see Supplemental Box

Restore the right of priority: the receiving Office is requested to restore the right of priority for the earlier application(s) identified above or in the Supplemental Box as item(s) (_____). *(See also the Notes to Box No. VI; further information **must** be provided to support a request to restore the right of priority.)*

Incorporation by reference: where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):*

ISA/ CA .....

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*

Date *(day/month/year)* Number Country *(or regional Office)*

Box No. VIII DECLARATIONS

The following **declarations** are contained in Boxes Nos. VIII (i) to (v) *(mark the applicable check-boxes below and indicate in the right column the number of each type of declaration)*:			Number of declarations
☒	Box No. VIII (i)	Declaration as to the identity of the inventor :	3
☒	Box No. VIII (ii)	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent :	1
☐	Box No. VIII (iii)	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application :	
☒	Box No. VIII (iv)	Declaration of inventorship (only for the purposes of the designation of the United States of America) :	3
☐	Box No. VIII (v)	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty :	

Sheet No. 8 11

Box No. IX CHECK LIST; LANGUAGE OF FILING

This international application **contains:**

(a) **on paper**, the following number of sheets:

request (including declaration and supplemental sheets)	8	13
description (excluding sequence listing and/or tables related thereto)	62	
claims	18	
abstract	1	
drawings	17	
Sub-total number of sheets	106	
sequence listing		111
tables related thereto		
(for both, actual number of sheets if filed on paper, whether or not also filed in electronic form; see (c) below)		
Total number of sheets	106	

(b) ☐ **only in electronic form** (Section 801(a)(i)) 111
- (i) ☐ sequence listing
- (ii) ☐ tables related thereto

(c) ☐ **also in electronic form** (Section 801(a)(ii))
- (i) ☐ sequence listing
- (ii) ☐ tables related thereto

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which are contained the
- ☐ sequence listing: .....
- ☐ tables related thereto: .....

(additional copies to be indicated under items 9(ii) and/or 10(ii), in right column)

This international application is **accompanied by** the following item(s) *(mark the applicable check-boxes below and indicate in right column the number of each item)*: — Number of items

1. ☐ fee calculation sheet :
2. ☐ original separate power of attorney :
3. ☐ original general power of attorney :
4. ☐ copy of general power of attorney; reference number, if any: ..... :
5. ☐ statement explaining lack of signature :
6. ☐ priority document(s) identified in Box No. VI as item(s): ..... :
7. ☐ translation of international application into *(language)*: ..... :
8. ☐ separate indications concerning deposited microorganism or other biological material :
9. ☐ sequence listing in electronic form *(indicate type and number of carriers)*
   - (i) ☐ copy submitted for the purposes of international search under Rule 13*ter* only (and not as part of the international application) :
   - (ii) ☐ *(only where check-box (b)(i) or (c)(i) is marked in left column)* additional copies including, where applicable, the copy for the purposes of international search under Rule 13*ter* :
   - (iii) ☐ together with relevant statement as to the identity of the copy or copies with the sequence listing mentioned in left column :
10. ☐ tables in electronic form related to sequence listing *(indicate type and number of carriers)*
    - (i) ☐ copy submitted for the purposes of international search under Section 802(b-*quater*) only (and not as part of the international application) :
    - (ii) ☐ *(only where check-box (b)(ii) or (c)(ii) is marked in left column)* additional copies including, where applicable, the copy for the purposes of international search under Section 802(b-*quater*) :
    - (iii) ☐ together with relevant statement as to the identity of the copy or copies with the tables mentioned in left column :
11. ☐ other *(specify)*: :

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: English

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

X

BJORSELL, ~~Johan~~ Emil Viktor | SOBOLYEV, Maksym | HUTTUNEN, Pentti Kalevi | for Digifonica (International) Limited

Date: 28th July 2009

For receiving Office use only

1. Date of actual receipt of the purported international application: 28 JULY 2009 28.07.2009

2. Drawings: ☒ received: ☐ not received:

3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:

4. Date of timely receipt of the required corrections under PCT Article 11(2):

5. International Searching Authority (if two or more are competent): ISA/ CA

6. ☒ Transmittal of search copy delayed until search fee is paid

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

Form PCT/RO/101 (last sheet) (April 2007)
LegalStar 2007, Form PCTREQ

See Notes to the request form

Sheet No. 8 12

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(i) ☐ sequence listing

(ii) ☐ tables related thereto

(c) ☐ **also in electronic form** (Section 801(a)(ii))

(i) ☐ sequence listing

(ii) ☐ tables related thereto

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which are contained the

☐ sequence listing: .....

☐ tables related thereto: .....

(additional copies to be indicated under items 9(ii) and/or 10(ii), in right column)

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    - (iii) ☐ together with relevant statement as to the identity of the copy or copies with the tables mentioned in left column :
11. ☐ other *(specify)*: :

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: English

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

BJORSELL, Johan Emil Viktor SOBOLYEV, Maksym HUTTUNEN, Pentti Kalevi for Digifonica (International) Limited

Date: 27 July 2009

For receiving Office use only

1. Date of actual receipt of the purported international application: 28 JULY 2009 28.07.2009

2. Drawings: [X] received: ☐ not received:

3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:

4. Date of timely receipt of the required corrections under PCT Article 11(2):

5. International Searching Authority (if two or more are competent): ISA/ CA

6. [X] Transmittal of search copy delayed until search fee is paid

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Form PCT/RO/101 (last sheet) (April 2007)
LegalStar 2007, Form PCTREQ

See Notes to the request form

Sheet No. 8 13

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(ii) ☐ tables related thereto

(c) ☐ **also in electronic form** (Section 801(a)(ii))

(i) ☐ sequence listing

(ii) ☐ tables related thereto

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which are contained the

☐ sequence listing: .....

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Figure of the drawings which should accompany the abstract: 1

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Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

BJORSELL, Johan Emil Viktor SOBOLYEV, Maksym HUTTUNEN, Pentti Kalevi for Digifonica (International) Limited

Date:

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3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:

4. Date of timely receipt of the required corrections under PCT Article 11(2):

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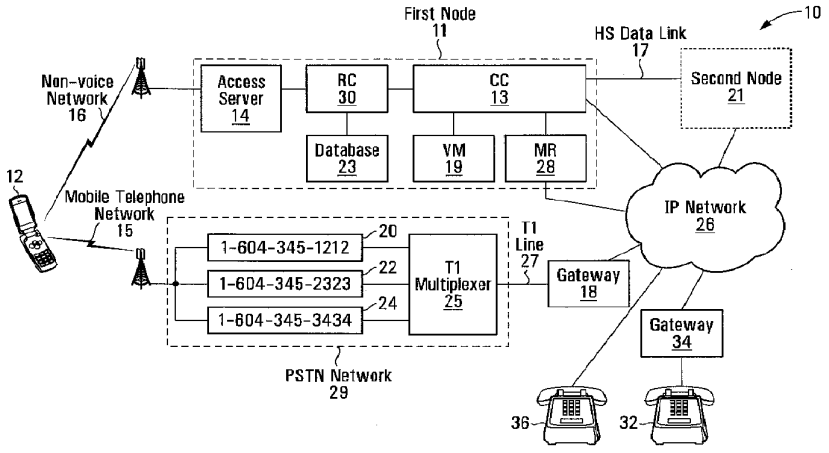


FIG. 1

(57) Abstract: A method of initiating a call to a callee using a mobile telephone involves: receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting an access code request message to an access server, said access code request message including said callee identifier; receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and initiating a call with the mobile telephone using said access code to identify the callee.

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MOBILE GATEWAY

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates generally to telecommunication, and more particularly to methods, systems, apparatuses, and computer readable media for initiating or enabling a call with a mobile telephone to a callee.

2. Description of Related Art

Mobile telephone service providers often charge significant fees for long distance telephone calls, particularly when the mobile telephone is roaming in another mobile telephone service provider's network.

One known technique for avoiding the long distance charges of mobile telephone service providers is to use a "calling card". A "calling card" may permit the user of the mobile telephone to place a call to a local telephone number or to a less-expensive telephone number (such as a toll-free number, for example) instead of placing the call directly to the callee. The user may thus avoid the long distance charges of the mobile telephone service provider, which may be higher than the charges for using the "calling card". However, this technique can be cumbersome and undesirable, because it may require the user of the mobile telephone to follow a number of complicated or cumbersome steps in order to initiate a call to the callee, for example.

SUMMARY OF THE INVENTION

In accordance with one aspect of the invention there is provided a method of initiating a call to a callee using a mobile telephone. The method involves receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting an access code request message to an access server, the access code request message including the callee identifier; receiving an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated

with the callee identifier; and initiating a call with the mobile telephone using the access code to identify the callee.

Transmitting may involve transmitting the access code request message to the access server on a non-voice network.

Transmitting may involve transmitting a location identifier of a location associated with the mobile telephone to the access server.

Transmitting the location identifier may involve transmitting an IP address of the mobile telephone in a wireless IP network.

Transmitting the location identifier may involve transmitting an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Transmitting the location identifier may involve transmitting a user-configured identifier of a location associated with the mobile telephone.

Receiving the access code reply message may involve receiving the access code reply message from the access server on a non-voice network.

Receiving the access code reply message may involve receiving, in the access code reply message, an access code temporarily associated with the callee identifier.

Receiving the access code reply message may involve receiving, in the access code reply message, a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

Initiating the call may involve engaging a routing controller to route the call on the IP network to the callee.

The method may further involve: receiving from the mobile telephone the access code request message; communicating with a routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmitting the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes: provisions for receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting provisions for transmitting an access code request message to an access server, the access code request message including the callee identifier; provisions for receiving an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and provisions for initiating a call using the access code to identify the callee.

The transmitting provisions may include a non-voice network interface for transmitting the access code request message to the access server on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The provisions for receiving an access code reply message may include a non-voice network interface for receiving the access code reply message on a non-voice network.

The access code may include a telephone number.

The means for initiating may involve a mobile telephone network interface.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes the mobile telephone, a routing controller, and an access server. The access server includes: provisions for receiving from the mobile telephone the access code request message; provisions for communicating with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and provisions for transmitting the access code reply message including the access code to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive, from a user of the mobile telephone, a callee identifier associated with the callee; cause an access code request message to be transmitted to an access server, the access code request message including the callee identifier; receive an access code reply message from the access server in response to the access code request message, the access code reply message including an access

code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to cause the access code request message to be transmitted may include codes for directing the processor circuit to cause the access code request message to be transmitted to the access server using the non-voice network interface on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive an access code reply message may include codes for directing the processor circuit to cause the access code reply message to be received from the access server using the non-voice network interface on a non-voice network.

The access code may include a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The network interface may include a mobile telephone network interface, and the codes for directing the processor circuit to initiate may include codes for

directing the processor circuit to cause a call to be initiated using the mobile telephone network interface on a mobile telephone network.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes: the mobile telephone; a routing controller; and an access server comprising a processor circuit and a computer readable medium in communication with the processor circuit. The computer readable medium is encoded with codes for directing the processor circuit to: receive from the mobile telephone the access code request message; communicate with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmit the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive, from a user of a mobile telephone, a callee identifier associated with a callee; transmit an access code request message to an access server, the access code request message including the callee identifier; receive an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

In accordance with another aspect of the invention, there is provided a method for enabling a mobile telephone to initiate a call to a callee through a channel. The method involves: receiving from the mobile telephone an access code request message including a callee identifier associated with the callee; communicating with a routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to

initiate a call to the callee using the channel; and transmitting an access code reply message including the access code to the mobile telephone.

Receiving may involve receiving the access code request message on a non-voice network.

The method may further involve causing the routing controller to produce the access code.

Producing may involve selecting the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The method may further involve determining a local calling area associated with the mobile telephone.

Determining may involve accessing a dialing profile associated with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

Determining may involve receiving an IP address of the mobile telephone in a wireless IP network.

Determining may involve receiving an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Determining may involve receiving a user-configured identifier of a location associated with the mobile telephone.

Selecting may involve selecting an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The method may further involve causing the routing controller to establish communication through the IP network in response to a call received on the channel.

Producing may further involve storing a caller identifier associated with the mobile telephone in association with the access code.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

Producing may further involve storing the callee identifier in association with the access code.

Producing may further involve searching the pool of access codes for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

Producing may further involve storing, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

Transmitting may involve transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes: provisions for receiving from the mobile telephone an access code request message including a callee identifier associated with the callee; provisions for communicating with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and provisions for transmitting an access code reply message including the access code to the mobile telephone.

The provisions for receiving may include a non-voice network interface for receiving the access code request message on a non-voice network.

The system may further include provisions for producing the access code.

The provisions for producing may include a processor circuit operably configured to select the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a dialing profile associated with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an IP address of the mobile telephone in a wireless IP network.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a user-configured identifier of a location associated with the mobile telephone.

The processor circuit may be operably configured to select an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The processor circuit may be operably configured to establish communication through the IP network in response to a call received on the channel.

The processor circuit may be operably configured to store a caller identifier associated with the mobile telephone in association with the access code.

The processor circuit may be operably configured to cause the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

The processor circuit may be operably configured to store the callee identifier in association with the access code.

The processor circuit may be operably configured to search the pool of access codes for an access code associated with the callee identifier to

identify the channel usable by the mobile telephone to initiate a call to the callee.

The processor circuit may be operably configured to store, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

The processor circuit may operably configured to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

The provisions for transmitting may include a non-voice network interface for transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive may include codes for directing the processor circuit to cause the access code request message to be received using the non-voice network interface on a non-voice network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause the access code to be produced.

The codes for directing the processor circuit to cause the access code to be produced may cause the access code to be selected from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause to be determined a local calling area associated with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause a dialing profile associated with the caller to be accessed, the dialing profile including a location field having contents identifying at least a default location of the caller.

The codes for directing the processor circuit to cause to be determined may cause to be received an IP address of the mobile telephone in a wireless IP network.

The codes for directing the processor circuit to cause to be determined may cause to be received an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause to be received a user-configured identifier of a location associated with the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may further cause to be selected an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause communication through the IP network to be established in response to a call received on the channel.

The codes for directing the processor circuit to cause the access code to be produced may cause a caller identifier associated with the mobile telephone to be stored in association with the access code.

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the caller identifier associated with the access code identifies the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may cause the callee identifier to be stored in association with the access code.

The codes for directing the processor circuit to cause the access code to be produced may cause the pool of access codes to be searched for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

The codes for directing the processor circuit to cause the access code to be produced may cause a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire, to be stored in association with the access code..

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the usability of the access code to initiate a call to the callee has not expired.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to transmit include codes for directing the processor circuit to cause the access code reply message to be transmitted using the non-voice network interface on a non-voice network.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the invention,

Figure **1** is a block diagram of a system for enabling a mobile telephone to initiate a call through a channel to a callee in accordance with a first embodiment in the invention;

Figure **2** is a block diagram of mobile telephone shown in Figure **1**;

Figure **3** is a flow chart of a process executed by the mobile telephone shown in Figure **1**;

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Figure **4** is a schematic representation of an access code request message transmitted between the mobile telephone and an access server shown in Figure **1**;

Figure **5** is a schematic representation of an access code reply message transmitted between the mobile telephone and the access server shown in Figure **1**;

Figure **6** is a block diagram of the access server shown in Figure **1**;

Figure **7** is a flow chart of a process executed by the access server shown in Figure **1**;

Figure **8** is a block diagram of a routing controller shown in Figure **1**;

Figure **9** is a tabular representation of a dialing profile stored in a database accessible by the routing controller illustrated in Figure **1**;

Figure **10** is a tabular representation of an access code association table stored in memory accessible by the routing controller shown in Figure **1**;

Figure **11** is a schematic representation of a DID bank table record stored in a database shown in Figure **1**;

Figure **12** is a flow chart of a process executed by the routing controller illustrated in Figure **1**;

Figure **13** is a block diagram of a gateway shown in Figure **1**;

Figure **14** is a tabular representation of an SIP invite message transmitted between the gateway and a call controller illustrated in Figure **1**;

Figure **15** is a block diagram of the call controller illustrated in Figure **1**;

Figure **16** is a flow chart of a process executed by the call controller illustrated in Figure **1**;

Figure **17** is a tabular representation of an RC request message transmitted between the call controller and the routing controller illustrated in Figure **1**

Figures **18**A–**18**C are a flow chart of a process executed by the routing controller illustrated in Figure **1**; and

Figure **19** is a tabular representation of a gateway node association table stored in the database illustrated in Figure **1**.

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DETAILED DESCRIPTION

Referring to Figure **1**, a system for enabling a mobile telephone to initiate a call to a callee is shown generally at **10**. The system **10** includes a first node **11**, a second node **21**, and a mobile telephone **12**.

The first and second nodes **11** and **21** in the illustrated embodiment may support "voice-over-IP" (VoIP) calls between telephones and/or videophones using the internet protocol (IP), as described in PCT Publication No. WO **2008/052340**, which is hereby incorporated by reference in its entirety herein. In the embodiment shown, the first node **11** is located in a geographical area, such as Vancouver, British Columbia, Canada, for example, and the second node **21** is located in London, England, for example. Different nodes may be located in different geographical regions throughout the world to provide telephone/videophone service to subscribers in respective regions. These nodes may be in communication with each other by high speed/high data throughput links including optical fiber, satellite, and/or cable links illustrated generally at **17**, forming a backbone to the system. These nodes may alternatively, or in addition, be in communication with each other through conventional internet services.

In the embodiment shown, the first node **11** provides telephone/videophone service to western Canadian customers from Vancouver Island to Ontario. Another node (not shown) may be located in Eastern Canada to provide services to subscribers in that area, for example.

Other nodes of the type shown may also be employed within the geographical area serviced by a node to provide for call load sharing, for example, within a region of the geographical area serviced by the node. However, in general, all nodes may be similar and have the properties described in connection with the first node **11**.

In this embodiment, the first node **11** includes a call controller (CC) **13**, an access server **14**, a routing controller (RC) **30,** a database **23**, a voicemail server **19,** and a media relay **28**. Each of these may be implemented as separate modules on a common computer system or by separate computers, for example. The voicemail server **19** need not be included in the node and can be provided by a third party service provider. Although the access server **14** is illustrated as being part of the first node **11**, access servers in alternative embodiments may be separate from the node and may be in communication with one or more nodes, for example.

The mobile telephone **12** is configured to place calls over a mobile telephone network, illustrated generally at **15**, in a manner well-known in the art. Furthermore, the mobile telephone **12** and the access server **14** are configured to communicate with each other, preferably on a non-voice network illustrated generally at **16**, such as a "WiFi" wireless IP network or a General Packet Radio Service (GPRS) network, for example. However, in alternative embodiments, the mobile telephone **12** and the access server **14** may communicate with each other over other networks, such as a mobile telephone network using Short Message Service (SMS) messages, for example.

The system **10** further includes a gateway **18** in communication with at least one, and preferably a plurality of, channels, which are illustrated schematically at **20**, **22**, and **24**, to which the mobile telephone **12** may initiate a call over the mobile telephone network **15**. The channels **20**, **22**, and **24** maybe telephone lines in a Public Switched Telephone Network (PSTN) **29**. The channels **20**, **22**, and **24** maybe associated with PSTN telephone numbers in a local calling area associated with the mobile telephone **12**, and thus these channels preferably depend on a geographical location of the mobile telephone. The expression "local calling area" herein refers generally to a set of telephone numbers, typically defined by a geographical region, to which telephone calls may be placed by callers within the local calling area at either no additional charge or at a lower additional charge than would be required for calls to

numbers that are outside of the local calling area. However, it will be appreciated that in other embodiments, the gateway **18** may be in communication with any number of channels, which need not be PSTN telephone lines. Also, in the illustrated embodiment, the channels **20**, **22**, and **24** are associated with telephone numbers for Vancouver, British Columbia, Canada and the surrounding area, although it will be appreciated that these channels may include PSTN telephone lines associated with other areas, for example, which may not necessarily be in a local calling area associated with the mobile telephone **12**.

In the illustrated embodiment, each of the channels **20**, **22**, and **24** is configured by a PSTN service provider (which, in Canada, may be Bell Canada or Telus, for example) to direct calls that are received on the channels to the gateway **18**. In the illustrated embodiment, the PSTN service provider has configured the channels **20**, **22**, and **24** to communicate with a **T1** multiplexer **25**, which multiplexes the channels **20**, **22**, and **24** in a manner known in the art onto one or more T1 lines **27** that are in communication with the gateway **18**. The gateway **18** is in communication with an IP network shown generally at **26**. The channels **20**, **22**, and **24** are thus configured to cooperate with the IP network **26** (via the gateway **18** in the illustrated embodiment) to cause a call involving the mobile telephone **12** and the callee to be routed through the IP network in response to a call received at one of the channels.

Also, in the illustrated embodiment, the access server **14** is in communication with the routing controller **30** of the first node **11**, and the routing controller **30** is configurable to associate a callee identifier with one of the channels **20**, **22**, and **24**, as described below. A callee identifier associated with one of the channels **20**, **22**, and **24** may be a telephone number of a PSTN telephone **32** that is in communication with the IP network **26** through a gateway **34**, or it may be a telephone number of a VoIP telephone **36** that is directly in communication with the IP network **26**, for example. Other routing controllers **30** of other nodes, such as the second node **21**, for example, may also

associate callee identifiers with other channels that are in communication with other gateways (not shown).

Mobile Telephone

Referring to Figure **2**, in this embodiment, the mobile telephone (**12**) includes a processor circuit shown generally at **50**. The processor circuit **50** includes a microprocessor **52**, a program memory **54**, an input/output (I/O) port **56**, parameter memory **58**, and temporary memory **60**. The program memory **54**, I/O port **56**, parameter memory **58**, and temporary memory **60** are all in communication with the microprocessor **52**. The processor circuit **50** may alternatively include a plurality of processors, a plurality of program memories, a plurality of temporary memories, and/or a plurality of I/O ports, or these components may alternatively be combined into a single device. However, for simplicity, the components of the processor circuit **50** are illustrated as shown in the example of Figure **2**.

In the illustrated embodiment, the I/O port **56** includes a dialing input **62** for receiving a callee identifier from a key pad, for example, or from a voice recognition unit, or from pre-stored callee identifiers stored in the parameter memory **58**, for example. For illustration purposes only, a myriad of possible dialing functions for providing a callee identifier are represented by the block entitled dialing function **64**. A callee identifier may be a telephone number of a callee, for example.

The I/O port **56** also includes a handset interface **66** for receiving and producing signals to and from a handset **68** that may be placed close to the user's ear and mouth, for producing and receiving audible signals for and from the user. It will be appreciated that alternatively, the handset **68** may include a camera and video screen, for example, and that video or other types of signals may be transmitted additionally or alternatively to audible signals.

The I/O port **56** also includes a non-voice network interface **70** for transmitting information to, and receiving information from, the non-voice network **16**

illustrated in Figure **1**, for example, and preferably interfaces with a high-speed internet connection.

The I/O port **56** in the illustrated embodiment further includes a mobile telephone network interface **72** for transmitting signals to and receiving signals from a mobile telephone service provider over a network such as a Global System for Mobile communications (GSM) or a Code Division Multiple Access (CDMA) network, such as the mobile telephone network **15** illustrated in Figure **1**, for example. Again, for simplicity, a mobile telephone network interface is illustrated, although it will be appreciated that video signals or other signals may be handled similarly when the mobile telephone (**12**) is facilitating communication of one or more of these types of signals. It will also be appreciated that alternatively, the non-voice network interface **70** and mobile telephone network interface **72** need not be distinct, but may be a single interface for communication over a single network, for example, or may be configured to communicate over a plurality of different networks, for example.

In the illustrated embodiment, the parameter memory **58** includes a username field **74** and a password field **76**, although it will be appreciated that the username and password may not be necessary, or may be input by the user as required, for example. The parameter memory **58** in the illustrated embodiment also includes a caller identifier field **78** for storing a caller identifier, which may be a telephone number associated with the mobile telephone (**12**) for identifying a "channel" such as a telephone line assigned to the mobile telephone that may be used to call back to the mobile telephone, for example. Generally, the contents of the username field **74**, the password field **76**, and the caller identifier field **78** are set once when the user first subscribes to the system.

The usernames referred to herein, such as the username in the username field **74**, preferably include a twelve digit number such as **2001 1050 8667**, for example, wherein the left-most digit is a continent code (such as "**2**" to

indicate North America, for example), followed by a three-digit country code (such as "**001**" to indicate Canada and the United States, for example), a four-digit dealer code (such as "**1050**", for example), and a unique four-digit number code (such as "**8667**", for example), as discussed more generally in PCT Publication No. **2008/052340**. Therefore, a prefix of a username referred to herein preferably indicates a geographical region associated with the user, or with the access code, and more preferably indicates a node associated with the user or access code.

The program memory **54** stores blocks of codes for directing the microprocessor **52** to carry out the functions of the mobile telephone (**12**), which are illustrated by example below.

Referring to Figures **2** and **3**, a flow chart representing functions performed by blocks of code that direct the microprocessor **52** to initiate a call with the mobile telephone **12** to a callee is shown generally at **100**. The blocks shown in Figure **3** generally represent codes that may be stored in the program memory **54** for example, for directing the microprocessor **52** to perform various functions relating to initiating a call with the mobile telephone (**12**) to a callee. The actual code to implement each block may be written in any suitable programming language, such as Java, C, and/or C++, for example.

The process **100** begins at **102**, in response to an interrupt produced at or for the microprocessor **52** by the dialing function **64**. Upon initiation of the process **100**, block **104** directs the microprocessor **52** to obtain a callee identifier from the dialing function **64** at the dialing input **62** of the I/O port **56** in the illustrated embodiment. The callee identifier is associated with a desired callee, and may be a telephone number of the callee, for example. The microprocessor **52** thus receives, from a user of the mobile telephone (**12**), a callee identifier associated with a callee.

Block **106** directs the microprocessor **52** to transmit, using the non-voice network interface **70** in the illustrated embodiment, an access code request

message, the access code request message including the callee identifier obtained at block **104**, to the access server **14** (illustrated in Figure **1**). In general, preferably block **106** directs the microprocessor **52** to cause an access code request message to be transmitted to the access server **14** over a non-voice network, such as an internet, using WiFi or GPRS technology for example. However, it will be appreciated that block **106** may direct the microprocessor **52** to transmit an access code request message to the access server **14** using any suitable technique, which may alternatively include a voice network, for example.

Referring to Figure **4**, an exemplary access code request message is shown generally at **110**. The access code request message **110** includes a username field **112**, a password field **114**, a callee identifier field **116**, and a caller identifier field **118**. In the illustrated embodiment, values for the username, password, and caller identifier fields **112**, **114**, and **118** are retrieved from the username, password, and caller identifier fields **74**, **76**, and **78** respectively in the parameter memory **58** of the processor circuit **50** (illustrated in Figure **2**), and a value for the callee identifier field **116** is obtained from the dialing function **64** in block **104**, and may be stored in the temporary memory (**60**), for example. It will be appreciated that the username field **112**, password field **114**, and caller identifier field **118** are not essential, although these fields are preferable in order to identify the user of the mobile telephone for billing purposes, for example.

Referring to Figures **1** and **4**, it will be appreciated that in order to minimize charges from the mobile telephone service provider of the mobile telephone **12**, the channels **20**, **22**, **24** will preferably be local or relatively inexpensive telephone lines associated with a geographical location, more particularly a pre-defined local calling area, associated with the mobile telephone **12**. Therefore, the exemplary access code request message **110** further includes a location identifier field **119**. The location identifier stored in the location identifier field **119** preferably identifies a location of the mobile telephone **12**

for use in determining a local calling area associated with the mobile telephone **12**.

For example, the location identifier in the location identifier field **119** may include an IP address of the mobile telephone **12** in a wireless IP network, such as the non-voice network **16** to which the non-voice network interface **70** shown in Figure **2** is connected, because this IP address may be an indicator of a geographical location of the mobile telephone **12**. The location identifier may also or alternatively include an identifier of a wireless voice signal station in wireless communication with the mobile telephone. In the illustrated embodiment, the wireless voice signal station is part of the mobile telephone network **15** that is in communication with the mobile telephone **12** through the mobile telephone network interface **72** illustrated in Figure **2**. In still other embodiments, the location identifier may include a user-configured identifier of a geographical location or local calling area where the mobile telephone **12** is or may be situated. The location identifier may thus be pre-determined and stored in the parameter memory **58** shown in Figure **2** or may be acquired from non-voice network or wireless voice signal station or from user input, for example. Therefore, in summary, the location identifier in the location identifier field **119** may include one or more of an IP address of the mobile telephone **12** in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier.

As described below, the location identifier in the location identifier field **119** may be used to determine a local calling area associated with the mobile telephone **12**, within which local calling area channels (illustrated as **20**, **22**, and **24** in Figure **1**) are available to the mobile telephone **12** for the lowest cost to the user. However, it will be appreciated that the location identifier may only approximately identify a local calling area, and may not necessarily identify the lowest cost channel (illustrated as **20**, **22**, and **24** in Figure **1**) for the mobile telephone **12**. It will also be appreciated that in other embodiments, the location identifier field **119** may be omitted.

Referring back to Figure **3**, the process **100** continues at block **130**, which directs the microprocessor (**52**) to receive an access code reply message from the access server (**14**) in response to the access code request message that was transmitted at block **106**.

Referring to Figure **5**, an exemplary access code reply message is shown generally at **140**. The access code reply message **140** includes an access code field **142** and a timeout field **144**. In the illustrated embodiment, the access code field **142** stores an access code which is a telephone number associated with a telephone line associated with one of the channels **20**, **22**, or **24** in Figure **1**. It will be appreciated that the access code is different from the callee identifier in the callee identifier field **116** shown in Figure **4**, in that the access code identifies a channel, other than that provided by the callee identifier provided by the dialing function **64** in Figure **2**, that the mobile telephone (**12**) can use to initiate a call to the callee. It will be appreciated that use of the access code facilitates avoidance of long distance or roaming charges that a mobile telephone service provider would charge for a call placed directly using the callee identifier using conventional calling processes, for example.

Still referring to Figure **5**, the timeout field **144** in the illustrated embodiment stores a value that indicates a period of time, for example a number of minutes, during which the access code in the access code field **142** is associated with the callee identifier in the callee identifier field **116** of the exemplary access code request message **110** illustrated in Figure **4**, such that the access code is only temporarily associated with the callee identifier. In one embodiment, the value stored in the timeout field **144** indicates **10** minutes, for example. It will be appreciated that in other embodiments, the timeout field **144** may not be necessary, but preferably it is included.

In the illustrated embodiment, the program codes in block **130** direct the microprocessor **52** to receive the access code reply message over a non-

voice network, such as a WiFi or GPRS network (illustrated at **16** in Figure **1**) via the non-voice network interface **70** shown in Figure **2**. However, it will be appreciated that the access code reply message may be received on any suitable network, even a voice network, for example.

Referring back to Figures **2** and **3**, block **149** directs the microprocessor **52** to initiate a call with the mobile telephone (**12**) on the mobile telephone network **15** (illustrated in Figure **1**) using the access code received in the access code field **142** of the access code reply message **140** (shown in Figure **5**) to identify the callee. In the illustrated embodiment, the codes in block **149** direct the microprocessor **52** to initiate a call to the channel (**20**, **22**, or **24**) identified by the access code, using the mobile telephone network interface **72** of the I/O port **56** of the mobile telephone (**12**), to engage the mobile telephone network (**15**).

Referring to Figure **1**, in the embodiment shown, the access code in the access code field (**142**) is a telephone number identifying a channel **20**, **22**, or **24** that is in communication with the gateway **18** to the IP network **26**. Through the gateway **18**, the channel **20**, **22**, or **24** is thus operably configured to cooperate with the IP network **26** to cause a call from the mobile telephone **12** to the callee to be routed through the IP network. Routing the call through the IP network may involve engaging the routing controller **30** to route the call on the IP network **26** to the callee, as described below. However, it will be appreciated that in other embodiments, the access code need not be a telephone number, but may be any code identifying a channel through which the mobile telephone **12** can initiate a call. Alternatively, if the mobile telephone is capable of voice over IP communications, the access code may be used to identify an IP address in the IP network to which the call is routed. In this embodiment, the IP address may act as the access code. The process **100** shown in Figure **3** is then ended.

Access Server

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Referring to Figure **6**, the access server (**14**) includes a processor circuit shown generally at **150**. The processor circuit **150** includes a microprocessor **152**, program memory **154**, an I/O port **156**, parameter memory **158**, and temporary memory **160**. The program memory **154**, I/O port **156**, parameter memory **158**, and temporary memory **160** are all in communication with the microprocessor **152**. The processor circuit **150** may alternatively include a plurality of microprocessors or I/O ports, for example, and the components of the illustrated processor circuit **150** may also alternatively be combined into a single device.

The program memory **154** stores blocks of codes for directing the microprocessor **152** to carry out the functions of the access server **14**. The I/O port **156** includes a non-voice network interface **162** for communicating with the non-voice network **16** illustrated in Figure **1**. The I/O port **156** also includes a routing controller interface **164** for interfacing with the routing controller **30** illustrated in Figure **1**.

Referring to Figures **6** and **7**, a flow chart of blocks of code for directing the microprocessor **152** of the access server (**14**) to provide an access code to the mobile telephone (**12**) is shown generally at **190**. The blocks **190** in Figure **7** generally represent codes that may be stored in the program memory **154** for directing the microprocessor **152** to perform various functions to provide the access to the mobile telephone (**12**) to enable the mobile telephone to place a call through a channel (**20**, **22**, or **24**).

The process **190** begins at **192**, in response to an interrupt created by or for the microprocessor **152** when it receives an access code request message **110** (as illustrated in Figure **4**) from the mobile telephone (**12**). In the illustrated embodiment, the access code request message (**110**) is received via the non-voice network interface **162** through a non-voice network (**16**) such as a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may use different techniques for receiving the access code request message (**110**) from the mobile telephone (**12**).

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The process **190** continues at block **196**, which directs the microprocessor **152** to communicate with the routing controller **30** to obtain from the routing controller an access code identifying a channel (illustrated as **20**, **22**, or **24** in Figure **1**) in communication with the gateway (**18**), wherein the access code is different from the callee identifier in the callee identifier field **116** (shown in Figure **4**) and is usable by the mobile telephone (**12**) to initiate a call to the callee using the channel, as further described below. Therefore, block **196** preferably causes an access code to be produced by retransmitting the access code request message **110** illustrated in Figure **4** that was received at **192** from the mobile telephone (**12**), to the routing controller **30** through the routing controller interface **164** of the I/O port **156**.

The process **190** continues at block **198**, which directs the microprocessor **152** to transmit an access code reply message (**140**), including the access code obtained by block **196**, to the mobile telephone (**12**). An exemplary access code reply message is shown in Figure **5**. In the illustrated embodiment, an access code reply message (**140**) is produced by the routing controller **30** in a manner described below in response to the access code request message (**110**) that was transmitted to the routing controller at block **196**, and the access code reply message (**140**) is received from the routing controller through the routing controller interface **164** of the I/O port **156**. Block **198** then causes the access code reply message that was received from the routing controller to be retransmitted to the mobile telephone (**12**). In the illustrated embodiment, the codes in block **198** direct the microprocessor **152** to transmit the access code reply message (**140**) using the non-voice network interface **162** to the non-voice network **16**, which may be a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may employ other types of networks for communicating the access code reply message (**140**) to the mobile telephone (**12**). The process **190** is then ended.

In summary, referring to Figure **1**, the access server **14** generally acts as an interface to the routing controller **30** for relaying access code request

messages and access code reply messages between the mobile telephone **12** and the routing controller. Therefore, it will be appreciated that in alternative embodiments, the access server **14** and the routing controller **30** need not be separate, but may, for example, be combined in a single component.

Routing Controller (RC)

Referring to Figure **1**, generally, the routing controller **30** executes a process to facilitate communication between callers and callees. The function of a routing controller generally in a VoIP system is described in PCT Publication No. WO **2008/052340**.

Referring to Figure **8**, the routing controller (**30**) includes a processor circuit shown generally at **230**. The processor circuit **230** includes a microprocessor (or more generally a processor) **232**, program memory **234**, an I/O port **236**, table memory **238**, temporary memory **240**, and a clock **244**. The program memory **234**, I/O port **236**, table memory **238**, temporary memory **240**, and clock **244** are all in communication with the processor **232**. The processor circuit **230** may include a plurality of microprocessors, for example, and the aforementioned components of the processor circuit **230** may be combined, for example. The program memory **234** includes blocks of code for directing the processor **232** to carry out the functions of the routing controller (**30**), and the I/O port **236** includes an access server interface **242** for communicating with the access server **14**.

In the illustrated embodiment as described above, the access server (**14**) transmits (at block **196** illustrated in Figure **7**) an access code request message (**110**) to the routing controller (**30**) in order to obtain from the routing controller (**30**) an access code. When an access code request message (**110**) is received at the access server interface **242**, the processor **232** preferably stores certain values from the access code request message in stores in the temporary memory **240** for ease of retrieval. In particular, the temporary memory **240** includes a callee identifier store **246** for storing the callee

identifier from the callee identifier field **116** in the access code request message **110** illustrated in Figure **4**, a caller identifier store **248** for storing the caller identifier that was stored in the caller identifier field **118** of the access code request message **110** illustrated in Figure **4**, a caller username store **249** for storing the caller username that was stored in the caller username field **112** of the access code request message **110** illustrated in Figure **4**, and an access code store **250** for storing an access code that is selected when the routing controller (**30**) receives an access code request message (**110**). The temporary memory **240** also includes a local calling area identifier store **245** for storing an identifier of a local calling area associated with the mobile telephone (**12**). The clock **244** generally maintains and stores a representation of a current date and time.

The I/O port **236** further includes a database request port **256** through which a request to the database (**23** in Figure **1**) can be made, and also includes a database response port **258** for receiving a reply from the database (**23**). The I/O port **236** further includes a routing controller (RC) request message input **260** for receiving an RC request message (illustrated in Figure **17**) from the call controller (**13** in Figure **1**) and includes a routing message output **262** for sending a routing message back to the call controller **13**. The I/O port **236** thus acts to receive a caller identifier and a callee identifier contained in an RC request message from the call controller, the RC request message being received in response to initiation of a call by a subscriber of the system, as described below.

The program memory **234** includes blocks of codes for directing the processor **232** to carry out various functions of the routing controller (**30**). One of these blocks includes an RC request message handler **380** which directs the routing controller (**30**) to produce a routing message in response to a received RC request message, an example of which is illustrated in Figure **17**. The RC request message handler process is shown in greater detail at **380** in Figures **18**A through **18**C. Another of these blocks in the program memory **234** includes an access code generator, which is described at **270** in Figure **12**,

and which directs the routing controller (**30**) to produce an access code as directed by the program codes in block **196** shown in Figure **7**. Yet another of these blocks in the program memory **234** includes a local calling area identifier generator, which directs the routing controller (**30**) to produce a local calling area identifier using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**.

Local Calling Area Identifier Generator

Referring to Figure **1**, it will be appreciated that preferably, a call made by the mobile telephone **12** using the access code obtained from the access server **14** will be a local call for the mobile telephone **12**, based on a geographical location of the mobile telephone. Therefore, blocks in the program memory **234** include a local calling area identifier generator, which directs the routing controller **30** to produce a local calling area identifier.

For example, the local calling area identifier generator may direct the microprocessor **152** to access a dialing profile associated with the caller. The dialing profile may be identified using the username in the username field **112** in the access code request message **110** illustrated in Figure **4**, and to store in the local calling area identifier field **245** a default location of the caller retrieved from the dialing profile associated with the caller.

Referring to Figure **9**, an exemplary dialing profile is illustrated generally at **200** and includes a username field **202**, a domain field **204**, and calling attributes comprising a national dialing digits (NDD) field **206**, an international dialing digits (IDD) field **208**, a country code field **210**, a local area codes field **212**, a caller minimum local number length field **214**, a caller maximum local number length field **216**, a reseller field **218**, a maximum number of concurrent calls field **220**, a current number of concurrent calls field **222**, and a default local calling area identifier field **224**. Therefore, in some embodiments, the local calling area identifier generator directs the

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microprocessor **152** to determine a local calling area associated with the mobile telephone (**12**) by retrieving the default local calling area identifier from the default local calling area identifier field **224** of the dialing profile **200**.

Effectively, the dialing profile **200** is a record identifying calling attributes of the caller identified by the username in the username field **202**. More generally, dialing profiles **200** represent calling attributes of respective users, and are discussed in more detail in PCT publication No. WO **2008/052340**. As described in PCT publication No. WO **2008/052340**, a dialing profile of the type shown in Figure **9**, and also other records such as direct-in-dial (DID) records, call blocking records, call forwarding records, and voicemail records, may be created whenever a user registers with the system or agrees to become a subscriber to the system.

Alternatively, the local calling area identifier generator may generate a local calling area identifier to be stored in the local calling area identifier store **245** using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**. As described above, the location identifier field (**119**) may store one or more of an IP address of the mobile telephone (**12**) in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier. One or more of these values may be used to identify a local calling area that is or is likely to be associated with the mobile telephone (**12**) in order to generate a local calling area identifier to be stored in the local calling area identifier store **245**.

For example, it has been found that services available from web sites such as http://www.ip2location.com/ and http://www.serviceobjects.com/products/dots_ipgeo.asp, for example, can produce a name of a location, and also latitude and longitude values, associated with an IP address. Using this information derived from an IP address, or other information from the location identifier field (**119**), a local calling area may be identified by hierarchical jurisdictional designations (such as country, province, and city in Canada or

country, state, and city in the United States) and encoded as codes identifying the local calling area. These codes may then be stored in the local calling area identifier store **245**.

Access Code Association Table

In the illustrated embodiment, the table memory **238** (shown in Figure **8**) includes an access code association table **170**, an example of which is illustrated in Figure **10**, for associating access codes with callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps. Although the routing controller (**30**) is illustrated in this embodiment as a separate component from the access server (**14**), it will be appreciated that in other embodiments, the routing controller (**30**) may be part of or integrated with the access server (**14**), and in these other embodiments, the access code association table **170** may be part of or integrated with the access server.

Referring to Figures **1** and **10**, the access code association table **170** generally includes a plurality of records, each having an access code field **173** storing an access code. The access codes in the access code association table **170** may thus form a pool of access codes, where each access code may identify a respective telephone number. In the illustrated embodiment, the access codes in the access code fields **173** of records of the access code association table **170** identify respective channels (illustrated by example only as **20**, **22**, and **24**) that are operably configured to cooperate with the IP network **26** via the gateway **18** to cause a call involving the mobile telephone **12** to be routed through the IP network.

Referring to Figure **10**, the exemplary access code association table **170** includes records **172**, **174**, **176**, **178**, and **180**, each having respective fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175**, a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**. Generally, a record in the access code association table **170** will be created for each access code that identifies a channel (such as the channels **20**, **22**, and **24** illustrated in Figure **1**) that is

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configured or configurable to establish communication through a gateway (such as the gateway **18** illustrated in Figure **1**) to an IP network (**26** in Figure **1**) in response to a call received at the channel. When a record is created in respect of a channel, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel, the access code field **173** is preferably initialized with an access code associated with the channel, and the channel identifier field **175** is preferably initialized with an identifier of the channel. The remaining fields (for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**) are preferably initialized with default "null" values when a record is created. The fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175** preferably remain generally constant during ordinary operation of the access code association table **170**, although the values stored in the fields for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may vary as described below. It will be appreciated that in some embodiments, one or more of the fields for storing a local calling area identifier **171**, a channel identifier **175**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may not be required and be omitted.

As noted above, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel. The local calling area identifier field **171** preferably stores codes that are encoded in the same manner as the codes in the local calling area identifier store **245**, as described above, so that an access code in the local calling area identified by the codes in the local calling area identifier store **245** may be identified by searching the access code association table **170** for an access code associated with a local calling area identifier in the associated local calling area identifier field **171** that matches the local calling area identifier in the local calling area identifier store **245**. It has been found that information available from web sites such as http://en.wikipedia.org/wiki/List_of_NANP_area_codes, and services available from web sites such as

http://www.serviceobjects.com/demos/PhoneExchangeDemo.asp, for example, may be used to determine a local calling area identifier associated with a given access code where, for example, the access code is a PSTN telephone number.

In the exemplary access code association table **170**, the access codes in the access code fields **173** are telephone numbers for PSTN lines, three of which are in the **604** area code in Vancouver, British Columbia, Canada, and two of which are in the **416** area code in Toronto, Ontario, Canada. It will be appreciated that the access code association table **170** is an example only, and other access code association tables may include any number of access codes, which need not be PSTN telephone numbers, and which need not be limited to particular geographical areas.

In the exemplary access code association table **170**, the access code field **173** in the record **174** stores an access code **1-604-345-2323**, which may be a local telephone number for Vancouver, British Columbia, Canada, and the callee identifier field **177** of the record **174** stores a callee identifier **1-403-789-1234**, which may be a telephone number for a callee in Calgary, Alberta, Canada for example, thereby associating the callee identifier **1-403-789-1234** with the access code **1-604-345-2323**. Furthermore, the caller identifier field **179** of the record **174** stores a caller identifier **1-416-444-1441** and the caller username field **183** stores a caller username **2001 1050 8667**, thereby associating the caller identifier **1-416-444-1441** and caller username **2001 1050 8667** with the aforementioned access code and callee identifier. The caller identifier **1-416-444-1441** may be associated with a mobile telephone normally geographically located in Toronto, Ontario, Canada, but which may be in Vancouver and is therefore using a Vancouver-based access code to place a call to a Calgary-based number, for example. In the example record **174**, the timestamp field **182** indicates that the callee identifier **1-403-789-1234**, the caller identifier **1-416-444-1441**, and the caller username **2001 1050 8667** were associated with the access code **1-604-345-2323** on June **15**,

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2008 at **10:31** am, and the timeout field **181** indicates that this association is to expire **10** minutes after the time indicated in the timestamp field.

Likewise, the exemplary record **178** indicates that the callee identifier **1-604-321-1234**, the caller identifier **1-416-444-1234**, and the caller username **2001 1050 4141** were associated with the access code **1-416-234-4646** on June **15**, **2008** at **2:21** pm, and the timeout field **181** of the record **178** indicates that this association is to expire within **10** minutes of the time in the timestamp field **182**.

It will also be appreciated that the access code association table **170** may, in other embodiments, be substituted with other data structures or storage media. For example, in alternative embodiments, as described below, a DID record of the type shown at **370** in Figure **11** may associate an access code with a callee identifier and with other information such as a caller identifier, a timeout value, and a timestamp value, additionally or alternatively to the access code association table **170**.

DID Bank Table Records

As described in PCT Publication No. **2008/052340**, a DID bank table record may be created and stored in a DID bank table in the database (**23** in Figure **1**) when a user registers with the system, to associate the username of the user and a host name of the node with which the user is associated, with a number on the PSTN network formatted in compliance with the **E.164** standard set by the International Telecommunication Union (ITU). However, as explained below, DID records may, in some embodiments, also associate usernames and host names with respective access codes, and may also associate access codes with respective callee identifiers and with other information such as caller identifiers, timeout values, and timestamp values.

Referring to Figure **11**, an exemplary DID bank table record is shown generally at **370**, and includes a username field **371**, a user domain field **372**, and a DID field **373**. The username field **371** may store a username of a user

of the system, in which case the user domain field **372** stores a host name of the node with which the user is associated, and the DID field **373** stores an E.**164** number on the PSTN network associated with the user. Exemplary host names stored in the user domain field **372** include sp.yvr.digifonica.com for Vancouver, British Columbia, Canada and sp.lhr.digifonica.com for London England, for example, as described in PCT Publication No. **2008/052340**. If the user has multiple telephone numbers, then multiple records of the type shown at **370** would be included in the DID bank table, each having the same username and user domain, but different DID field **373** contents reflecting the different telephone numbers associated with that user.

However, DID fields **373** of DID bank table records **370** may also store access codes, in which case the username field **371** may store a username associated with the access code. In these DID bank table records **370**, the user domain field **372** stores a host name of the node with which the access code is associated. Therefore, DID bank table records **370** may, in some embodiments, associate usernames and host names with respective access codes.

The exemplary DID bank table record **370** further includes a callee identifier field **374**, a caller identifier field **375**, a timeout field **376**, a timestamp field **377**, a local calling area identifier field **378**, a channel identifier field **379**, and a caller username field **381**, which may be used in an analogous manner to the callee identifier field **177**, the caller identifier field **179**, the timeout field **181**, the timestamp field **182**, the local calling area identifier field **171**, the channel identifier field **175**, and the caller username field **183** respectively of the access code association table **170** illustrated in Figure **10**. The DID bank table records **370** may thus associate access codes with respective local calling area identifiers, callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps, although the caller identifier field **375**, timeout field **376**, timestamp field **377**, local calling area identifier field **378**, channel identifier field **379**, and caller username field **381** may not be necessary, and one or more of these fields may be omitted in some embodiments.

Furthermore, it will be appreciated that the callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may be omitted for DID table records that are not in respect of access codes, but rather are in respect of telephone numbers of users of the system, for example, as described in PCT Publication No. **2008/052340**. The callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may also be omitted in embodiments where the access code association table **170** includes records with these types of fields.

For simplicity, the following description is directed to embodiments wherein an access code association table **170** associates access codes with respective callee identifiers, caller identifiers, timeout values, and timestamp values. However, it will be appreciated that the processes described herein for records in the access code association table **170** may additionally or alternatively be applied to DID bank table records **370** in an analogous manner.

Access Code Generator

Referring back to Figures **1**, **4**, and **8** in the illustrated embodiment as described above, the access server **14** transmits (at block **196** illustrated in Figure **7**) an access code request message **110** to the routing controller **30** in order to obtain from the routing controller **30** an access code. When an access code request message **110** is received at the access server interface **242**, the processor **232** preferably authenticates the user by making various enquiries of databases to which it has access, to determine whether or not the password in the password field **114** of the access code request message **110** matches a password stored in the database in association with the username in the username field **112**. Various functions may be used to pass encryption keys or hash codes back and forth to ensure that the transmittal of passwords is secure. If the user is successfully authenticated, the processor **232** then preferably produces an access code.

Referring to Figures **8** and **12**, a process for producing an access code is shown generally at **270**. Essentially the process **270** determines whether the access code in a given record (referred to below as the "currently addressed record") in the access code association table shown at **170** in Figure **10** is within the local calling area identified by the local calling area identifier store **245**, and whether the access code is currently available for association with a callee identifier. In order to produce an access code in response to receiving an access code request message (**110**) from the access server (**14**), the processor **232** of the routing controller (**30**) preferably searches the pool of access codes in the access code association table (**170**) to identify an access code identifying a channel usable by the mobile telephone (**12**) to initiate a call to the callee, using the process **270** until an available access code in the local calling area identified by the local calling area identifier store **245** is identified. The access code generator thus preferably selects an access code from the pool of access codes in the access code association table (**170**), and preferably selects an access code in a local calling area associated with the mobile telephone (**12**).

Starting with the first record in the access code association table, the process **270** begins at block **272**, which directs the processor **232** of the routing controller (**30**) to determine whether the access code in the currently addressed record of the access code association table **170** is associated with the same local calling area as the mobile telephone (**12**) as identified by the contents of the local calling area identifier store **245**. If at block **272** the access code of the currently addressed record is not associated with the same local calling area as the mobile telephone (**12**), the process **270** ends, the next record in the access code association table **170** is addressed, and the process is repeated for the next record in the access code association table.

However, if at block **272** the access code of the currently addressed record is associated with the same local calling area as the mobile telephone (**12**), or if the access code request message **110** (illustrated in Figure **4**) did not include

a local calling area identifier, then the process **270** continues at block **274**, which directs the processor **232** to determine whether the access code of the currently addressed record is associated with a callee identifier. To do this, the processor **232** determines whether the callee identifier field (**177**) of the currently addressed record stores a "null" value that was assigned to it on initialization, or whether the callee identifier field instead stores a callee identifier. In other words the processor checks to see whether the currently addressed record has already been in use.

If at block **274** the callee identifier field (**177**) of the currently addressed record in the access code association table (**170**) does store a callee identifier and not the "null" value that was assigned to the callee identifier field on initialization (for example, records **174** and **178** in Figure **10**), then the access code of that record is associated with a callee identifier, and the process **270** continues at block **278**, which directs the processor **232** to determine whether the association of the callee identifier with the access code has expired. In the illustrated embodiment, the codes at block **278** direct the processor **232** to determine whether the sum of the contents of the timestamp field (**182**) and of the timeout field (**181**) in the currently addressed record of the access code association table **170** (shown in Figure **10**) is less than the current time represented by the clock **244**. If at block **278** the sum of the timeout and timestamp fields in the currently addressed record of the access code association table **170** is less than the time represented by the clock **244**, then the association of the callee identifier with the access code is not expired and the process **270** ends, the next record in the access code association table (**170**) is addressed, and the process **270** is repeated for the next record in the access code association table.

However, if at block **278** the sum of the contents of the timeout and timestamp fields (**181** and **182**) in the currently addressed record of the access code association table (**170**) is not less than the time represented by the clock **244**, then the association of the callee identifier with the access code has expired, and the process **270** continues at block **276** which directs the processor **232**

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to store the contents of the access code field **173** of the currently addressed record in the access code store **250** of the temporary memory **240** of the routing controller **30**.

Referring to Figures **8, 10**, and **12**, if at block **274** the callee identifier field in the currently addressed record does not store a callee identifier but stores instead the "null" value that was assigned to the callee identifier field on initialization (for example, records **172**, **176**, and **180**), then the access code of that record is not associated with a callee identifier, and the process **270** continues at block **276**, which directs the processor **232** to store the access code from the access code field **173** of the currently addressed record, in the access code store **250** in the temporary memory **240**.

After the selected access code is stored in the access code store **250** at block **276**, the process **270** continues at block **280**, which directs the processor **232** to store the callee identifier from the callee identifier store **246** in the callee identifier field **177** of the currently addressed record, thereby creating an association of the callee identifier with the selected access code.

The process **270** then continues at block **282**, which directs the processor **232** to store the caller identifier from the caller identifier store **248** (which identifies the mobile telephone **12** shown in Figure **1**) in the caller identifier field **179** of the currently addressed record of the access code association table **170**, thereby also storing the caller identifier in association with the selected access code.

The process **270** then continues at block **283**, which directs the processor **232** to store the caller username from the caller username store **249** in the caller username field **183** of the currently addressed record of the access code association table **170**, thereby also storing the caller username in association with the selected access code.

The process **270** then continues at block **284**, which directs the processor **232** to store timeout and timestamp values in the timeout and timestamp fields **181** and **182** of the currently addressed record of the access code association table **170**, thus further storing, in association with the selected access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire. A default value, such as **10** minutes, for example may be stored in the timeout field **181** of the currently addressed record. Also, the current time indicated by the clock **244** is preferably stored in the timestamp field **182** of the currently addressed record.

In alternative embodiments, the access code association table (**170**) might not include fields for a caller identifier, caller username, a timeout, or a timestamp. In these embodiments, one or more of blocks **282**, **283**, and **284** described above are not necessary, and one or more of the caller identifier store **248** and the caller username store **249** may be omitted.

In summary, the access code generator in the illustrated embodiment responds to receiving an access code request message **110** illustrated in Figure **4** from the access server (**14**) by first authenticating the user, and then by searching through a pool of access codes, using the process **270** shown in Figure **12**, to identify an access code that is associated with the local calling area identified by the local calling area identifier store (**245**) and that is not previously and validly associated with another callee identifier. It will be appreciated that in alternative embodiments, different data structures and algorithms may be preferable for identifying an access code that meets the aforementioned criteria. For example, in accordance with conventional database design that is well-known in the art, the records illustrated in the access code association table **170** illustrated in Figure **10** may alternatively be organized in a binary tree according to the value in the local calling area identifier field **171**, or in separate tables for respective local calling area identifiers, for example, in order to enable a more efficient search of the access code association table for an access code that satisfies the aforementioned criteria. Therefore, the access code association table (**170**)

and the process **270** illustrated in Figure **12** are examples only, and one of ordinary skill in the art will readily appreciate numerous alternative data structures and algorithms.

Gateway

Referring to Figure **13**, in this embodiment, the gateway (**18**) includes a processor circuit shown generally at **300**, which includes a microprocessor **302**. The processor circuit **300** also includes a program memory **304**, a memory **305**, and an I/O port **306**, all of which are in communication with the microprocessor **302**. The processor circuit **300** may include multiple processors etc., and the aforementioned components of the processor circuit **300** may alternatively be combined.

The I/O port **306** includes a channel interface **308**, which, in the illustrated embodiment, is in communication with the channels **20**, **22**, and **24** that were also illustrated in Figure **1**. Where, as in the illustrated embodiment, the channels **20**, **22**, and **24** are PSTN telephone lines in the PSTN network **29**, the channel interface **308** may, for example, be a T**1** port for communication with one or more T**1** lines (illustrated at **27** in Figure **1**) of a PSTN service provider, in a manner well-known in the art. The I/O port in the illustrated embodiment also includes an internet interface **309** for interfacing with the IP network **26** illustrated in Figure **1**. The program memory **304** stores blocks of codes for directing the microprocessor **302** to carry out the functions of the gateway (**18**). It has been found that the AS**5350** Universal Gateway available from Cisco Systems, Inc. of San Jose, California may, for example, be suitable as the gateway (**18**).

Referring back to Figure **1**, and also still to Figure **13**, when a call is received on one of the channels **20**, **22**, or **24**, the microprocessor **302** causes the I/O port **306** to use the internet interface **309** to send a Session Initiation Protocol (SIP) Invite message to a pre-determined node with which the gateway **18** is associated, which in the illustrated embodiment is the first node **11**. Generally, the gateway **18** will be associated with a node that is geographically closest to

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the gateway, in order to minimize transmission times over the IP network **26**. In response to the SIP Invite message, the call controller **13** sends an RC request message to the routing controller **30** which makes various enquiries of the database **23** to produce a routing message that is sent back to the call controller **13**. The call controller **13** then communicates with the media relay **28** to cause a communications link including an audio path (and a videopath if a videophone call) to be established through the media relay to the same node, a different node, or to a communications supplier gateway as shown generally at **34** to carry audio, and where applicable, video traffic to the call recipient or callee.

Referring to Figure **14**, an exemplary SIP Invite message is shown generally at **310** and includes a caller identifier field **312**, a callee identifier field **314**, a digest parameter field **315**, a call identifier field **316**, an IP address field **317**, and a gateway UDP port field **318**. Examples of values for the fields in the SIP Invite message **310** are shown for illustration purposes only in Figure **14**. The caller identifier in the caller identifier field **312** is preferably in the form of the telephone number of the caller followed by the "@" symbol, which in turn is followed by the IP address of the gateway (**18**) in the IP network (**26**). The caller identifier may be determined by retrieving calling line identification (CLID) information from the signal provided by the PSTN network (**29**) to the gateway (**18**) for example. Where the caller identification information is not available to the gateway (**18**), the caller identifier in the caller identifier field **312** preferably includes a pre-assigned number (such as **11111**, for example) indicating that the caller identification information was not available, followed by the "@" symbol and then by the IP address of the gateway (**18**).

The callee identifier in the callee identifier field **314** is the access code identifying the channel (**20**, **22**, or **24** in the example of Figure **1**) on which the call was placed, and which was received from the access server (**14**). In the illustrated example, the access code is the PSTN telephone number **1-604-345-1212** corresponding to the channel **20** illustrated in Figure **1**, and to the

access code stored in the access code field **173** of the record **172** in the exemplary access code association table **170** illustrated in Figure **10**.

The digest parameter in the digest parameter field **315** is generated by the gateway (**18**) and may uniquely identify the SIP session that is initiated with the SIP Invite message **310**.

The call identifier in the call identifier field **316** is, in the illustrated embodiment, a four-digit hexadecimal number generated by the gateway (**18**) to identify the call, followed by the "@" symbol, which in turn is followed by the IP address of the gateway.

The IP address in the IP address field **317** is the IP address of the gateway (**18**) in the IP network (**26**), and the gateway UDP port number in the gateway UDP port field **318** includes a UDP port identifier identifying a UDP port at which the audio/video path will be terminated at the gateway (**18**).

It should be noted that throughout the description of the embodiments of this invention, the IP/UDP addresses of all elements such as the gateway (**18**) will be assumed to be valid IP/UDP addresses directly accessible via the Internet or a private IP network, for example, depending on the specific implementation of the system. As such, it will be assumed, for example, that the gateway (**18**) will have an IP/UDP address directly accessible by the call controllers and the media relays on their respective nodes, and those addresses will not be obscured by Network Address Translation (NAT) or similar mechanisms. In other words, the IP/UDP information contained in SIP messages (for example the SIP Invite message or the RC Request message which will be described below) will match the IP/UDP addresses of the IP packets carrying these SIP messages.

It will be appreciated that in many situations, the IP addresses assigned to various elements of the system may be in a private IP address space, and thus not directly accessible from other elements. Furthermore, it will also be

appreciated that NAT is commonly used to share a "public" IP address between multiple devices, for example between home PCs and IP telephones sharing a single Internet connection. For example, the gateway (**18**) may be assigned an IP address such as **192.168.0.5**. This address is located in so called "non-routable" (IP) address space and cannot be accessed directly from the Internet. In order for this device to communicate with other computers located on the Internet, the IP address has to be converted into a "public" IP address, for example **24.14.102.5** assigned by the Internet Service Provider, by a device performing NAT, typically a router. In addition to translating the IP address, NAT typically also translates UDP port numbers, for example an audio path originating at the gateway (**18**) and using a UDP port **12378** at its private IP address, may have be translated to a UDP port **23465** associated with the public IP address of the NAT device. In other words, when a packet originating from the gateway (**18**) arrives at an Internet-based node, the source IP/UDP address contained in the IP packet header will be **24.14.102.5:23465**, whereas the source IP/UDP address information contained in the SIP message inside this IP packet will be **192.168.0.5:12378**. The mismatch in the IP/UDP addresses may cause a problem for SIP-based VoIP systems because, for example, a node will attempt to send messages to a private address but the messages will never get there.

Call Controller

Referring to Figure **15**, the call controller (**13**) includes a processor circuit shown generally at **320**. The processor circuit **320** includes a microprocessor **322**, program memory **324**, and an I/O port **326**. The program memory **324** and the I/O port **326** are in communication with the microprocessor **322**. The processor circuit **320** may include a plurality of microprocessors, a plurality of program memories, and a plurality of I/O ports to be able to handle a large volume of calls. However, for simplicity, the processor circuit **320** will be described as having only one microprocessor **322**, program memory **324**, and I/O port **326**, it being understood that there may be more.

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Generally, the I/O port **326** includes an input **328** for receiving messages such as the SIP Invite message from the gateway (**18**) or from a VoIP telephone (**36** in Figure **1**, for example). The I/O port **326** also has an RC request message output **330** for transmitting an RC request message to the routing controller **30** of Figure **1**, an RC message input **332** for receiving routing messages from the routing controller **30**, a gateway output **334** for transmitting messages to the gateway **18** and/or **34** shown in Figure **1** to advise the gateway **18** and/or **34** to establish an audio path, for example, and a gateway input **336** for receiving messages from the gateway **18** and/or **34**. The I/O port **326** further includes a SIP output **338** for transmitting messages to the gateway (**18** and/or **34**) or VoIP telephone (**36**, for example) to advise the gateway **18** and/or **34** or IP telephone of the IP addresses of the gateways which will establish the audio/video path. The I/O port **326** further includes a voicemail server input and output **340** and **342** respectively for communicating with the voicemail server **19** shown in Figure **1**.

While certain inputs and outputs have been shown as separate, it will be appreciated that some may be a single IP address and IP port. For example, the messages sent to the routing controller (**30**) and received from the routing controller (**30**) may be transmitted and received on the same single IP port.

The program memory **324** includes blocks of code for directing the microprocessor **322** to carry out various functions of the call controller (**13**). For example, these blocks of code include a first block **344** for causing the processor circuit **320** to execute a SIP Invite to RC Request process to produce an RC Request Message in response to a received SIP Invite message. In addition, there is a Routing Message to Gateway message block **346** which causes the processor circuit **320** of the call controller to produce a gateway query message in response to a received routing message from the routing controller (**30**).

Referring to Figures **15** and **16**, the SIP Invite to RC Request process is shown in more detail at **344**. On receipt of a SIP Invite message of the type

shown in Figure **14**, block **350** directs the processor circuit **320** to produce an RC Request Message. Block **352** then directs the processor circuit **320** to cause the RC Request Message to be sent to the routing controller **30** illustrated in Figure **1**.

Referring to Figure **17**, an exemplary RC request message is shown generally at **360** and includes a caller identifier field **362**, a callee identifier field **364**, a digest parameters field **366**, and a call identifier field **368**. These fields may be populated with the contents of the caller identifier field **312**, callee identifier field **314**, digest parameter field **315**, and call identifier field **316** respectively of the SIP Invite message **310** illustrated in Figure **14**. In other embodiments, the RC request message may further include a type field (not shown) containing a type code to indicate whether the call is from a third party or from a system subscriber. Other variations of an RC request message are explained in PCT Publication No. WO **2008/052340**. A type field (not shown) in the RC request message **360** may be advantageous in embodiments where SIP Invite messages may also be received from an IP telephone that is using VoIP software to make a voice call. However, in the embodiments that are illustrated herein, SIP Invite messages originate from the gateway (**18**), and therefore a type designation is not necessary and may be omitted from the RC request message **360**. In embodiments where a SIP Invite message may be received from an IP telephone, the SIP invite to RC request process shown in Figure **16** may require additional steps, as illustrated in Figure **5** of PCT Publication No. WO **2008/052340**.

RC Request Message Handler

As illustrated in Figure **8**, the program memory **234** includes an RC request message handler **380** which directs the routing controller (**30**) to produce a routing message in response to a received RC request message (**360**). Referring to Figure **18A**, the RC request message handler **380** begins with a first block **382** that directs the RC processor circuit (**230**) to separately store the contents of the callee identifier field **364** and caller identifier field **362** of

the RC request message (**360**) in the callee identifier store **246** and the caller identifier store **248** respectively of Figure **8**.

Block **384** then directs the RC processor circuit (**230**) to use the contents of the caller username store **249** to locate and retrieve from the database (**23**) a dialing profile **200** associated with the caller, as described above and illustrated in Figure **9**, for example. The retrieved dialing profile may then be stored in the temporary memory **240**, for example.

The RC request message handler **380** continues at block **386**, which directs the processor circuit (**230**) of the routing controller to determine whether the contents of the current number of concurrent calls field **222** of the dialing profile **200** shown in Figure **9** are less than the contents of the maximum number of concurrent calls field **220** of the dialing profile for the caller and, if so, block **388** directs the processor circuit to increment the contents of the current number of concurrent calls field **222** and the processor circuit (**230**) is directed to point A in Figure **18**B. If the contents of the current number of concurrent calls field **222** are equal to or greater than the contents of the maximum number of concurrent calls field **220**, then block **390** directs the processor circuit (**230**) to send an error message back to the call controller (**13**) to cause the call controller to notify the caller that the maximum number of concurrent calls has been reached and no further calls can exist concurrently, including the presently requested call.

Assuming that block **386** allows the call to proceed, the RC processor circuit (**230**) is directed to perform certain checks on the callee identifier in the callee identifier field **246** in Figure **8**. These checks are shown in greater detail in Figure **18**B.

Referring to Figure **18**B, the RC processor circuit (**230**) is directed to a first block **392** that causes it to determine whether a digit pattern of the callee identifier includes a pattern that matches the contents of the international dialing digits (IDD) field **208** in the dialing profile **200** (shown in Figure **9**)

associated with the caller. If so, then block **394** directs the RC processor circuit (**230**) to set a call type code identifier variable maintained by the processor to indicate that the call is an international call, and block **396** directs the processor to produce a reformatted callee identifier by reformatting the callee identifier into a predefined digit format. In this embodiment, this is done by removing the pattern of digits matching the IDD field contents (**208**) of the caller dialing profile **200** to effectively shorten the callee identifier. Then, block **398** directs the RC processor circuit (**230**) to determine whether or not the callee identifier has a length which meets criteria establishing it as a number compliant with the E.**164** Standard set by the ITU. If the length does not meet these criteria, then block **400** directs RC processor circuit (**230**) to send back to the call controller (**13**) a message indicating the length is not correct. The process **380** is then ended. At the call controller **13**, routines (not shown) stored in the program memory **324** may direct the processor circuit (**320** of Figure **15**) to respond to the incorrect length message by transmitting a message back to the mobile telephone (**12** shown in Figure **1**) to indicate that an invalid number has been dialled.

If the length of the amended callee identifier meets the criteria set forth at block **398**, then block **402** directs the RC processor circuit (**230**) to make a database request to the database (**23**) to determine whether or not the amended callee identifier is found in the DID field (**373**) of a record such as shown in Figure **11** in the DID bank table. If at block **402** the RC processor circuit (**230**) receives a response from the database (**23**) indicating that the reformatted callee identifier produced at block **396** is found in the DID field (**373**) of a record in the DID bank table, then the callee is a subscriber to the system and the call is classified as a private network call by directing the processor to block **404**, which directs the RC processor circuit (**230**) to copy the contents of the corresponding username field (**371** in Figure **11**) from the callee DID bank table record (**370** in Figure **11**) into the callee identifier store (**246** in Figure **8**). Thus, the RC processor circuit (**230**) locates a subscriber username associated with the reformatted callee identifier. The processor (**232**) is then directed to point B in Figure **18**A.

Calls to Subscribers in Different Nodes

Referring back to Figure **1**, as noted above, the gateway **18** is preferably associated with a pre-determined node, which in the illustrated embodiment is the first node **11**. Referring back to Figure **18**A, block **406** directs the processor (**232** of Figure **8**) to execute a process to determine whether or not the node associated with the reformatted callee identifier in the callee identifier store (**246** in Figure **8**, which, at block **404**, was set to be a username of the callee) is the same node that is associated with the gateway **18** illustrated in Figure **1**.

To do this, the processor (**232**) may, for example, identify a node associated with the gateway (**18**) by using an IP address associated with the gateway to determine a node identifier of the gateway. An IP address associated with the gateway (**18**) may, for example, be obtained from either the caller identifier field **362** or the call identifier field **368** of the RC request message **360** illustrated in Figure **17**, as each of these fields includes a portion following an "@" symbol that indicates an IP address of the gateway. In order to determine a node identifier associated with the gateway (**18**) using the IP address associated with gateway (**18**), the processor **232** (illustrated in Figure **8**) may access a gateway node association table stored in the database **23** (illustrated in Figure **1**).

Referring to Figure **19**, an exemplary gateway node association table is shown generally at **480**. The exemplary gateway node association table **480** includes first and second records **482** and **484**, each having a respective gateway IP address field **486** and a respective node identifier field **488**. It will be appreciated that the exemplary gateway node association table **480** is an example for illustration purposes only. The values in the gateway IP address fields **486** are preferably initialized when a gateway (such as the gateway **18** illustrated in Figure **1**) is installed as part of the system (**10**), and are preferably updated as the IP addresses of the respective gateways may change from time to time. The values in the node identifier fields **488** are also

preferably initialized when a gateway (such as the gateway **18** illustrated in Figure **1**) is installed as part of the system (**10**).

As indicated above, the reformatted callee identifier in the callee identifier store (**246** in Figure **8**) was set at block **404** in Figure **18**B to be a username of the callee from the username field **371** (illustrated in Figure **11**), and in this embodiment, a prefix of the username of the callee preferably indicates a node associated with the callee. In the illustrated embodiment, the left-most digit in the username of the callee is a continent code, which is a sufficient prefix to identify a node associated with the callee. However, it will be appreciated that in other embodiments, other prefixes or other information may identify the associated node. Preferably, the values in the node identifier fields **488** correspond to the prefixes of the usernames in the username fields **371** (illustrated in Figure **11**), so that the node associated with the callee is the same node that is associated with the gateway **18** illustrated in Figure **1** if the prefix of the username of the callee matches the node identifier associated with the gateway (**18**). Therefore, in the illustrated embodiment, if the reformatted callee identifier in the callee identifier store (**246** in Figure **8**) is **2001 1050 8667**, for example, then in the example of Figure **19**, the node associated with the callee is the same node as the node identified by the continent code "**2**" that is associated with the gateway associated with the IP address **20.14.102.5** in the record **482**, but is not the same node as the node identified by the continent code "**5**" that is associated with the gateway associated with the IP address **104.12.131.12** in the record **484**.

Referring back to Figure **18**A, if at block **406** the prefix of the username of the callee does not match the node identifier associated with the gateway (**18**), then the call is a "cross-domain" call, and block **408** in Figure **18**A directs the processor (**232** in Figure **8**) to set a call type flag in the temporary memory (**240** in Figure **8**) to indicate the call is a cross-domain call. Then, block **410** of Figure **18**A directs the processor (**232** of Figure **8**) to produce a routing message identifying an address on the private network with which the callee identified by the contents of the callee ID buffer is associated and to set a time

to live for the call at a maximum value of **99999**, for example. Routing messages and time to live values, and also a method of determining the node in the system with which the callee is associated, are further described in PCT Publication No. WO **2008/052340**. Once a routing message is produced at block **410**, block **412** directs the processor (**232** in Figure **8**) to cause the routing message to be sent to the call controller **13** shown in Figure **1**, and the process ends.

Referring back to Figure **18**B, if at block **392**, the callee identifier stored in the callee identifier store (**246** in Figure **8**) does not begin with an international dialing digit, then block **414** directs the processor (**232**) to determine whether or not the callee identifier begins with the same national dial digit code as assigned to the caller. To do this, the processor (**232**) is directed to refer to the retrieved caller dialing profile as shown in Figure **9**. In Figure **9**, the national dialing digit code **206** is the number **1**. Thus, if the callee identifier begins with the number **1**, then the processor (**232**) is directed to block **416** in Figure **18**B.

Block **416** directs the processor (**232** of Figure **8**) to examine the callee identifier to determine whether or not the digits following the NDD digit identify an area code that is the same as any of the area codes identified in the local area codes field **212** of the caller dialing profile **200** shown in Figure **9**. If not, block **418** of Figure **18**B directs the processor (**232**) to set the call type flag to indicate that the call is a national call. If the digits following the NDD digit identify an area code that is the same as a local area code associated with the caller as indicated by the caller dialing profile, block **420** directs the processor (**232**) to set the call type flag to indicate a local call, national style. After executing block **418** or **420**, block **422** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a re-formatted callee identifier by removing the national dialled digit and prepending a caller country code identified by the country code field **210** of the caller dialing profile shown in Figure **9**. The processor (**232**) is then

directed to block **398** of Figure **18**B to perform other processing as already described above.

If at block **414**, the callee identifier does not begin with a national dialled digit, block **424** directs the processor (**232**) to determine whether the callee identifier begins with digits that identify the same area code as the caller. Again, the reference for this is the retrieved caller dialing profile shown in Figure **9**. The processor (**232**) determines whether or not the first few digits of the callee identifier identify an area code corresponding to the contents of any area code identifier stored in the local area code field **212** of the retrieved caller dialing profile **200** (illustrated in Figure **9**). If so, then block **426** directs the processor (**232**) to set the call type flag to indicate that the call is a local call. It should be noted that the call will not necessarily be a local call in every case where the first few digits of the callee identifier identify an area code corresponding to the contents of an area code identifier stored in the local area code field **212** (illustrated in Figure **9**), and other determinations of when a call is to be considered local may be appropriate. However, it has been found that the determination described above for block **424** is satisfactory for some purposes. Next, block **428** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a reformatted callee identifier by prepending the caller country code to the callee identifier, the caller country code being determined from the country code field **210** of the retrieved caller dialing profile **200** shown in Figure **9**. The processor (**232**) is then directed to block **398** for further processing as described above.

If at block **424**, the callee identifier does not start with the same area code as the caller, block **430** directs the processor (**232** of Figure **8**) to determine whether the number of digits in the callee identifier, *i.e.* the length of the callee identifier, is within the range of digits indicated by the caller minimum local number length field **214** and the caller maximum local number length field **216** of the retrieved caller dialing profile **200** shown in Figure **9**, and whether there is more than one area code identifier stored in the local area code field **212** of the retrieved caller dialing profile. If the number of digits in the callee identifier

is within the aforementioned range and there is only one area code identifier stored in the local area code field (**212**), then block **432** directs the processor (**232**) to set the call type flag to indicate a local call and block **434** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a reformatted callee identifier by prepending to the callee identifier the caller country code (as indicated by the country code field **210** of the retrieved caller dialing profile **200** shown in Figure **9**) followed by the caller area code as indicated by the local area code stored in the local area code field **212** of the caller dialing profile **200** shown in Figure **9**. The processor (**232**) is then directed to block **398** of Figure **18**B for further processing as described above.

If at block **430**, the callee identifier has a length that does not fall within the range specified by the caller minimum local number length field (**214** in Figure **9**) and the caller maximum local number length field (**216** in Figure **9**), or if there is more than one area code identifier stored in the local area code field **212** of the retrieved caller dialing profile **200** illustrated in Figure **9**, then block **436** directs the processor (**232**) to send an error message back to the call controller (**13**), and the process ends.

In alternative embodiments, such as those illustrated in PCT Publication No. WO **2008/052340**, an additional block (**402** in Figure **8**B of PCT Publication No. WO **2008/052340**) may determine whether the callee identifier is a valid username. However, in the embodiment disclosed herein, the callee identifier is assumed to be a telephone number of the callee, and not a username.

From Figure **18**B, it will be appreciated that there are certain groups of blocks of codes that direct the processor **232** in Figure **8** to determine whether the callee identifier has certain features such as an international dialing digit, a national dialing digit, an area code and a length that meet certain criteria, and cause the processor **232** to reformat the callee identifier stored in the callee identifier store **246** in Figure **8**, as necessary into a predetermined target format including only a country code, area code, and a normal telephone number, for example, to cause the callee identifier to be compatible with the

E.**164** number plan standard in this embodiment. This enables block **402** in Figure **18**B to have a consistent format of callee identifiers for use in searching through the DID bank table records **370** of the type shown in Figure **11** to determine how to route calls to subscribers on the same system. Effectively, therefore blocks **392**, **414**, **424**, and **430** establish call classification criteria for classifying the call as a public network call or a private network call. Block **402** classifies the call, depending on whether or not the formatted callee identifier has a DID bank table record, and this depends on how the call classification criteria are met.

Calls to Non-Subscribers

Not all calls will be to subscribers, and this will be detected by the processor **232** of Figure **8** when it executes block **402** in Figure **18**B, and does not find a DID bank table record (**370** illustrated in Figure **11**) that is associated with the callee, in the DID bank table. When this occurs, the call is classified as a public network call, by directing the processor (**232**) to point C in Figure **18**C.

Referring to Figure **18**C, block **438** directs the processor (**232**) to determine whether the formatted callee identifier in the callee identifier store **246** in Figure **8** corresponds to an access code in the access code field **173** of a record in the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier. Because the callee identifier in the callee identifier store **246** in Figure **8** has been formatted as described above with reference to Figure **18**B, block **438** may involve determining whether an access code in the access code field **173** of a record of the access code association table **170** (illustrated in Figure **10**) matches the formatted callee identifier in the callee identifier store **246** in Figure **8**, and also whether a callee identifier (as opposed to the "null" value assigned on initialization) is stored in the callee identifier field **177** in association with the access code. As noted above, for simplicity, this description is directed to embodiments wherein an access code association table **170** associates access codes with respective callee identifiers, caller identifiers, timeout values, and timestamp values, although it will be appreciated that the processes described herein for

records in the access code association table **170** may additionally or alternatively be applied to DID bank table records **370** in an analogous manner.

If at block **438** the formatted callee identifier in the callee identifier store **246** in Figure **8** is the same as an access code in the access code field (**173**) of a record of the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier, then block **440** directs the processor (**232**) to determine whether the caller identifier in the caller identifier store **248** (illustrated in Figure **8**) is the same as the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**), and thus whether the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**) identifies the mobile telephone identified by the caller identifier in the caller identifier store **248**. If not, then block **442** directs the processor (**232**) to send an error message to the call controller (**13**), and the process ends.

But if at block **440** the caller identifier in the caller identifier store **248** (illustrated in Figure **8**) corresponds to the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**), then the routing controller (**30**) will produce a routing message that will cause the call controller to establish communication through the IP network (**26**) to the callee in response to a call received at a channel (**20**, **22**, or **24**). Preferably, block **444** includes codes that direct the processor (**232**) to determine whether the association of the access code with the callee identifier has expired, and thus whether the usability of the access code to initiate a call to the callee has expired, in the manner described above for block **278** in Figure **12**. If at block **444** the association of the access code with the callee identifier has expired, then block **442** directs the processor (**232**) to send an error message to the call controller (**13**), and the process ends. Thus the routing controller produces a routing message that causes the call controller to establish the call only when the association of the access code with the callee identifier has not expired.

It will be appreciated that in alternative embodiments, one or more of the caller identifier, timeout, and timestamp fields **179**, **181**, and **182** may be omitted from the access code association table **170** illustrated in Figure **10**, and in these embodiments, one or more of the blocks **440**, **442**, and **444** may also be omitted.

If at block **444** the association of the access code with the callee identifier has not expired, or if one or both of blocks **440** and **444** is omitted, then block **446** directs the processor (**232**) to store the callee identifier from the callee identifier field **177** of the record of the access code association table (**170**) in the callee identifier store **246** illustrated in Figure **8**. The processor (**232**) is then directed to point A in Figure **18**B to repeat the steps illustrated in Figure **18**B using the callee identifier retrieved from the callee identifier field (**177**) in the record of the access code association table (**170**).

However, if at block **438** the formatted callee identifier in the callee identifier store **246** in Figure **8** does not correspond to an access code in a record of the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier, then block **448** of Figure **18**B causes the processor (**232**) to set the contents of the callee identifier store **246** of Figure **8** to be the newly formatted callee identifier, i.e., a number compatible with the E.**164** standard. Then, block **450** of Figure **18**B directs the processor (**232**) to generate a routing message identifying a gateway to the public network usable by the call controller (**13**) to establish a "public system" call. In one embodiment, block **450** includes codes that, for example, direct the processor (**232**) to search a database of route or master list records and to search a database of supplier records to identify at least one supplier operable to supply a communications link for the call, and to load a routing message buffer with supplier information, time to live values, and timeout values. An example of an implementation of these steps is described with reference to blocks **410**, **412**, **560**, **562**, **563**, **564**, **566**, and **571** in Figures **8**B and **8**D in PCT Publication No. WO **2008/052340**. Next, block **452** directs the processor

232 of Figure **10** to send the routing message to the call controller **13** in Figure **1**, and the process ends.

Calls to Subscribers Within the Same Node

Referring back to Figure **18**A, if at block **406**, the prefix of the username of the callee matches the node identifier associated with the gateway (**18**), then the call is on one domain, and block **454** directs the processor (**232**) to use the callee identifier in the callee identifier store **246** illustrated in Figure **8** (which, at block **404**, was set to be a username of the callee) to locate and retrieve a dialing profile for the callee. The dialing profile may be of the type shown in Figure **9**, for example. Block **456** of Figure **18**A then directs the processor **232** of Figure **8** to get call block, call forward, and voicemail records from the database **23** of Figure **1**, based on the username identified in the callee dialing profile retrieved by the processor at block **454**. Exemplary call block, call forward, and voicemail records are described in PCT Publication No. WO **2008/052340**.

Then block **458** directs the processor **232** of Figure **8** to determine whether or not the caller identifier received in the RC request message matches a block pattern stored in the call block record associated with the callee and retrieved at block **454**. If the caller identifier matches a block pattern, then block **460** directs the processor to send a drop call or non-completion message to the call controller (**13**) and the process is ended. If the caller identifier does not match a block pattern associated with the callee, then block **462** directs the processor (**232**) to determine whether or not call forwarding is required, as described in PCT Publication No. WO **2008/052340**.

If at block **462**, the call forwarding record for the callee indicates that no call forwarding is required, then the processor (**232**) is directed to block **464**, which directs the processor (**232**) to generate a routing message identifying an address on the private network, associated with the callee for a "private system" call. In one embodiment, block **464** includes codes that, for example, direct the processor (**232**) to store, in a routing message buffer, a username

and domain of the callee, time to live values, and an IP address of the current node, to determine whether or not the user identified by the callee identifier has paid for voicemail service and if so, to store voicemail information in the routing message buffer. An example of an implementation of these steps is described with reference to blocks **609**, **620**, **640**, **642**, and **644** in Figures **8**A and **8**C in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference. Next, block **466** directs the processor **232** of Figure **8** to cause the routing message to be sent to the call controller **13** in Figure **1**, and the process ends.

But if at block **462**, the call forwarding record for the callee indicates that call forwarding is required, then block **468** directs the processor (**232**) to search a dialing profile table to find a dialing profile record as shown in Figure **9**, for the user identified by the destination number field of the call forward record, as illustrated in PCT Publication No. WO **2008/052340**. The processor (**232**) is further directed to store the username and domain for that user and a time to live value in a routing message buffer, an example of which is described in PCT Publication No. WO **2008/052340**. This process is repeated for each call forwarding record associated with the callee identified by the callee identifier store **246** in Figure **8** to add to the routing message buffer all call forwarding usernames and domains associated with the callee.

Referring to Figures **1**, **18**A, and **18**C, the routing message sent at one of blocks **412**, **452**, and **466** is received at the call controller **13** and the call controller interprets the receipt of the routing message as a request to establish a call. Referring to Figure **15**, the program memory **324** of the call controller **13** includes a routing to gateway routine depicted generally at **346**.

Where a routing message received at the call controller **13** is of the type produced at block **464** shown in Figure **18**A, indicating that the callee is a system subscriber on the same node as the gateway (**18**) (such as a user of the VoIP telephone **36** illustrated in Figure **1**), the routing to gateway routine **346** may direct the microprocessor **322** to cause a message to be sent back

through the IP network **26** shown in Figure **1** to the VoIP telephone (**36**), using the IP address of the VoIP telephone (**36**) that is available from the callee username.

Alternatively, if the routing message received at the call controller **13** is of the type produced at block **410** shown in Figure **18**A, identifying a domain associated with another node in the system, the call controller **13** may send a SIP invite message along the high speed/high data throughput link **17** in communication with the other node. The other node may function as explained above and in PCT Publication No. WO **2008/052340**, in response to receipt of a SIP invite message.

If the routing message received at the call controller **13** is of the type produced at block **450** shown in Figure **18**C, indicating that the callee is not a subscriber to the system (such as a user of the PSTN telephone **32** that is in communication with the IP network **26** through the gateway **34** as illustrated in Figure **1**), the call controller sends one or more SIP invite messages to the suppliers identified in the routing message to identify the IP address of a supplier that is able to carry the call, such as the IP address of the gateway **34** illustrated in the example of Figure **1**. A process for identifying the IP address of a supplier that is able to carry the call is given in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference. In some cases, the gateway of the supplier that is able to carry the call will be the gateway **18** illustrated in Figure **1**, that is, the same gateway through which the caller telephone (**12**) initiated the call. For simplicity, the following description assumes that the gateways **18** and **34** are distinct gateways. It will be understood that in some cases, they may be the same gateway, but in these cases, the following steps may still be applied.

Referring to Figure **1**, the IP address of the gateway **34** is sent in a message from the call controller **13** to the media relay **28**, which responds with a message indicating an IP address to which the gateway **18** should send its audio/video traffic, and an IP address to which the gateway **34** should send its

audio/video for the call. The call controller conveys the IP address at which the media relay **28** expects to receive audio/video from the gateways **18** and **34**, to the gateways **18** and **34** in one or more messages. The gateway **18** replies to the call controller **13** with an IP address at which it would like to receive audio/video, and the call controller conveys that IP address to the media relay **28**. The call may then be conducted between the caller and callee through the media relay **28** and the gateways **18** and **34**.

If the call controller **13** receives a routing message of the type produced at block **464** shown in Figure **18**A, indicating that the callee is a system subscriber on the same node as the gateway (**18**) (such as a user of the VoIP telephone **36** illustrated in Figure **1**), and which has at least one call forwarding number and/or a voicemail number, the call controller attempts to establish a call to the callee VoIP telephone **36** by seeking from the callee telephone a message indicating an IP address to which the media relay **28** should send audio/video. If no such message is received from the callee telephone, no call is established. If no call is established within a pre-determined time, the call controller **13** attempts to establish a call with the next user identified in the call routing message in the same manner. This process is repeated until all call forwarding possibilities have been exhausted, in which case the call controller communicates with the voicemail server **19** identified in the routing message to obtain an IP address to which the media relay **28** should send audio/video and the remainder of the process mentioned above for establishing IP addresses at the media relay and the caller telephone is carried out to establish audio/video paths to allowing the caller to leave a voicemail message with the voicemail server.

When an audio/video path through the media relay **28** is established, a call timer maintained by the call controller **13** preferably logs the start date and time of the call and logs the call ID and an identification of the route (i.e., audio/video path IP address) for later use in billing.

Terminating the Call

Referring back to Figure **1**, in the event that the caller terminates a call, the gateway **18** sends a SIP bye message to the call controller **13**. Similarly, in the event that the callee terminates the call, the gateway **34** or the VoIP telephone **36** of the callee sends a SIP bye message to the call controller **13**. Exemplary SIP bye messages are described in PCT Publication No. WO **2008/052340**. The SIP bye message is received at the call controller **13**, and the call controller executes a process that involves decrementing the contents of the current number of concurrent calls field **222** dialing profile **200** of the caller as illustrated in Figure **9**, generating an RC call stop message (not shown), sending the RC call stop message to the routing controller **30**, and sending a "bye" message to the party that did not terminate the call. An exemplary RC call stop message, and an example of how these steps may be implemented, are described in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference.

When the routing controller **30** receives the RC call stop message from the call controller **13**, the routing controller executes an RC call stop message process that involves making various updates to subscriber, reseller, and supplier account records (not shown) following the call. Examples of subscriber, reseller, and supplier account records, and of updates to subscriber, reseller, and supplier account records, are described in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference.

While specific embodiments of the invention have been described and illustrated, such embodiments should be considered illustrative of the invention only and not as limiting the invention.

What is claimed is:

1. A method of initiating a call to a callee using a mobile telephone, the method comprising:

receiving, from a user of the mobile telephone, a callee identifier associated with the callee;

transmitting an access code request message to an access server, said access code request message including said callee identifier;

receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiating a call with the mobile telephone using said access code to identify the callee.

2. The method of claim **1** wherein transmitting comprises transmitting said access code request message to said access server on a non-voice network.

3. The method of claim **1** wherein transmitting comprises transmitting a location identifier of a location associated with the mobile telephone to said access server.

4. The method of claim **3** wherein transmitting said location identifier comprises transmitting an IP address of the mobile telephone in a wireless IP network.

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5. The method of claim **3** wherein transmitting said location identifier comprises transmitting an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

6. The method of claim **3** wherein transmitting said location identifier comprises transmitting a user-configured identifier of a location associated with the mobile telephone.

7. The method of claim **1** wherein receiving said access code reply message comprises receiving said access code reply message from said access server on a non-voice network.

8. The method of claim **1** wherein receiving said access code reply message comprises receiving, in said access code reply message, said access code temporarily associated with said callee identifier.

9. The method of claim **1** wherein receiving said access code reply message comprises receiving, in said access code reply message, a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

10. The method of claim **9** wherein initiating said call comprises engaging a routing controller to route said call on said IP network to the callee.

11. The method of any one of claims **1** to **10** further comprising:

receiving from the mobile telephone said access code request message;

communicating with a routing controller to obtain from the routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to

cause the routing controller to establish a call to the callee using the channel; and

transmitting said access code reply message to the mobile telephone.

12. A mobile telephone apparatus comprising:

means for receiving, from a user of the mobile telephone, a callee identifier associated with the callee;

transmitting means for transmitting an access code request message to an access server, said access code request message including said callee identifier;

means for receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

means for initiating a call using said access code to identify the callee.

13. The mobile telephone apparatus of claim **12** wherein said transmitting means comprises a non-voice network interface for transmitting said access code request message to said access server on a non-voice network.

14. The mobile telephone apparatus of claim **12** wherein said access code request message further includes a location identifier of a location associated with the mobile telephone.

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15. The mobile telephone apparatus of claim **14** wherein said location identifier comprises an IP address of the mobile telephone in a wireless IP network.

16. The mobile telephone apparatus of claim **14** wherein said location identifier comprises an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

17. The mobile telephone apparatus of claim **14** wherein said location identifier comprises a user-configured identifier of a location associated with the mobile telephone.

18. The mobile telephone apparatus of claim **12** wherein said means for receiving an access code reply message comprises a non-voice network interface for receiving said access code reply message on a non-voice network.

19. The mobile telephone apparatus of claim **12** wherein said access code includes a telephone number.

20. The mobile telephone apparatus of claim **12** wherein said means for initiating comprises a mobile telephone network interface.

21. A system for initiating a call to a callee, the system comprising:

the mobile telephone apparatus of any one of claims **12** – **20**, and further comprising;

a routing controller; and

an access server comprising:

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means for receiving from the mobile telephone said access code request message;

means for communicating with said routing controller to obtain from said routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and

means for transmitting said access code reply message including said access code to the mobile telephone.

22. A mobile telephone apparatus comprising:

a processor circuit;

a network interface in communication with said processor circuit; and

a computer readable medium in communication with said processor circuit and encoded with codes for directing said processor circuit to:

receive, from a user of the mobile telephone, a callee identifier associated with the callee;

cause an access code request message to be transmitted to an access server, said access code request message including said callee identifier;

receive an access code reply message from the access server in response to said access code request message,

said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiate a call using said access code to identify the callee.

23. The mobile telephone apparatus of claim **22** wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to cause said access code request message to be transmitted include codes for directing said processor circuit to cause said access code request message to be transmitted to said access server using said non-voice network interface on a non-voice network.

24. The mobile telephone apparatus of claim **22** wherein said access code request message further includes a location identifier of a location associated with the mobile telephone.

25. The mobile telephone apparatus of claim **24** wherein said location identifier comprises an IP address of the mobile telephone in a wireless IP network.

26. The mobile telephone apparatus of claim **24** wherein said location identifier comprises an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

27. The mobile telephone apparatus of claim **24** wherein said location identifier comprises a user-configured identifier of a location associated with the mobile telephone.

28. The mobile telephone apparatus of claim **22** wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to receive an access code

reply message include codes for directing said processor circuit to cause said access code reply message to be received from said access server using said non-voice network interface on a non-voice network.

29. The mobile telephone apparatus of claim **22** wherein said access code includes a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

30. The mobile telephone apparatus of claim **22** wherein said network interface comprises a mobile telephone network interface, and wherein said codes for directing said processor circuit to initiate include codes for directing said processor circuit to cause a call to be initiated using said mobile telephone network interface on a mobile telephone network.

31. A system for initiating a call to a callee, the system comprising:

the mobile telephone of any one of claims **22 – 30**, and further comprising;

a routing controller; and

an access server comprising a processor circuit and a computer readable medium in communication with the processor circuit, the computer readable medium encoded with codes for directing said processor circuit to:

receive from the mobile telephone said access code request message;

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communicate with said routing controller to obtain from said routing controller said access code wherein said access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and

transmit said access code reply message to the mobile telephone.

32. A computer readable medium encoded with codes for directing a processor circuit to initiate a call to a callee using a mobile telephone, said codes being operable to direct the processor circuit to:

receive, from a user of a mobile telephone, a callee identifier associated with a callee;

transmit an access code request message to an access server, said access code request message including said callee identifier;

receive an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and

initiate a call using said access code to identify the callee.

33. A method for enabling a mobile telephone to initiate a call to a callee through a channel, the method comprising:

receiving from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicating with a routing controller to obtain from the routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

transmitting an access code reply message including said access code to the mobile telephone.

34. The method of claim **33** wherein receiving comprises receiving said access code request message on a non-voice network.

35. The method of claim **33** further comprising causing the routing controller to produce said access code.

36. The method of claim **35** wherein producing comprises selecting said access code from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

37. The method of claim **36** further comprising determining a local calling area associated with the mobile telephone.

38. The method of claim **37** wherein determining comprises accessing a dialing profile associated with the caller, said dialing profile including a location field having contents identifying at least a default location of the caller.

39. The method of claim **37** wherein determining comprises receiving an IP address of the mobile telephone in a wireless IP network.

40. The method of claim **37** wherein determining comprises receiving an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

41. The method of claim **37** wherein determining comprises receiving a user-configured identifier of a location associated with the mobile telephone.

42. The method of claim **37** wherein selecting comprises selecting an access code in said local calling area associated with the mobile telephone.

43. The method of claim **36** wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

44. The method of claim **43** further comprising causing said routing controller to establish communication through said IP network in response to a call received on said channel.

45. The method of claim **44** wherein producing further comprises storing a caller identifier associated with the mobile telephone in association with said access code.

46. The method of claim **45** wherein causing said routing controller to establish communication comprises causing said routing controller to establish communication only if said caller identifier associated with said access code identifies the mobile telephone.

47. The method of claim **36** wherein producing further comprises storing said callee identifier in association with said access code.

48. The method of claim **47** wherein producing further comprises searching said pool of access codes for an access code associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

49. The method of claim **35** wherein producing further comprises storing, in association with said access code, a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire.

50. The method of claim **49** wherein causing said routing controller to establish communication comprises causing said routing controller to establish communication only if the usability of said access code to initiate a call to the callee has not expired.

51. The method of claim **33** wherein transmitting comprises transmitting said access code reply message on a non-voice network.

52. A system for enabling a mobile telephone to initiate a call to a callee through a channel, the system comprising:

means for receiving from the mobile telephone an access code request message including a callee identifier associated with the callee;

means for communicating with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

means for transmitting an access code reply message including said access code to the mobile telephone.

53. The system of claim **52** wherein said means for receiving comprises a non-voice network interface for receiving said access code request message on a non-voice network.

54. The system of claim **52** further comprising means for producing said access code.

55. The system of claim **54** wherein said means for producing comprises a processor circuit operably configured to select said access code from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

56. The system of claim **55** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone.

57. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using a dialing profile associated with the caller, said dialing profile including a location field having contents identifying at least a default location of the caller.

58. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using an IP address of the mobile telephone in a wireless IP network.

59. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

60. The system of claim **56** wherein said processor circuit is operably configured to determine a local calling area associated with the mobile telephone using a user-configured identifier of a location associated with the mobile telephone.

61. The system of claim **56** wherein said processor circuit is operably configured to select an access code in said local calling area associated with the mobile telephone.

62. The system of claim **55** wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

63. The system of claim **62** wherein said processor circuit is operably configured to establish communication through said IP network in response to a call received on said channel.

64. The system of claim **63** wherein said processor circuit is operably configured to store a caller identifier associated with the mobile telephone in association with said access code.

65. The system of claim **64** wherein said processor circuit is operably configured to cause said routing controller to establish communication only if said caller identifier associated with said access code identifies the mobile telephone.

66. The system of claim **55** wherein said processor circuit is operably configured to store said callee identifier in association with said access code.

67. The system of claim **66** wherein said processor circuit is operably configured to search said pool of access codes for an access code

associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

68. The system of claim **54** wherein said processor circuit is operably configured to store, in association with said access code, a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire.

69. The system of claim **68** wherein said processor circuit is operably configured to establish communication only if the usability of said access code to initiate a call to the callee has not expired.

70. The system of claim **52** wherein said means for transmitting comprises a non-voice network interface for transmitting said access code reply message on a non-voice network.

71. A system for enabling a mobile telephone to initiate a call to a callee through a channel, the system comprising:

a processor circuit;

a network interface in communication with said processor circuit; and

a computer readable medium in communication with said processor circuit and encoded with codes for directing said processor circuit to:

receive from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicate with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

cause an access code reply message including said access code to be transmitted to the mobile telephone.

72. The system of claim **71** wherein said network interface comprises a non-voice network interface, and wherein said codes for directing said processor circuit to receive include codes for directing said processor circuit to cause said access code request message to be received using said non-voice network interface on a non-voice network.

73. The system of claim **71** wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause said access code to be produced.

74. The system of claim **73** wherein said codes for directing said processor circuit to cause said access code to be produced cause said access code to be selected from a pool of access codes, where each access code in said pool of access codes identifies a respective telephone number.

75. The system of claim **74** wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause to be determined a local calling area associated with the mobile telephone.

76. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause a dialing profile associated with

the caller to be accessed, said dialing profile including a location field having contents identifying at least a default location of the caller.

77. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause to be received an IP address of the mobile telephone in a wireless IP network.

78. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause to be received an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

79. The system of claim **75** wherein said codes for directing said processor circuit to cause to be determined cause to be received a user-configured identifier of a location associated with the mobile telephone.

80. The system of claim **75** wherein said codes for directing said processor circuit to cause said access code to be produced further cause to be selected an access code in said local calling area associated with the mobile telephone.

81. The system of claim **74** wherein each access code in said pool of access codes further identifies a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

82. The system of claim **81** wherein said computer readable medium is further encoded with codes for directing said processor circuit to cause communication through said IP network to be established in response to a call received on said channel.

83. The system of claim **82** wherein said codes for directing said processor circuit to cause said access code to be produced cause a caller

identifier associated with the mobile telephone to be stored in association with said access code.

84. The system of claim **83** wherein said codes for directing said processor circuit to cause communication to be established cause communication to be established only if said caller identifier associated with said access code identifies the mobile telephone.

85. The system of claim **74** wherein said codes for directing said processor circuit to cause said access code to be produced cause said callee identifier to be stored in association with said access code.

86. The system of claim **85** wherein said codes for directing said processor circuit to cause said access code to be produced cause said pool of access codes to be searched for an access code associated with said callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

87. The system of claim **73** wherein said codes for directing said processor circuit to cause said access code to be produced cause a timestamp for use in determining when the usability of said access code to initiate a call to the callee will expire, to be stored in association with said access code.

88. The system of claim **87** wherein said codes for directing said processor circuit to cause communication to be established cause communication to be established only if the usability of said access code to initiate a call to the callee has not expired.

89. The system of claim **71** wherein said network interface comprises a non-voice network interface, and wherein codes for directing said processor circuit to transmit include codes for directing said processor

circuit to cause said access code reply message to be transmitted using said non-voice network interface on a non-voice network.

90. A computer readable medium encoded with codes for directing a processor circuit to enable a mobile telephone to initiate a call to a callee through a channel, the codes being operable to direct the processor circuit:

receive from the mobile telephone an access code request message including a callee identifier associated with the callee;

communicate with said routing controller to obtain from said routing controller an access code identifying the channel, said access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and

cause an access code reply message including said access code to be transmitted to the mobile telephone.

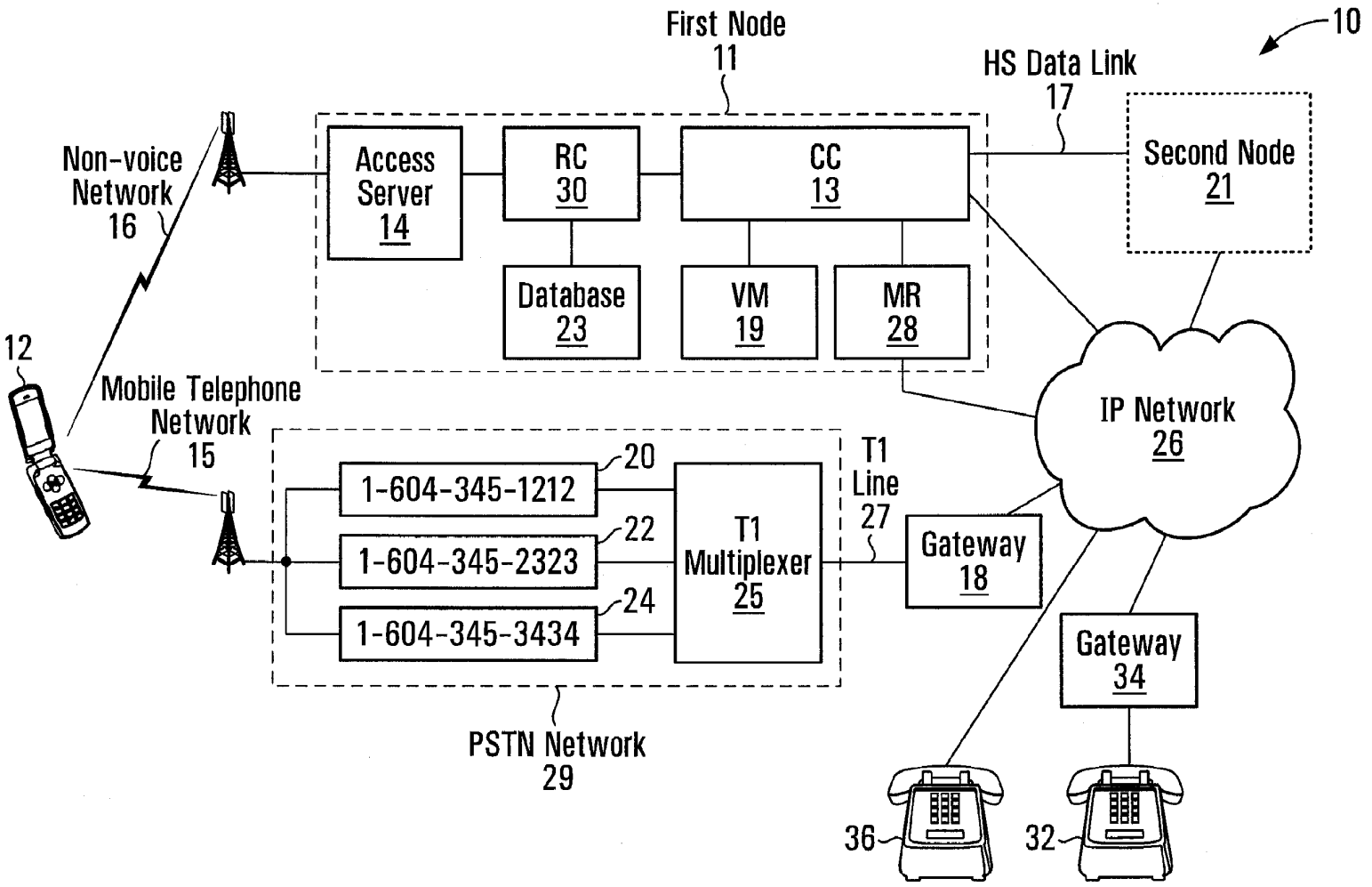

First Node
11
10
HS Data Link
17
Second Node
21
Non-voice
Network
16
Access
Server
14
RC
30
CC
13
Database
23
VM
19
MR
28
12
Mobile Telephone
Network
15
IP Network
26
20
1-604-345-1212
22
1-604-345-2323
24
1-604-345-3434
T1
Multiplexer
25
T1
Line
27
Gateway
18
Gateway
34
PSTN Network
29
36
32

FIG. 1

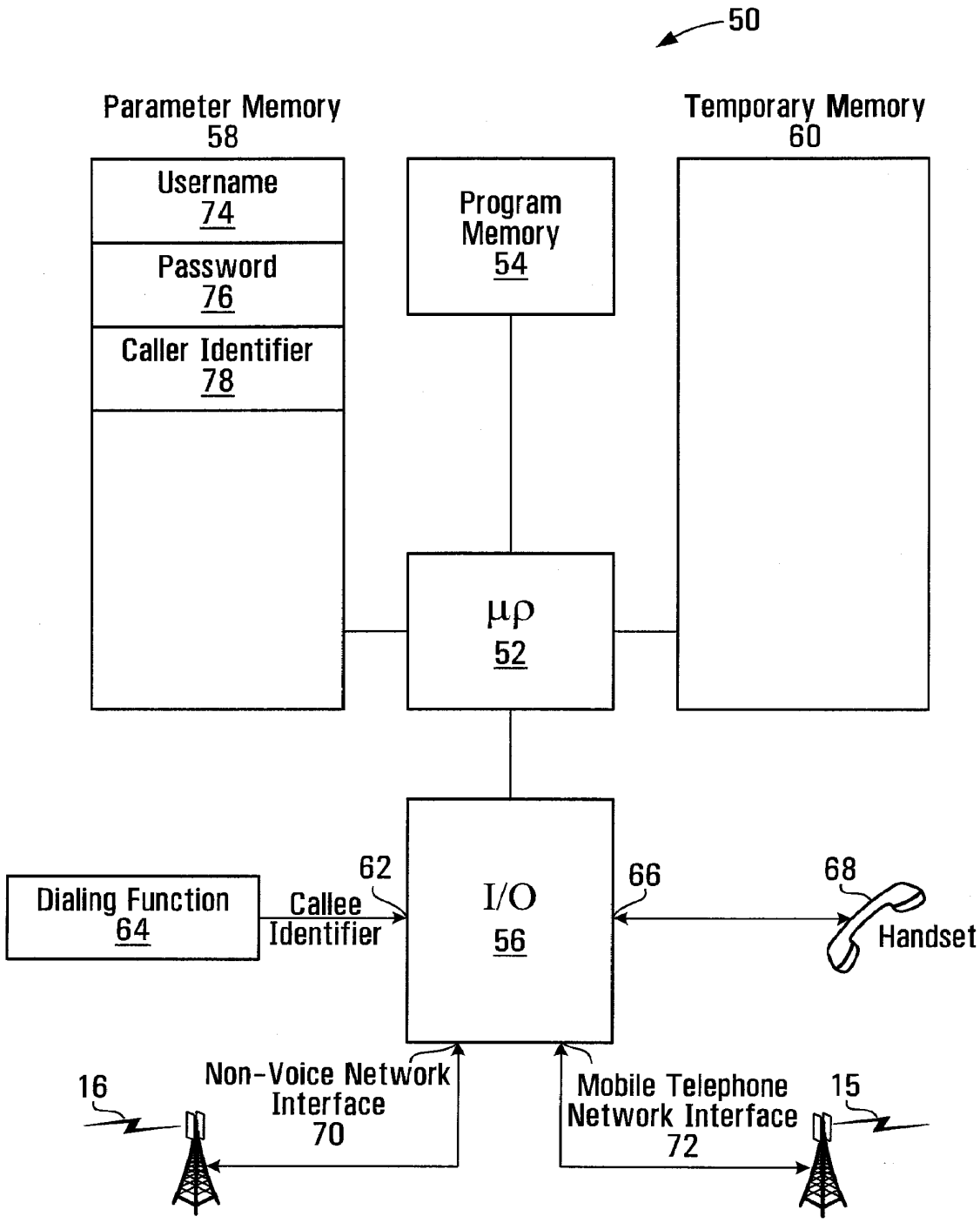

Mobile Telephone (12)
50
Parameter Memory
58
Username
74
Password
76
Caller Identifier
78
Program Memory
54
Temporary Memory
60
μρ
52
I/O
56
62
Callee Identifier
Dialing Function
64
66
68
Handset
16
Non-Voice Network Interface
70
Mobile Telephone Network Interface
72
15

FIG. 2

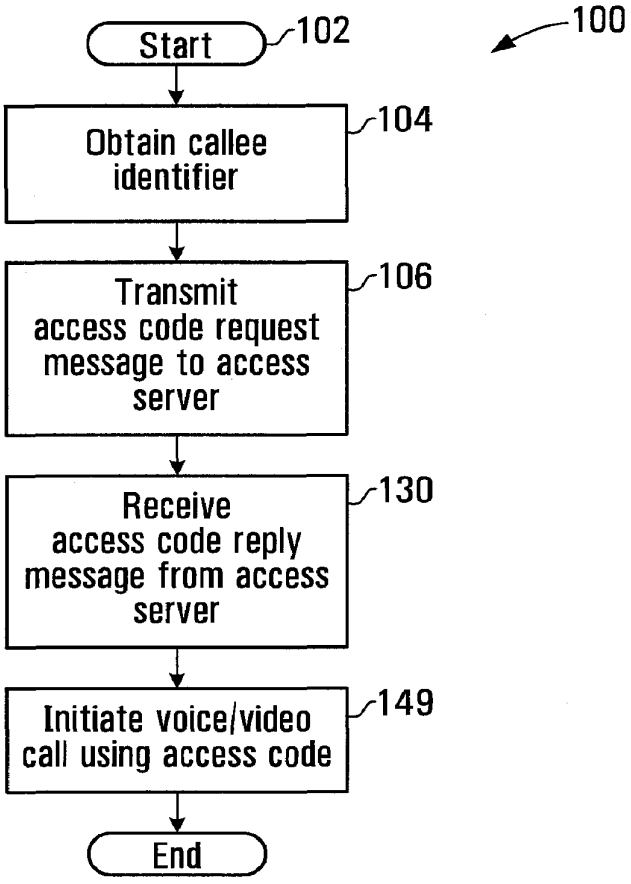


FIG. 3

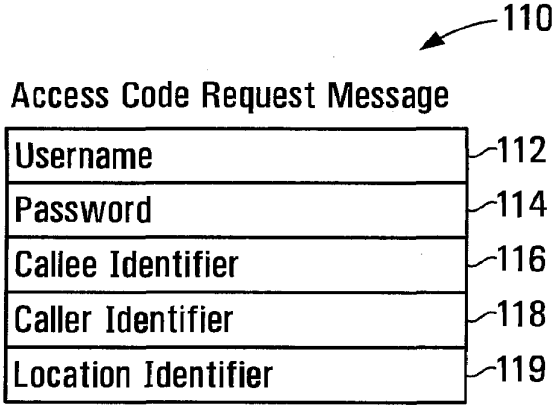


FIG. 4

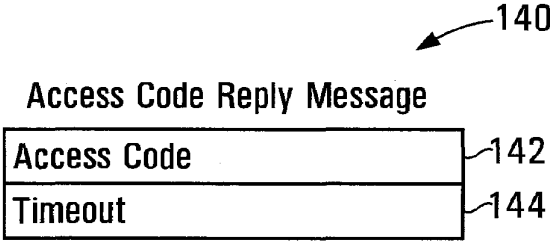


FIG. 5

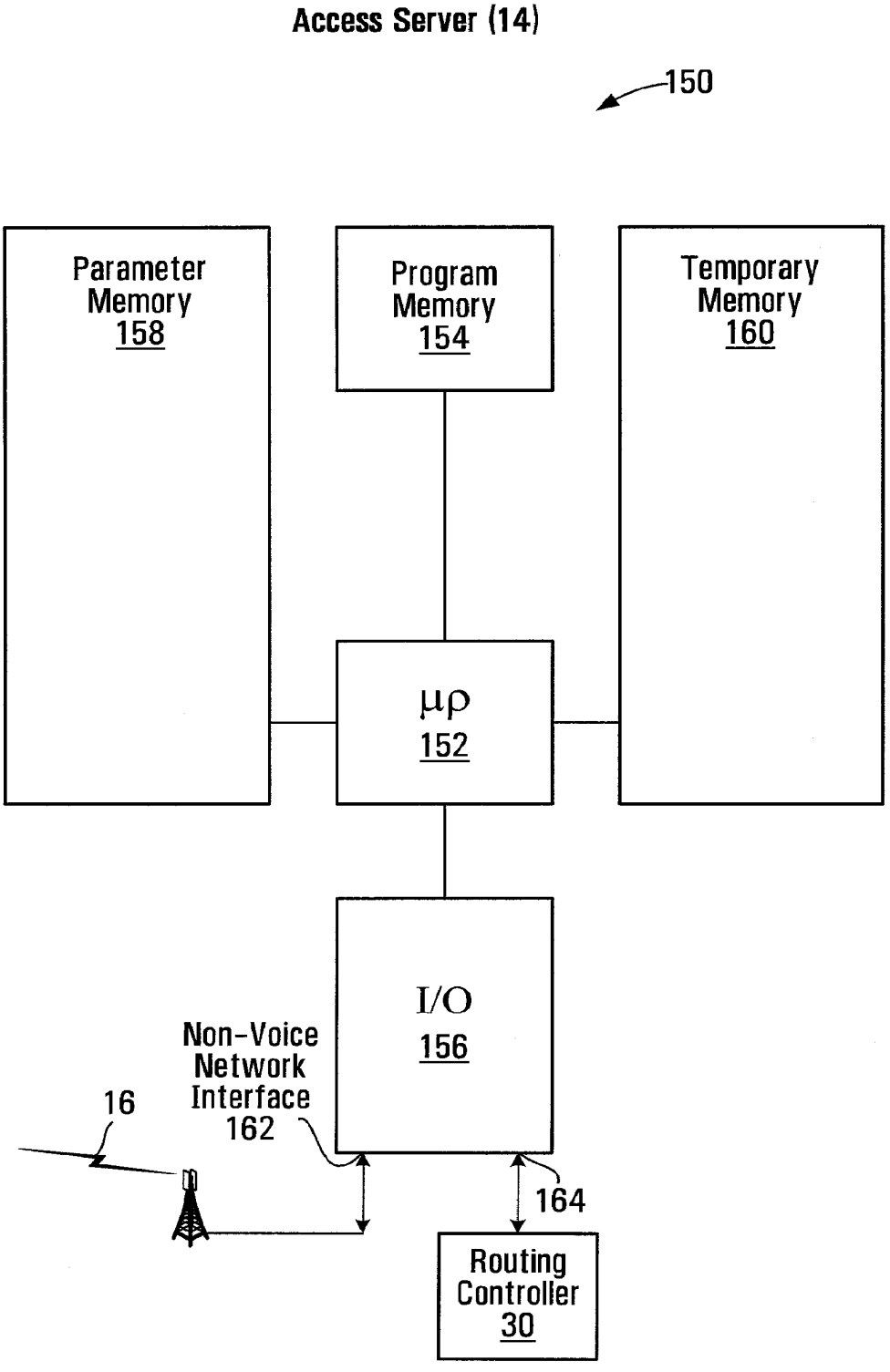

Access Server (14)
150
Parameter Memory 158
Program Memory 154
Temporary Memory 160
μρ 152
I/O 156
Non-Voice Network Interface 162
16
164
Routing Controller 30

FIG. 6

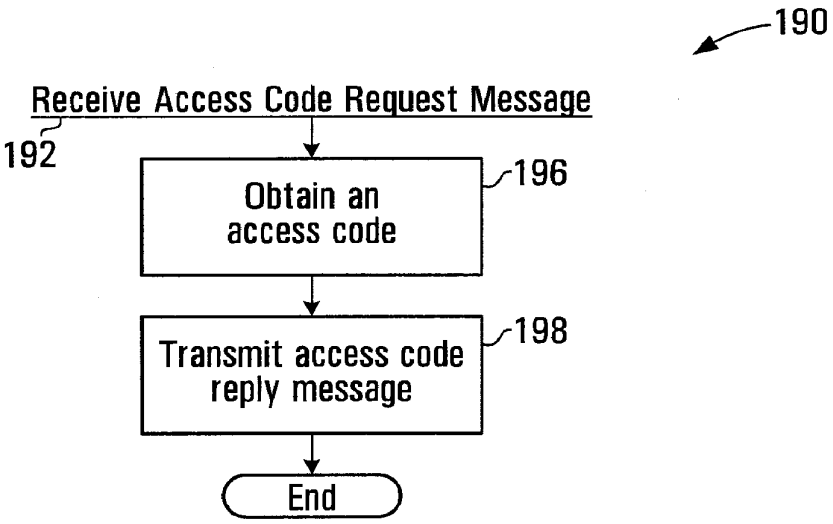

190
Receive Access Code Request Message
192
Obtain an access code
196
Transmit access code reply message
198
End

FIG. 7

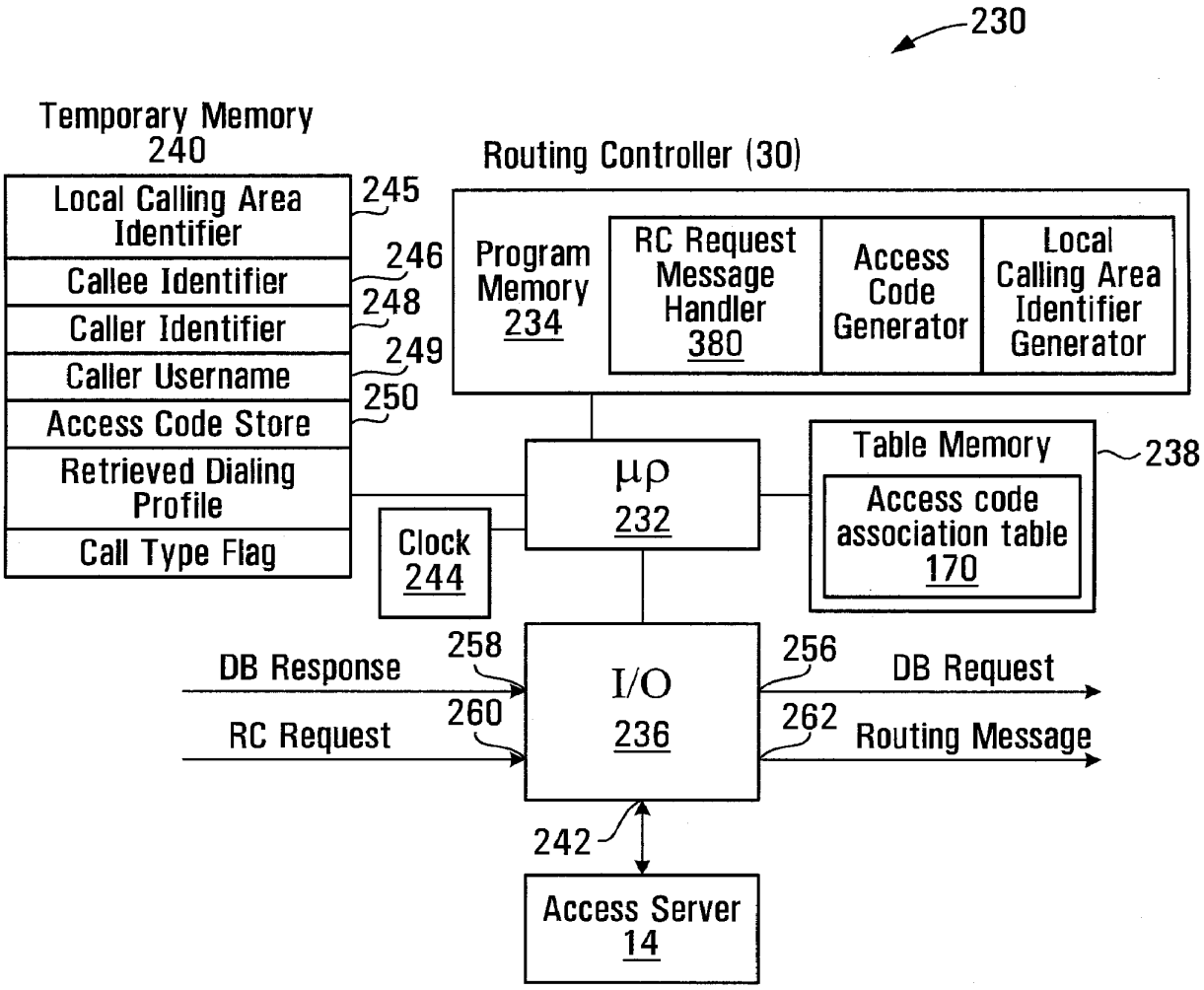

230
Temporary Memory
240
Local Calling Area Identifier
Callee Identifier
Caller Identifier
Caller Username
Access Code Store
Retrieved Dialing Profile
Call Type Flag
245
246
248
249
250
Routing Controller (30)
Program Memory 234
RC Request Message Handler 380
Access Code Generator
Local Calling Area Identifier Generator
μρ 232
Clock 244
Table Memory
238
Access code association table 170
DB Response
RC Request
258
260
I/O 236
256
262
DB Request
Routing Message
242
Access Server 14

FIG. 8

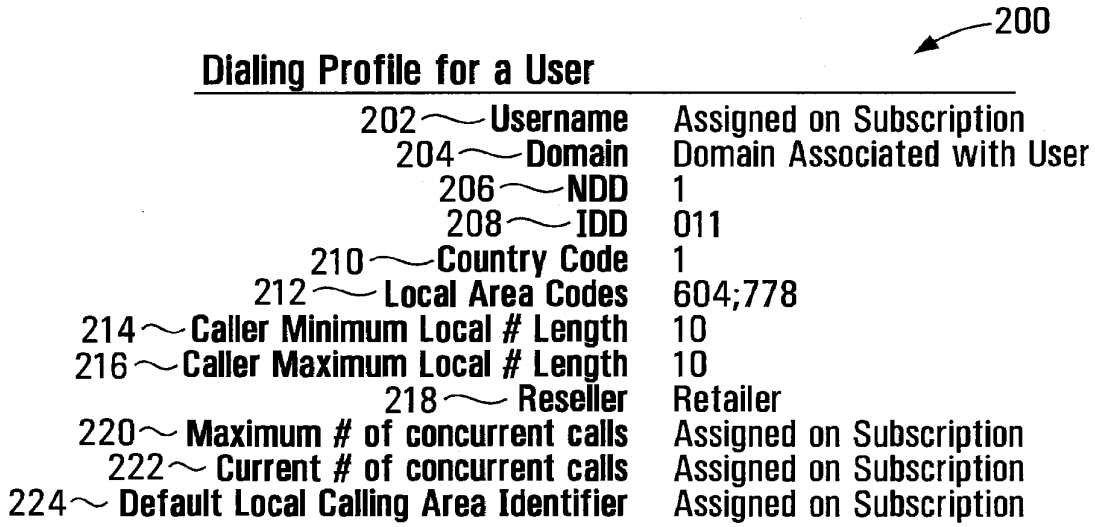

200
Dialing Profile for a User
202 Username
Assigned on Subscription
204 Domain
Domain Associated with User
206 NDD
1
208 IDD
011
210 Country Code
1
212 Local Area Codes
604;778
214 Caller Minimum Local # Length
10
216 Caller Maximum Local # Length
10
218 Reseller
Retailer
220 Maximum # of concurrent calls
Assigned on Subscription
222 Current # of concurrent calls
Assigned on Subscription
224 Default Local Calling Area Identifier
Assigned on Subscription

FIG. 9

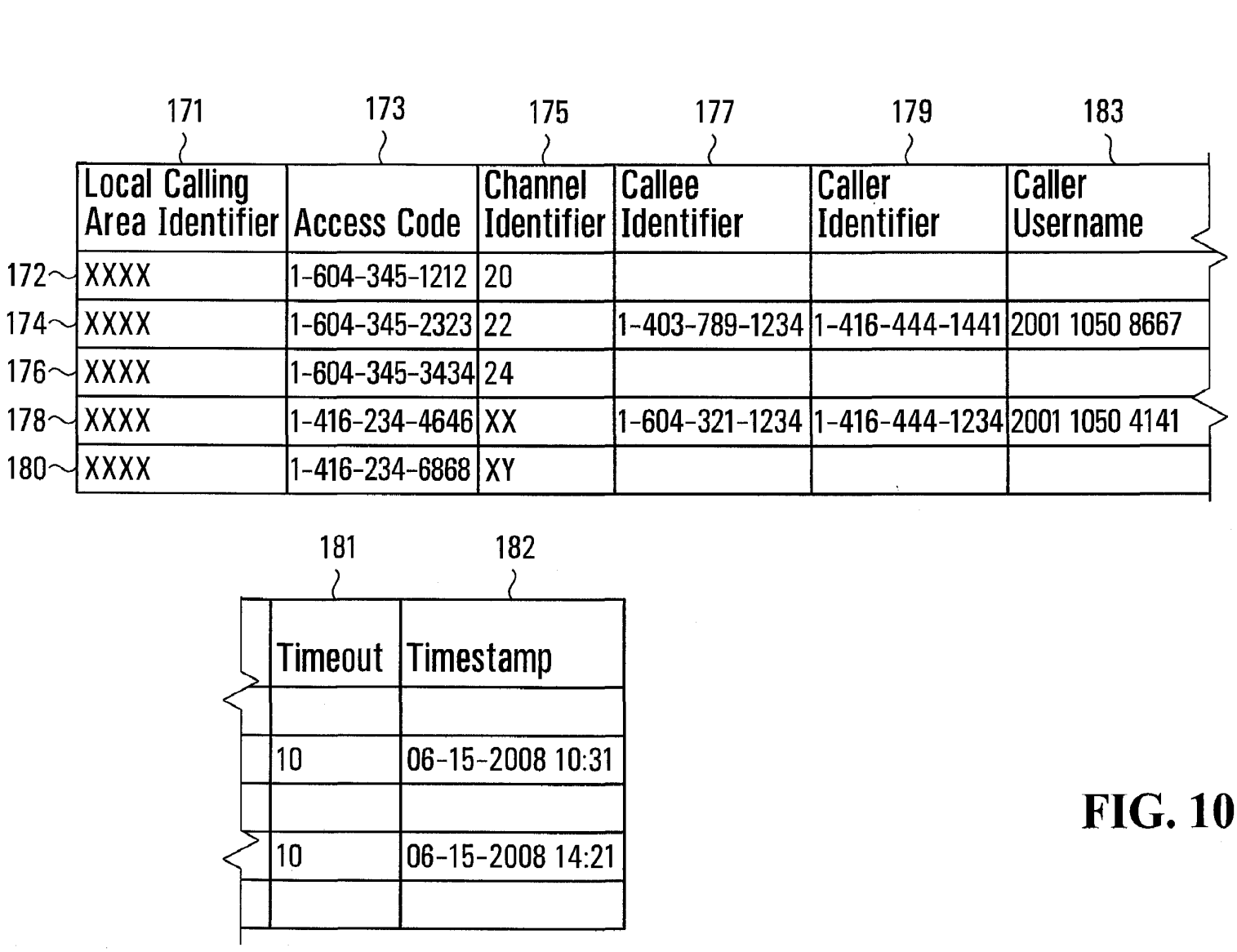

170
171
173
175
177
179
183
Local Calling Area Identifier
Access Code
Channel Identifier
Callee Identifier
Caller Identifier
Caller Username
172
XXXX
1-604-345-1212
20
174
XXXX
1-604-345-2323
22
1-403-789-1234
1-416-444-1441
2001 1050 8667
176
XXXX
1-604-345-3434
24
178
XXXX
1-416-234-4646
XX
1-604-321-1234
1-416-444-1234
2001 1050 4141
180
XXXX
1-416-234-6868
XY
181
182
Timeout
Timestamp
10
06-15-2008 10:31
10
06-15-2008 14:21

FIG. 10

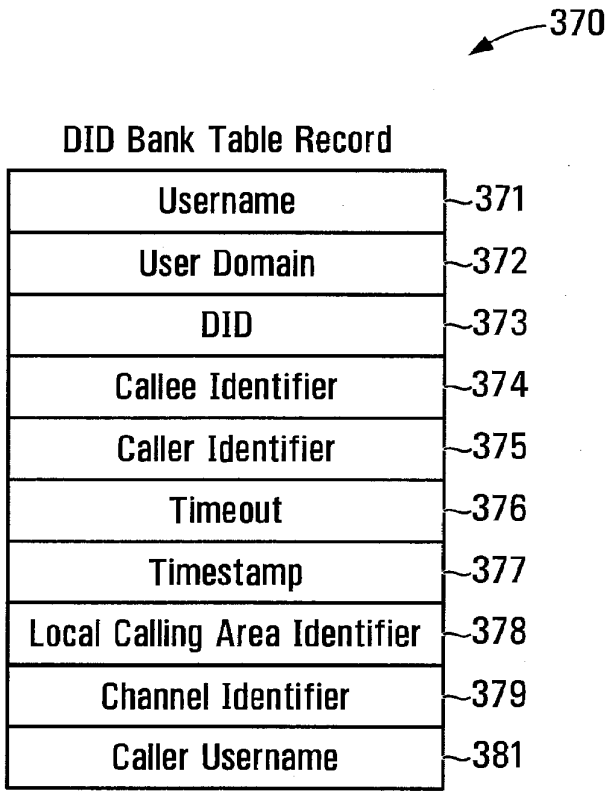

370
DID Bank Table Record
Username
371
User Domain
372
DID
373
Callee Identifier
374
Caller Identifier
375
Timeout
376
Timestamp
377
Local Calling Area Identifier
378
Channel Identifier
379
Caller Username
381

FIG. 11

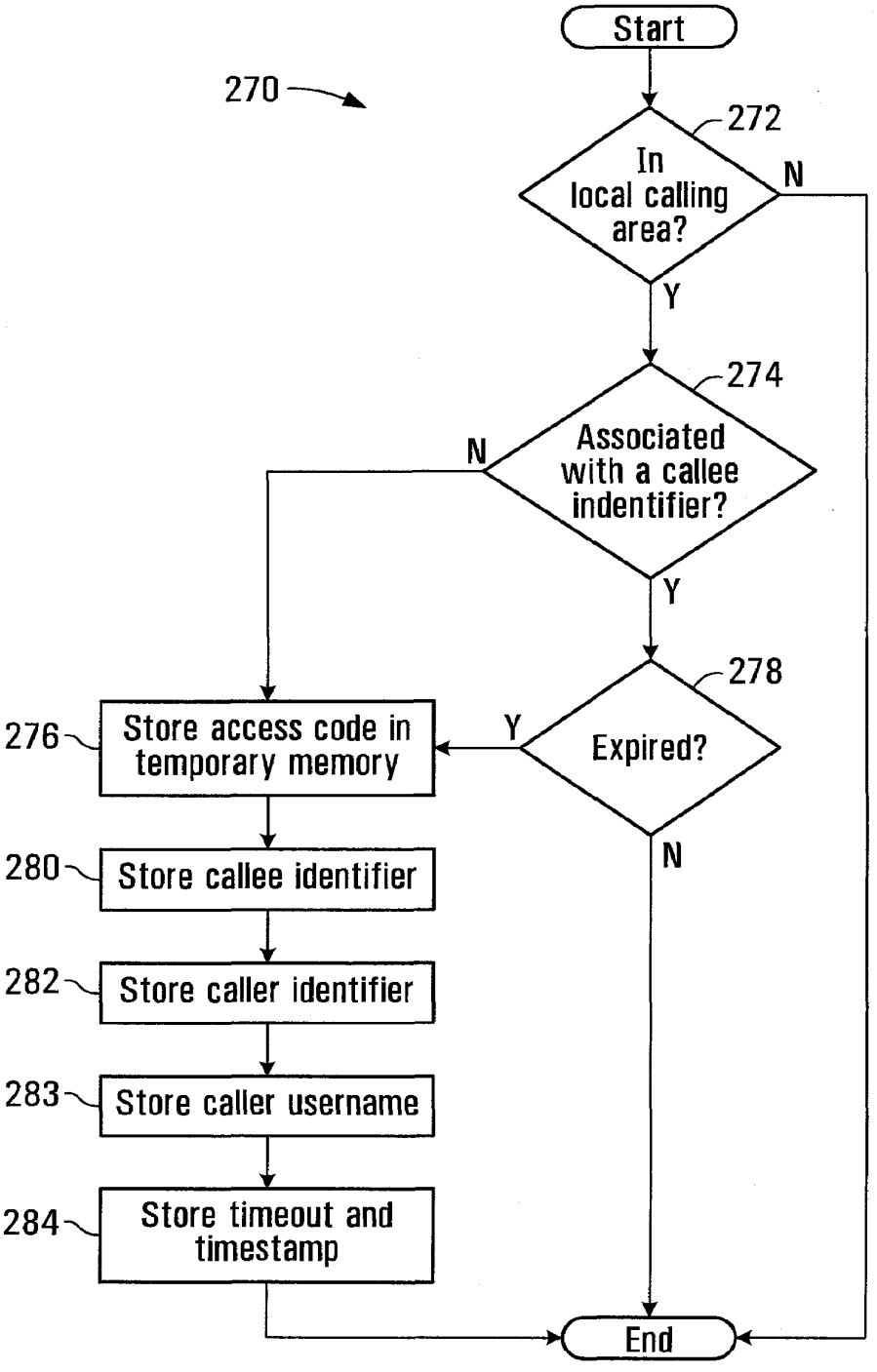

Start
270
272
In local calling area?
N
Y
274
Associated with a callee indentifier?
N
Y
278
Expired?
Y
N
276
Store access code in temporary memory
280
Store callee identifier
282
Store caller identifier
283
Store caller username
284
Store timeout and timestamp
End

FIG. 12

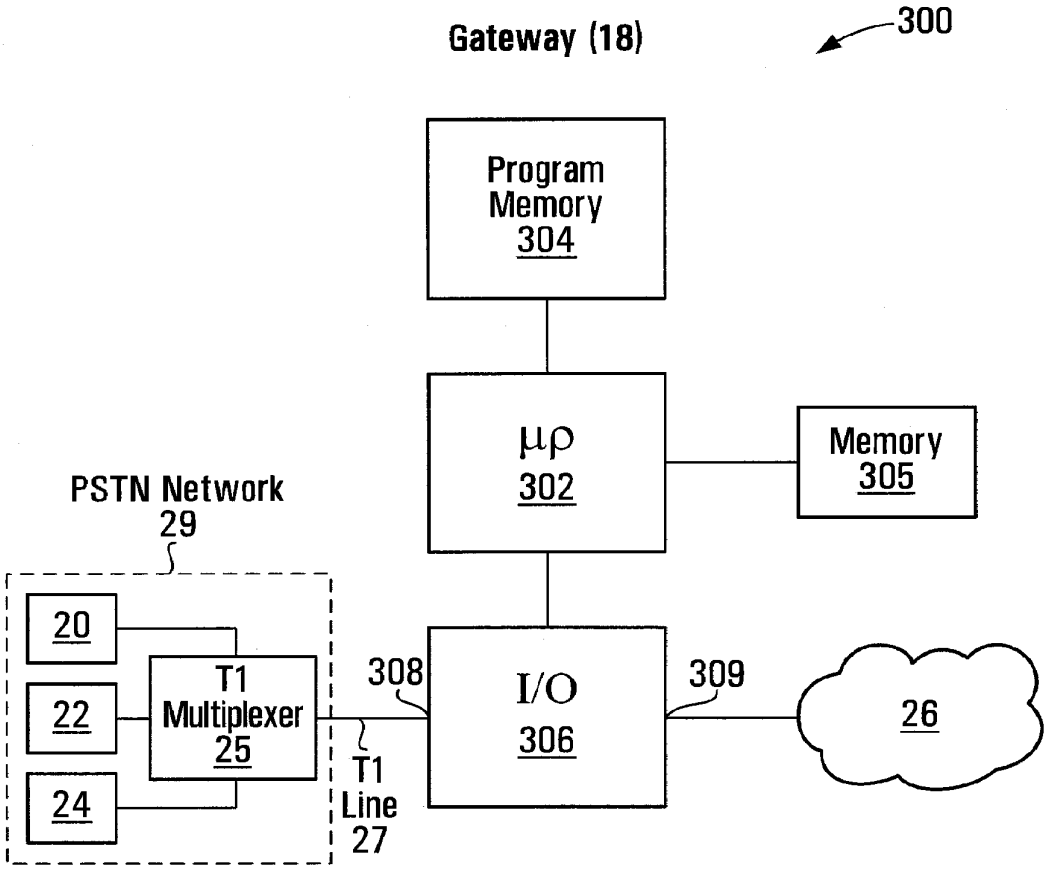


FIG. 13

310

SIP Invite Message

312	Caller Identifier	1-604-678-1234@20.14.102.5
314	Callee Identifier	1-604-345-1212
315	Digest Parameter	XXXXXXX
316	Call Identifer	FF10@20.14.102.5
317	IP Address	20.14.102.5
318	Gateway UDP Port	12378

FIG. 14

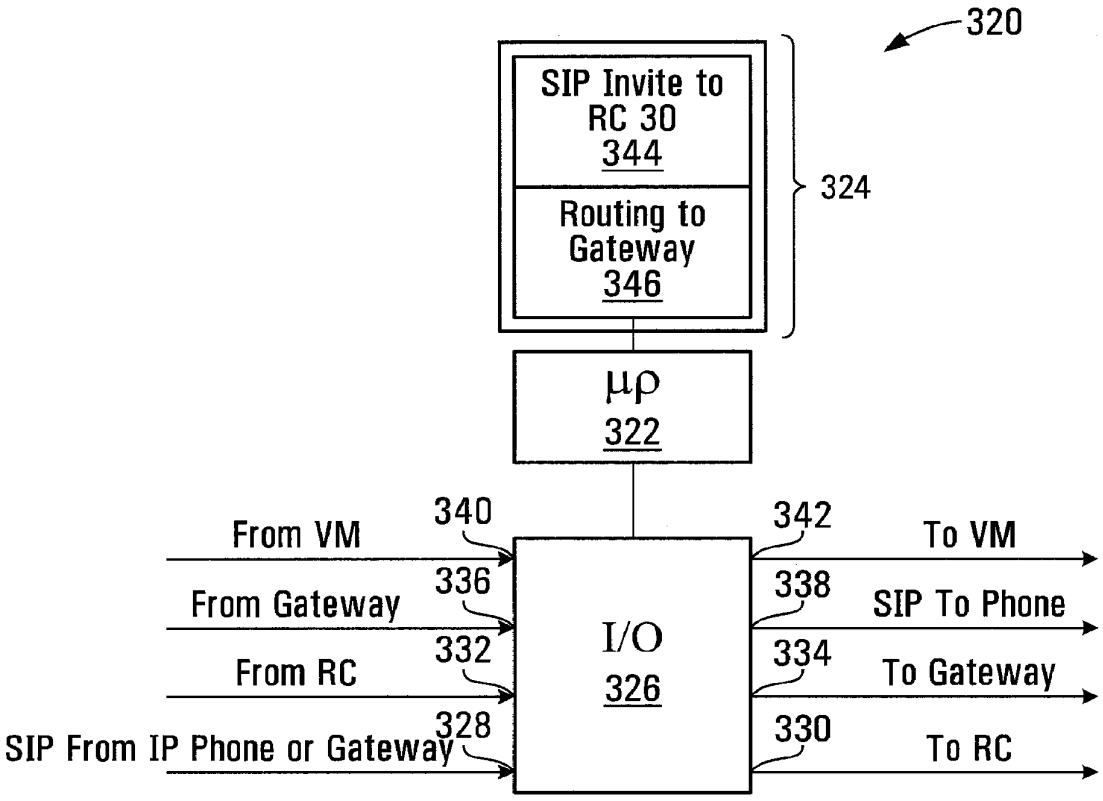

Call Controller (13)
320
SIP Invite to RC 30
344
Routing to Gateway
346
324
μρ
322
I/O
326
From VM
340
From Gateway
336
From RC
332
SIP From IP Phone or Gateway
328
To VM
342
SIP To Phone
338
To Gateway
334
To RC
330

FIG. 15

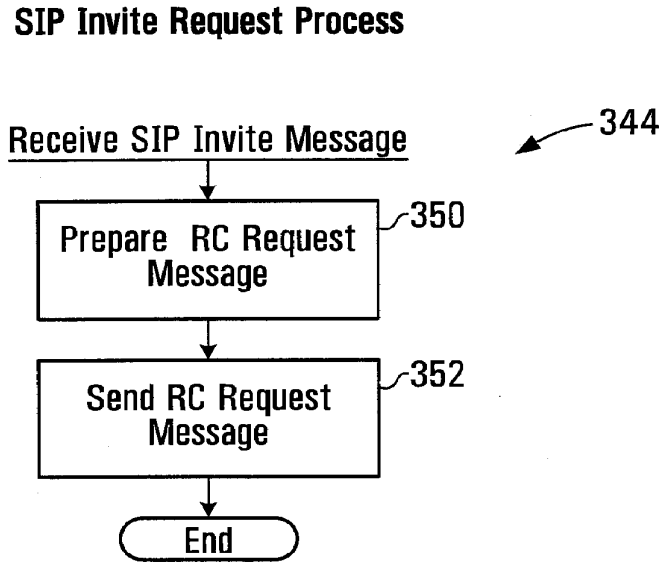

SIP Invite Request Process
Receive SIP Invite Message
344
Prepare RC Request Message
350
Send RC Request Message
352
End

FIG. 16

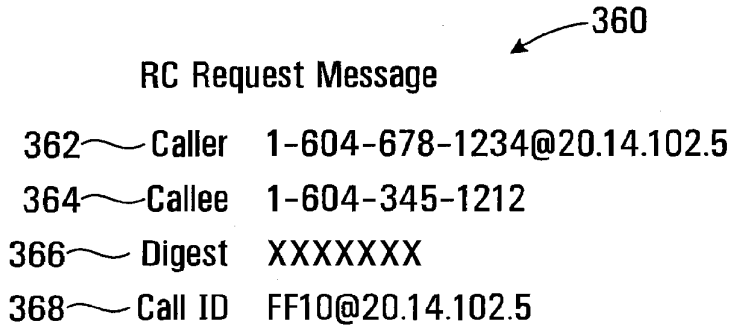

360
RC Request Message
362 Caller 1-604-678-1234@20.14.102.5
364 Callee 1-604-345-1212
366 Digest XXXXXXX
368 Call ID FF10@20.14.102.5

FIG. 17

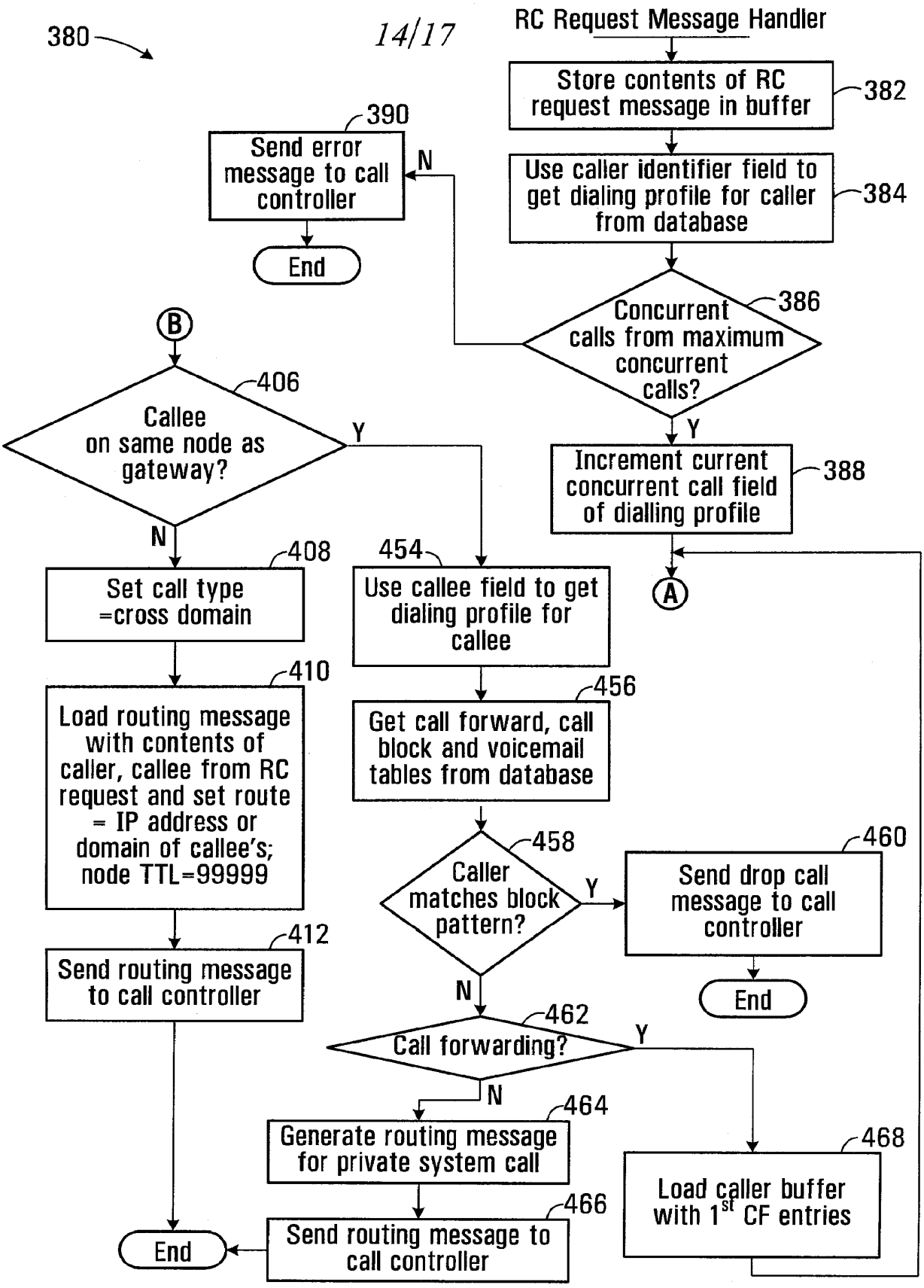

380
RC Request Message Handler
Store contents of RC request message in buffer
382
Use caller identifier field to get dialing profile for caller from database
384
Concurrent calls from maximum concurrent calls?
386
N
Y
Send error message to call controller
390
End
Increment current concurrent call field of dialling profile
388
A
B
Callee on same node as gateway?
406
Y
N
Set call type =cross domain
408
Load routing message with contents of caller, callee from RC request and set route = IP address or domain of callee's; node TTL=99999
410
Send routing message to call controller
412
454
Use callee field to get dialing profile for callee
Get call forward, call block and voicemail tables from database
456
Caller matches block pattern?
458
Y
N
Send drop call message to call controller
460
End
Call forwarding?
462
Y
N
Generate routing message for private system call
464
Load caller buffer with 1st CF entries
468
Send routing message to call controller
466
End

FIG. 18A

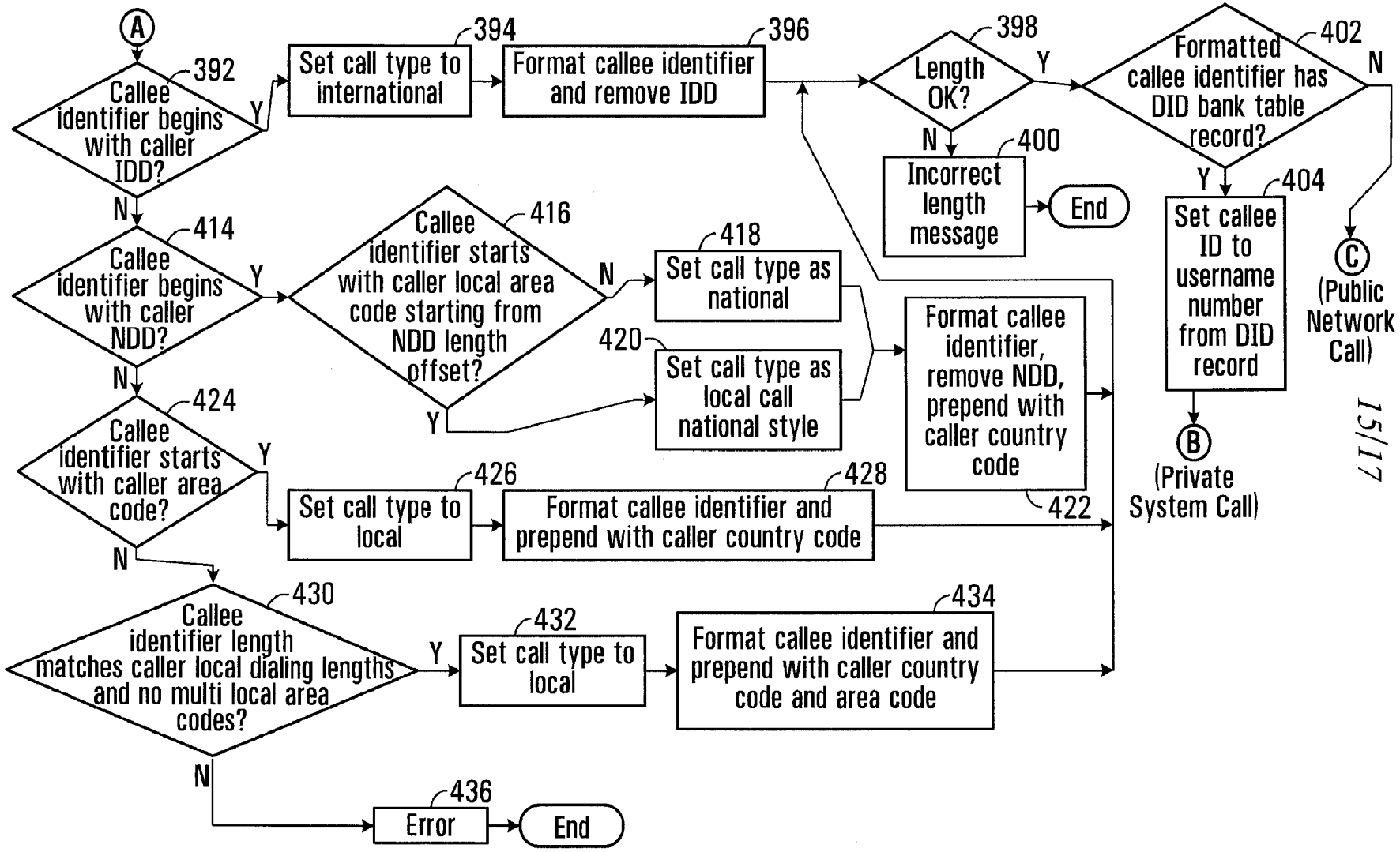

A
392
Callee identifier begins with caller IDD?
Y
394
Set call type to international
396
Format callee identifier and remove IDD
398
Length OK?
Y
N
400
Incorrect length message
End
402
Formatted callee identifier has DID bank table record?
N
Y
404
Set callee ID to username number from DID record
C
(Public Network Call)
B
(Private System Call)
N
414
Callee identifier begins with caller NDD?
Y
416
Callee identifier starts with caller local area code starting from NDD length offset?
N
418
Set call type as national
420
Set call type as local call national style
Y
Format callee identifier, remove NDD, prepend with caller country code
422
N
424
Callee identifier starts with caller area code?
Y
426
Set call type to local
428
Format callee identifier and prepend with caller country code
N
430
Callee identifier length matches caller local dialing lengths and no multi local area codes?
Y
432
Set call type to local
434
Format callee identifier and prepend with caller country code and area code
N
436
Error
End

FIG. 18B

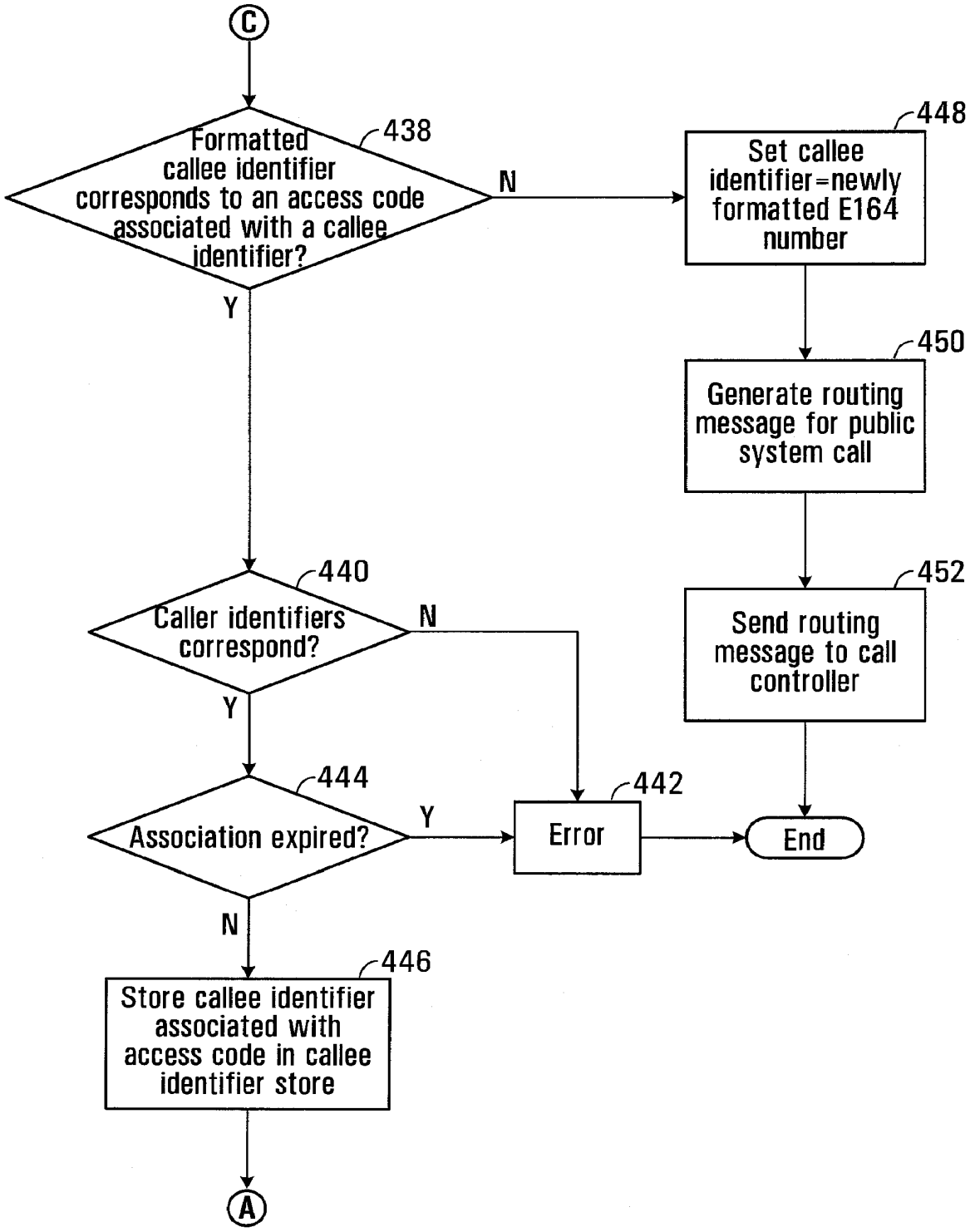

C
Formatted callee identifier corresponds to an access code associated with a callee identifier?
438
N
Y
448
Set callee identifier=newly formatted E164 number
450
Generate routing message for public system call
452
Send routing message to call controller
440
Caller identifiers correspond?
N
Y
444
Association expired?
Y
442
Error
End
N
446
Store callee identifier associated with access code in callee identifier store
A

FIG. 18C

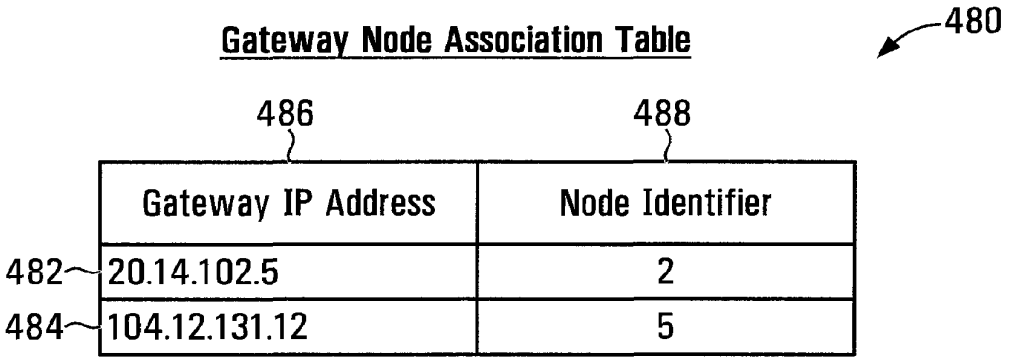

Gateway Node Association Table
480
486
488
Gateway IP Address
Node Identifier
482
20.14.102.5
2
484
104.12.131.12
5

FIG. 19

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H04W 88/06 (2009.01)

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— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

[Continued on next page]

(54) Title: MOBILE GATEWAY

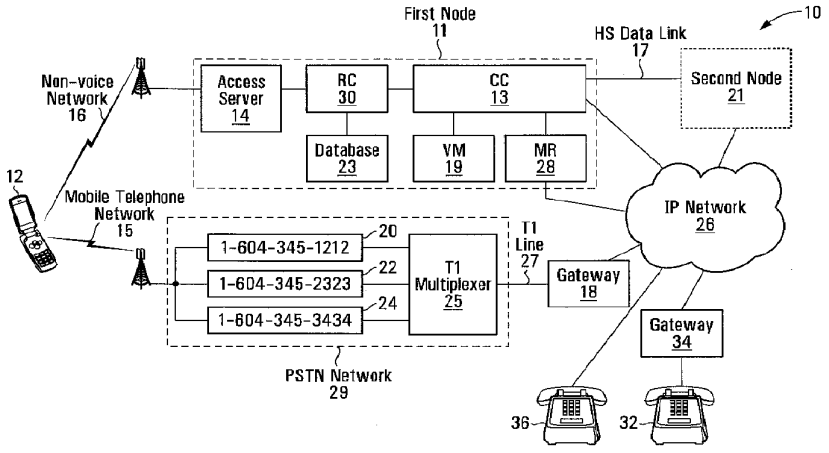


FIG. 1

(57) Abstract: A method of initiating a call to a callee using a mobile telephone involves: receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting an access code request message to an access server, said access code request message including said callee identifier; receiving an access code reply message from the access server in response to said access code request message, said access code reply message including an access code different from said callee identifier and associated with said callee identifier; and initiating a call with the mobile telephone using said access code to identify the callee.

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This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

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INVENTOR(S)		
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☐ *Additional inventors are being named on th____ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

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Respectfully submitted,

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

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P19SMALL/REV08

MOBILE GATEWAY

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates generally to telecommunication, and more particularly to methods, systems, apparatuses, and computer readable media for initiating or enabling a call with a mobile telephone to a callee.

2. Description of Related Art

Mobile telephone service providers often charge significant fees for long distance telephone calls, particularly when the mobile telephone is roaming in another mobile telephone service provider's network.

One known technique for avoiding the long distance charges of mobile telephone service providers is to use a "calling card". A "calling card" may permit the user of the mobile telephone to place a call to a local telephone number or to a less-expensive telephone number (such as a toll-free number, for example) instead of placing the call directly to the callee. The user may thus avoid the long distance charges of the mobile telephone service provider, which may be higher than the charges for using the "calling card". However, this technique can be cumbersome and undesirable, because it may require the user of the mobile telephone to follow a number of complicated or cumbersome steps in order to initiate a call to the callee, for example.

SUMMARY OF THE INVENTION

In accordance with one aspect of the invention there is provided a method of initiating a call to a callee using a mobile telephone. The method involves: receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting an access code request message to an access server, the access code request message including the callee identifier; receiving an access code reply message from the access server in response to the access code request message, the access code reply message

including an access code different from the callee identifier and associated with the callee identifier; and initiating a call with the mobile telephone using the access code to identify the callee.

Transmitting may involve transmitting the access code request message to the access server on a non-voice network.

Transmitting may involve transmitting a location identifier of a location associated with the mobile telephone to the access server.

Transmitting the location identifier may involve transmitting an IP address of the mobile telephone in a wireless IP network.

Transmitting the location identifier may involve transmitting an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Transmitting the location identifier may involve transmitting a user-configured identifier of a location associated with the mobile telephone.

Receiving the access code reply message may involve receiving the access code reply message from the access server on a non-voice network.

Receiving the access code reply message may involve receiving, in the access code reply message, an access code temporarily associated with the callee identifier.

Receiving the access code reply message may involve receiving, in the access code reply message, a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

Initiating the call may involve engaging a routing controller to route the call on the IP network to the callee.

The method may further involve: receiving from the mobile telephone the access code request message; communicating with a routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmitting the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes: means for receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting means for transmitting an access code request message to an access server, the access code request message including the callee identifier; means for receiving an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and means for initiating a call using the access code to identify the callee.

The transmitting means may include a non-voice network interface for transmitting the access code request message to the access server on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The means for receiving an access code reply message may include a non-voice network interface for receiving the access code reply message on a non-voice network.

The access code may include a telephone number.

The means for initiating may involve a mobile telephone network interface.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes the mobile telephone, a routing controller, and an access server. The access server includes: means for receiving from the mobile telephone the access code request message; means for communicating with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and means for transmitting the access code reply message including the access code to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive, from a user of the mobile telephone, a callee identifier associated with the callee; cause an access code request message to be transmitted to an access server, the access code request message including the callee identifier; receive an

access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to cause the access code request message to be transmitted may include codes for directing the processor circuit to cause the access code request message to be transmitted to the access server using the non-voice network interface on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive an access code reply message may include codes for directing the processor circuit to cause the access code reply message to be received from the access server using the non-voice network interface on a non-voice network.

The access code may include a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The network interface may include a mobile telephone network interface, and the codes for directing the processor circuit to initiate may include codes for directing the processor circuit to cause a call to be initiated using the mobile telephone network interface on a mobile telephone network.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes: the mobile telephone; a routing controller; and an access server comprising a processor circuit and a computer readable medium in communication with the processor circuit. The computer readable medium is encoded with codes for directing the processor circuit to: receive from the mobile telephone the access code request message; communicate with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmit the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive, from a user of a mobile telephone, a callee identifier associated with a callee; transmit an access code request message to an access server, the access code request message including the callee identifier; receive an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

In accordance with another aspect of the invention, there is provided a method for enabling a mobile telephone to initiate a call to a callee through a channel. The method involves: receiving from the mobile telephone an

access code request message including a callee identifier associated with the callee; communicating with a routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and transmitting an access code reply message including the access code to the mobile telephone.

Receiving may involve receiving the access code request message on a non-voice network.

The method may further involve causing the routing controller to produce the access code.

Producing may involve selecting the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The method may further involve determining a local calling area associated with the mobile telephone.

Determining may involve accessing a dialing profile associated with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

Determining may involve receiving an IP address of the mobile telephone in a wireless IP network.

Determining may involve receiving an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Determining may involve receiving a user-configured identifier of a location associated with the mobile telephone.

Selecting may involve selecting an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The method may further involve causing the routing controller to establish communication through the IP network in response to a call received on the channel.

Producing may further involve storing a caller identifier associated with the mobile telephone in association with the access code.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

Producing may further involve storing the callee identifier in association with the access code.

Producing may further involve searching the pool of access codes for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

Producing may further involve storing, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

Transmitting may involve transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes: means for receiving from the mobile telephone an access code request message including a callee identifier associated with the callee; means for communicating with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and means for transmitting an access code reply message including the access code to the mobile telephone.

The means for receiving may include a non-voice network interface for receiving the access code request message on a non-voice network.

The system may further include means for producing the access code.

The means for producing may include a processor circuit operably configured to select the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a dialing profile associated

with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an IP address of the mobile telephone in a wireless IP network.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a user-configured identifier of a location associated with the mobile telephone.

The processor circuit may be operably configured to select an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The processor circuit may be operably configured to establish communication through the IP network in response to a call received on the channel.

The processor circuit may be operably configured to store a caller identifier associated with the mobile telephone in association with the access code.

The processor circuit may be operably configured to cause the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

The processor circuit may be operably configured to store the callee identifier in association with the access code.

The processor circuit may be operably configured to search the pool of access codes for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

The processor circuit may be operably configured to store, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

The processor circuit may operably configured to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

The means for transmitting may include a non-voice network interface for transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive may include codes for directing the processor circuit to cause the access code request message to be received using the non-voice network interface on a non-voice network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause the access code to be produced.

The codes for directing the processor circuit to cause the access code to be produced may cause the access code to be selected from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause to be determined a local calling area associated with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause a dialing profile associated with the caller to be accessed, the dialing profile including a location field having contents identifying at least a default location of the caller.

The codes for directing the processor circuit to cause to be determined may cause to be received an IP address of the mobile telephone in a wireless IP network.

The codes for directing the processor circuit to cause to be determined may cause to be received an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause to be received a user-configured identifier of a location associated with the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may further cause to be selected an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause communication through the IP network to be established in response to a call received on the channel.

The codes for directing the processor circuit to cause the access code to be produced may cause a caller identifier associated with the mobile telephone to be stored in association with the access code.

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the caller identifier associated with the access code identifies the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may cause the callee identifier to be stored in association with the access code.

The codes for directing the processor circuit to cause the access code to be produced may cause the pool of access codes to be searched for an access

code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

The codes for directing the processor circuit to cause the access code to be produced may cause a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire, to be stored in association with the access code.

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the usability of the access code to initiate a call to the callee has not expired.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to transmit include codes for directing the processor circuit to cause the access code reply message to be transmitted using the non-voice network interface on a non-voice network.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the invention,

Figure **1** is a block diagram of a system for enabling a mobile telephone to initiate a call through a channel to a callee in accordance with a first embodiment in the invention,

Figure **2** is a block diagram of a mobile telephone shown in Figure **1**,

Figure **3** is a flow chart of a process executed by the mobile telephone shown in Figure **1**,

Figure **4** is a schematic representation of an access code request message transmitted between the mobile telephone and an access server shown in Figure **1**,

Figure **5** is a schematic representation of an access code reply message transmitted between the mobile telephone and the access server shown in Figure **1**,

Figure **6** is a block diagram of the access server shown in Figure **1**,

Figure **7** is a flow chart of a process executed by the access server shown in Figure **1**,

Figure **8** is a block diagram of a routing controller shown in Figure **1**,

Figure **9** is a tabular representation of a dialing profile stored in a database accessible by the routing controller illustrated in Figure **1**,

Figure **10** is a tabular representation of an access code association table stored in memory accessible by the routing controller shown in Figure **1**,

Figure **11** is a schematic representation of a DID bank table record stored in a database shown in Figure **1**,

Figure **12** is a flow chart of a process executed by the routing controller illustrated in Figure **1**,

Figure **13** is a block diagram of a gateway shown in Figure **1**,

Figure **14** is a tabular representation of an SIP invite message transmitted between the gateway and a call controller illustrated in Figure **1**,

Figure **15** is a block diagram of the call controller illustrated in Figure **1**,

Figure **16** is a flow chart of a process executed by the call controller illustrated in Figure **1**,

Figure **17** is a tabular representation of an RC request message transmitted between the call controller and the routing controller illustrated in Figure **1**,

Figures **18A–18C** are a flow chart of a process executed by the routing controller illustrated in Figure **1**, and

Figure **19** is a tabular representation of a gateway node association table stored in the database illustrated in Figure **1**.

DETAILED DESCRIPTION

Referring to Figure **1**, a system for enabling a mobile telephone to initiate a call to a callee is shown generally at **10**. The system **10** includes a first node **11**, a second node **21**, and a mobile telephone **12**.

The first and second nodes **11** and **21** in the illustrated embodiment may support "voice-over-IP" (VoIP) calls between telephones and/or videophones using the internet protocol (IP), as described in PCT Publication No. WO **2008/052340**, which is hereby incorporated by reference in its entirety herein. In the embodiment shown, the first node **11** is located in a geographical area, such as Vancouver, British Columbia, Canada, for example, and the second node **21** is located in London, England, for example. Different nodes may be located in different geographical regions throughout the world to provide telephone/videophone service to subscribers in respective regions. These nodes may be in communication with each other by high speed/high data throughput links including optical fiber, satellite, and/or cable links illustrated generally at **17**, forming a backbone to the system. These nodes may alternatively, or in addition, be in communication with each other through conventional internet services.

In the embodiment shown, the first node **11** provides telephone/videophone service to western Canadian customers from Vancouver Island to Ontario.

Another node (not shown) may be located in Eastern Canada to provide services to subscribers in that area, for example.

Other nodes of the type shown may also be employed within the geographical area serviced by a node to provide for call load sharing, for example, within a region of the geographical area serviced by the node. However, in general, all nodes may be similar and have the properties described in connection with the first node **11**.

In this embodiment, the first node **11** includes a call controller (CC) **13**, an access server **14**, a routing controller (RC) **30**, a database **23**, a voicemail server **19**, and a media relay **28**. Each of these may be implemented as separate modules on a common computer system or by separate computers, for example. The voicemail server **19** need not be included in the node and can be provided by a third party service provider. Although the access server **14** is illustrated as being part of the first node **11**, access servers in alternative embodiments may be separate from the node and may be in communication with one or more nodes, for example.

The mobile telephone **12** is configured to place calls over a mobile telephone network, illustrated generally at **15**, in a manner well-known in the art. Furthermore, the mobile telephone **12** and the access server **14** are configured to communicate with each other, preferably on a non-voice network illustrated generally at **16**, such as a "WiFi" wireless IP network or a General Packet Radio Service (GPRS) network, for example. However, in alternative embodiments, the mobile telephone **12** and the access server **14** may communicate with each other over other networks, such as a mobile telephone network using Short Message Service (SMS) messages, for example.

The system **10** further includes a gateway **18** in communication with at least one, and preferably a plurality of, channels, which are illustrated schematically

at **20**, **22**, and **24**, to which the mobile telephone **12** may initiate a call over the mobile telephone network **15**. Preferably, the channels **20**, **22**, and **24** are telephone lines in a Public Switched Telephone Network (PSTN) **29**. The channels **20**, **22**, and **24** are preferably associated with PSTN telephone numbers in a local calling area associated with the mobile telephone **12**, and thus these channels preferably depend on a geographical location of the mobile telephone. The expression "local calling area" herein refers generally to a set of telephone numbers, typically defined by a geographical region, to which telephone calls may be placed by callers within the local calling area at either no additional charge or at a lower additional charge than would be required for calls to numbers that are outside of the local calling area. However, it will be appreciated that in other embodiments, the gateway **18** may be in communication with any number of channels, which need not be PSTN telephone lines. Also, in the illustrated embodiment, the channels **20**, **22**, and **24** are associated with telephone numbers for Vancouver, British Columbia, Canada and the surrounding area, although it will be appreciated that these channels may include PSTN telephone lines associated with other areas, for example, which may not necessarily be in a local calling area associated with the mobile telephone **12**.

In the illustrated embodiment, each of the channels **20**, **22**, and **24** is configured by a PSTN service provider (which, in Canada, may be Bell Canada or Telus, for example) to direct calls that are received on the channels to the gateway **18**. In the illustrated embodiment, the PSTN service provider has configured the channels **20**, **22**, and **24** to communicate with a **T1** multiplexer **25**, which multiplexes the channels **20**, **22**, and **24** in a manner known in the art onto one or more **T1** lines **27** that are in communication with the gateway **18**. The gateway **18** is in communication with an IP network shown generally at **26**. The channels **20**, **22**, and **24** are thus configured to cooperate with the IP network **26** (via the gateway **18** in the illustrated embodiment) to cause a call involving the mobile telephone **12** and the callee

to be routed through the IP network in response to a call received at one of the channels.

Also, in the illustrated embodiment, the access server **14** is in communication with the routing controller **30** of the first node **11**, and the routing controller **30** is configurable to associate a callee identifier with one of the channels **20**, **22**, and **24**, as described below. A callee identifier associated with one of the channels **20**, **22**, and **24** may be a telephone number of a PSTN telephone **32** that is in communication with the IP network **26** through a gateway **34**, or it may be a telephone number of a VoIP telephone **36** that is directly in communication with the IP network **26**, for example. Other routing controllers **30** of other nodes, such as the second node **21**, for example, may also associate callee identifiers with other channels that are in communication with other gateways (not shown).

Mobile Telephone

Referring to Figure **2**, in this embodiment, the mobile telephone (**12**) includes a processor circuit shown generally at **50**. The processor circuit **50** includes a microprocessor **52**, a program memory **54**, an input/output (I/O) port **56**, parameter memory **58**, and temporary memory **60**. The program memory **54**, I/O port **56**, parameter memory **58**, and temporary memory **60** are all in communication with the microprocessor **52**. The processor circuit **50** may alternatively include a plurality of processors, a plurality of program memories, a plurality of temporary memories, and/or a plurality of I/O ports, or these components may alternatively be combined into a single device. However, for simplicity, the components of the processor circuit **50** are illustrated as shown in the example of Figure **2**.

In the illustrated embodiment, the I/O port **56** includes a dialing input **62** for receiving a callee identifier from a key pad, for example, or from a voice recognition unit, or from pre-stored callee identifiers stored in the parameter memory **58**, for example. For illustration purposes only, a myriad of possible

dialing functions for providing a callee identifier are represented by the block entitled dialing function **64**. A callee identifier may be a telephone number of a callee, for example.

The I/O port **56** also includes a handset interface **66** for receiving and producing signals to and from a handset **68** that may be placed close to the user's ear and mouth, for producing and receiving audible signals for and from the user. It will be appreciated that alternatively, the handset **68** may include a camera and video screen, for example, and that video or other types of signals may be transmitted additionally or alternatively to audible signals.

The I/O port **56** also includes a non-voice network interface **70** for transmitting information to, and receiving information from, the non-voice network **16** illustrated in Figure **1**, for example, and preferably interfaces with a high-speed internet connection.

The I/O port **56** in the illustrated embodiment further includes a mobile telephone network interface **72** for transmitting signals to and receiving signals from a mobile telephone service provider over a network such as a Global System for Mobile communications (GSM) or a Code Division Multiple Access (CDMA) network, such as the mobile telephone network **15** illustrated in Figure **1**, for example. Again, for simplicity, a mobile telephone network interface is illustrated, although it will be appreciated that video signals or other signals may be handled similarly when the mobile telephone (**12**) is facilitating communication of one or more of these types of signals. It will also be appreciated that alternatively, the non-voice network interface **70** and mobile telephone network interface **72** need not be distinct, but may be a single interface for communication over a single network, for example, or may be configured to communicate over a plurality of different networks, for example.

In the illustrated embodiment, the parameter memory **58** includes a username field **74** and a password field **76**, although it will be appreciated that the username and password may not be necessary, or may be input by the user as required, for example. The parameter memory **58** in the illustrated embodiment also includes a caller identifier field **78** for storing a caller identifier, which may be a telephone number associated with the mobile telephone (**12**) for identifying a "channel" such as a telephone line assigned to the mobile telephone that may be used to call back to the mobile telephone, for example. Generally, the contents of the username field **74**, the password field **76**, and the caller identifier field **78** are set once when the user first subscribes to the system.

The usernames referred to herein, such as the username in the username field **74**, preferably include a twelve digit number such as **2001 1050 8667**, for example, wherein the left-most digit is a continent code (such as **"2"** to indicate North America, for example), followed by a three-digit country code (such as **"001"** to indicate Canada and the United States, for example), a four-digit dealer code (such as **"1050"**, for example), and a unique four-digit number code (such as **"8667"**, for example), as discussed more generally in PCT Publication No. **2008/052340**. Therefore, a prefix of a username referred to herein preferably indicates a geographical region associated with the user, or with the access code, and more preferably indicates a node associated with the user or access code.

The program memory **54** stores blocks of codes for directing the microprocessor **52** to carry out the functions of the mobile telephone (**12**), which are illustrated by example below.

Referring to Figures **2** and **3**, a flow chart representing functions performed by blocks of code that direct the microprocessor **52** to initiate a call with the mobile telephone **12** to a callee is shown generally at **100**. The blocks shown in Figure **3** generally represent codes that may be stored in the program

memory **54** for example, for directing the microprocessor **52** to perform various functions relating to initiating a call with the mobile telephone **(12)** to a callee. The actual code to implement each block may be written in any suitable programming language, such as Java, C, and/or C++, for example.

The process **100** begins at **102**, in response to an interrupt produced at or for the microprocessor **52** by the dialing function **64**. Upon initiation of the process **100**, block **104** directs the microprocessor **52** to obtain a callee identifier from the dialing function **64** at the dialing input **62** of the I/O port **56** in the illustrated embodiment. The callee identifier is associated with a desired callee, and may be a telephone number of the callee, for example. The microprocessor **52** thus receives, from a user of the mobile telephone **(12)**, a callee identifier associated with a callee.

Block **106** directs the microprocessor **52** to transmit, using the non-voice network interface **70** in the illustrated embodiment, an access code request message, the access code request message including the callee identifier obtained at block **104**, to the access server **14** (illustrated in Figure **1**). In general, preferably block **106** directs the microprocessor **52** to cause an access code request message to be transmitted to the access server **14** over a non-voice network, such as an internet, using WiFi or GPRS technology for example. However, it will be appreciated that block **106** may direct the microprocessor **52** to transmit an access code request message to the access server **14** using any suitable technique, which may alternatively include a voice network, for example.

Referring to Figure **4**, an exemplary access code request message is shown generally at **110**. The access code request message **110** includes a username field **112**, a password field **114**, a callee identifier field **116**, and a caller identifier field **118**. In the illustrated embodiment, values for the username, password, and caller identifier fields **112**, **114**, and **118** are retrieved from the username, password, and caller identifier fields **74**, **76**, and

78 respectively in the parameter memory 58 of the processor circuit 50 (illustrated in Figure 2), and a value for the callee identifier field 116 is obtained from the dialing function 64 in block 104, and may be stored in the temporary memory (60), for example. It will be appreciated that the username field 112, password field 114, and caller identifier field 118 are not essential, although these fields are preferable in order to identify the user of the mobile telephone for billing purposes, for example.

Referring to Figures 1 and 4, it will be appreciated that in order to minimize charges from the mobile telephone service provider of the mobile telephone 12, the channels 20, 22, 24 will preferably be local or relatively inexpensive telephone lines associated with a geographical location, more particularly a pre-defined local calling area, associated with the mobile telephone 12. Therefore, the exemplary access code request message 110 further includes a location identifier field 119. The location identifier stored in the location identifier field 119 preferably identifies a location of the mobile telephone 12 for use in determining a local calling area associated with the mobile telephone 12.

For example, the location identifier in the location identifier field 119 may include an IP address of the mobile telephone 12 in a wireless IP network, such as the non-voice network 16 to which the non-voice network interface 70 shown in Figure 2 is connected, because this IP address may be an indicator of a geographical location of the mobile telephone 12. The location identifier may also or alternatively include an identifier of a wireless voice signal station in wireless communication with the mobile telephone. In the illustrated embodiment, the wireless voice signal station is part of the mobile telephone network 15 that is in communication with the mobile telephone 12 through the mobile telephone network interface 72 illustrated in Figure 2. In still other embodiments, the location identifier may include a user-configured identifier of a geographical location or local calling area where the mobile telephone 12 is or may be situated. The location identifier may thus be pre-determined and

stored in the parameter memory **58** shown in Figure **2** or may be acquired from non-voice network or wireless voice signal station or from user input, for example. Therefore, in summary, the location identifier in the location identifier field **119** may include one or more of an IP address of the mobile telephone **12** in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier.

As described below, the location identifier in the location identifier field **119** may be used to determine a local calling area associated with the mobile telephone **12**, within which local calling area channels (illustrated as **20**, **22**, and **24** in Figure **1**) are available to the mobile telephone **12** for the lowest cost to the user. However, it will be appreciated that the location identifier may only approximately identify a local calling area, and may not necessarily identify the lowest cost channel (illustrated as **20**, **22**, and **24** in Figure **1**) for the mobile telephone **12**. It will also be appreciated that in other embodiments, the location identifier field **119** may be omitted.

Referring back to Figure **3**, the process **100** continues at block **130**, which directs the microprocessor (**52**) to receive an access code reply message from the access server (**14**) in response to the access code request message that was transmitted at block **106**.

Referring to Figure **5**, an exemplary access code reply message is shown generally at **140**. The access code reply message **140** includes an access code field **142** and a timeout field **144**. In the illustrated embodiment, the access code field **142** stores an access code which is a telephone number associated with a telephone line associated with one of the channels **20**, **22**, or **24** in Figure **1**. It will be appreciated that the access code is different from the callee identifier in the callee identifier field **116** shown in Figure **4**, in that the access code identifies a channel, other than that provided by the callee identifier provided by the dialing function **64** in Figure **2**, that the mobile

telephone (**12**) can use to initiate a call to the callee. It will be appreciated that use of the access code facilitates avoidance of long distance or roaming charges that a mobile telephone service provider would charge for a call placed directly using the callee identifier using conventional calling processes, for example.

Still referring to Figure **5**, the timeout field **144** in the illustrated embodiment stores a value that indicates a period of time, for example a number of minutes, during which the access code in the access code field **142** is associated with the callee identifier in the callee identifier field **116** of the exemplary access code request message **110** illustrated in Figure **4**, such that the access code is only temporarily associated with the callee identifier. In one embodiment, the value stored in the timeout field **144** indicates **10** minutes, for example. It will be appreciated that in other embodiments, the timeout field **144** may not be necessary, but preferably it is included.

In the illustrated embodiment, the program codes in block **130** direct the microprocessor **52** to receive the access code reply message over a non-voice network, such as a WiFi or GPRS network (illustrated at **16** in Figure **1**) via the non-voice network interface **70** shown in Figure **2**. However, it will be appreciated that the access code reply message may be received on any suitable network, even a voice network, for example.

Referring back to Figures **2** and **3**, block **149** directs the microprocessor **52** to initiate a call with the mobile telephone (**12**) on the mobile telephone network **15** (illustrated in Figure **1**) using the access code received in the access code field **142** of the access code reply message **140** (shown in Figure **5**) to identify the callee. In the illustrated embodiment, the codes in block **149** direct the microprocessor **52** to initiate a call to the channel (**20**, **22**, or **24**) identified by the access code, using the mobile telephone network interface **72** of the I/O port **56** of the mobile telephone (**12**), to engage the mobile telephone network (**15**).

Referring to Figure **1**, in the embodiment shown, the access code in the access code field **(142)** is a telephone number identifying a channel **20**, **22**, or **24** that is in communication with the gateway **18** to the IP network **26**. Through the gateway **18**, the channel **20**, **22**, or **24** is thus operably configured to cooperate with the IP network **26** to cause a call from the mobile telephone **12** to the callee to be routed through the IP network. Routing the call through the IP network may involve engaging the routing controller **30** to route the call on the IP network **26** to the callee, as described below. However, it will be appreciated that in other embodiments, the access code need not be a telephone number, but may be any code identifying a channel through which the mobile telephone **12** can initiate a call. Alternatively, if the mobile telephone is capable of voice over IP communications, the access code may be used to identify an IP address in the IP network to which the call is routed. In this embodiment, the IP address may act as the access code. The process **100** shown in Figure **3** is then ended.

Access Server

Referring to Figure **6**, the access server **(14)** includes a processor circuit shown generally at **150**. The processor circuit **150** includes a microprocessor **152**, program memory **154**, an I/O port **156**, parameter memory **158**, and temporary memory **160**. The program memory **154**, I/O port **156**, parameter memory **158**, and temporary memory **160** are all in communication with the microprocessor **152**. The processor circuit **150** may alternatively include a plurality of microprocessors or I/O ports, for example, and the components of the illustrated processor circuit **150** may also alternatively be combined into a single device.

The program memory **154** stores blocks of codes for directing the microprocessor **152** to carry out the functions of the access server **14**. The I/O port **156** includes a non-voice network interface **162** for communicating with the non-voice network **16** illustrated in Figure **1**. The I/O port **156** also

includes a routing controller interface **164** for interfacing with the routing controller **30** illustrated in Figure **1**.

Referring to Figures **6** and **7**, a flow chart of blocks of code for directing the microprocessor **152** of the access server (**14**) to provide an access code to the mobile telephone (**12**) is shown generally at **190**. The blocks **190** in Figure **7** generally represent codes that may be stored in the program memory **154** for directing the microprocessor **152** to perform various functions to provide the access to the mobile telephone (**12**) to enable the mobile telephone to place a call through a channel (**20**, **22**, or **24**).

The process **190** begins at **192**, in response to an interrupt created by or for the microprocessor **152** when it receives an access code request message **110** (as illustrated in Figure **4**) from the mobile telephone (**12**). In the illustrated embodiment, the access code request message (**110**) is received via the non-voice network interface **162** through a non-voice network (**16**) such as a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may use different techniques for receiving the access code request message (**110**) from the mobile telephone (**12**).

The process **190** continues at block **196**, which directs the microprocessor **152** to communicate with the routing controller **30** to obtain from the routing controller an access code identifying a channel (illustrated as **20**, **22**, or **24** in Figure **1**) in communication with the gateway (**18**), wherein the access code is different from the callee identifier in the callee identifier field **116** (shown in Figure **4**) and is usable by the mobile telephone (**12**) to initiate a call to the callee using the channel, as further described below. Therefore, block **196** preferably causes an access code to be produced by retransmitting the access code request message **110** illustrated in Figure **4** that was received at **192** from the mobile telephone (**12**), to the routing controller **30** through the routing controller interface **164** of the I/O port **156**.

The process **190** continues at block **198**, which directs the microprocessor **152** to transmit an access code reply message (**140**), including the access code obtained by block **196**, to the mobile telephone (**12**). An exemplary access code reply message is shown in Figure **5**. In the illustrated embodiment, an access code reply message (**140**) is produced by the routing controller **30** in a manner described below in response to the access code request message (**110**) that was transmitted to the routing controller at block **196**, and the access code reply message (**140**) is received from the routing controller through the routing controller interface **164** of the I/O port **156**. Block **198** then causes the access code reply message that was received from the routing controller to be retransmitted to the mobile telephone (**12**). In the illustrated embodiment, the codes in block **198** direct the microprocessor **152** to transmit the access code reply message (**140**) using the non-voice network interface **162** to the non-voice network **16**, which may be a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may employ other types of networks for communicating the access code reply message (**140**) to the mobile telephone (**12**). The process **190** is then ended.

In summary, referring to Figure **1**, the access server **14** generally acts as an interface to the routing controller **30** for relaying access code request messages and access code reply messages between the mobile telephone **12** and the routing controller. Therefore, it will be appreciated that in alternative embodiments, the access server **14** and the routing controller **30** need not be separate, but may, for example, be combined in a single component.

Routing Controller (RC)

Referring to Figure **1**, generally, the routing controller **30** executes a process to facilitate communication between callers and callees. The function of a routing controller generally in a VoIP system is described in PCT Publication No. WO **2008/052340**.

Referring to Figure **8**, the routing controller (**30**) includes a processor circuit shown generally at **230**. The processor circuit **230** includes a microprocessor (or more generally a processor) **232**, program memory **234**, an I/O port **236**, table memory **238**, temporary memory **240**, and a clock **244**. The program memory **234**, I/O port **236**, table memory **238**, temporary memory **240**, and clock **244** are all in communication with the processor **232**. The processor circuit **230** may include a plurality of microprocessors, for example, and the aforementioned components of the processor circuit **230** may be combined, for example. The program memory **234** includes blocks of code for directing the processor **232** to carry out the functions of the routing controller (**30**), and the I/O port **236** includes an access server interface **242** for communicating with the access server **14**.

In the illustrated embodiment as described above, the access server (**14**) transmits (at block **196** illustrated in Figure **7**) an access code request message (**110**) to the routing controller (**30**) in order to obtain from the routing controller (**30**) an access code. When an access code request message (**110**) is received at the access server interface **242**, the processor **232** preferably stores certain values from the access code request message in stores in the temporary memory **240** for ease of retrieval. In particular, the temporary memory **240** includes a callee identifier store **246** for storing the callee identifier from the callee identifier field **116** in the access code request message **110** illustrated in Figure **4**, a caller identifier store **248** for storing the caller identifier that was stored in the caller identifier field **118** of the access code request message **110** illustrated in Figure **4**, a caller username store **249** for storing the caller username that was stored in the caller username field **112** of the access code request message **110** illustrated in Figure **4**, and an access code store **250** for storing an access code that is selected when the routing controller (**30**) receives an access code request message (**110**). The temporary memory **240** also includes a local calling area identifier store **245** for storing an identifier of a local calling area associated with the mobile

telephone (**12**). The clock **244** generally maintains and stores a representation of a current date and time.

The I/O port **236** further includes a database request port **256** through which a request to the database (**23** in Figure **1**) can be made, and also includes a database response port **258** for receiving a reply from the database (**23**). The I/O port **236** further includes a routing controller (RC) request message input **260** for receiving an RC request message (illustrated in Figure **17**) from the call controller (**13** in Figure **1**) and includes a routing message output **262** for sending a routing message back to the call controller **13**. The I/O port **236** thus acts to receive a caller identifier and a callee identifier contained in an RC request message from the call controller, the RC request message being received in response to initiation of a call by a subscriber of the system, as described below.

The program memory **234** includes blocks of codes for directing the processor **232** to carry out various functions of the routing controller (**30**). One of these blocks includes an RC request message handler **380** which directs the routing controller (**30**) to produce a routing message in response to a received RC request message, an example of which is illustrated in Figure **17**. The RC request message handler process is shown in greater detail at **380** in Figures **18A** through **18C**. Another of these blocks in the program memory **234** includes an access code generator, which is described at **270** in Figure **12**, and which directs the routing controller (**30**) to produce an access code as directed by the program codes in block **196** shown in Figure **7**. Yet another of these blocks in the program memory **234** includes a local calling area identifier generator, which directs the routing controller (**30**) to produce a local calling area identifier using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**.

Local Calling Area Identifier Generator

Referring to Figure **1**, it will be appreciated that preferably, a call made by the mobile telephone **12** using the access code obtained from the access server **14** will be a local call for the mobile telephone **12**, based on a geographical location of the mobile telephone. Therefore, blocks in the program memory **234** include a local calling area identifier generator, which directs the routing controller **30** to produce a local calling area identifier.

For example, the local calling area identifier generator may direct the microprocessor **152** to access a dialing profile associated with the caller. The dialing profile may be identified using the username in the username field **112** in the access code request message **110** illustrated in Figure **4**, and to store in the local calling area identifier field **245** a default location of the caller retrieved from the dialing profile associated with the caller.

Referring to Figure **9**, an exemplary dialing profile is illustrated generally at **200** and includes a username field **202**, a domain field **204**, and calling attributes comprising a national dialing digits (NDD) field **206**, an international dialing digits (IDD) field **208**, a country code field **210**, a local area codes field **212**, a caller minimum local number length field **214**, a caller maximum local number length field **216**, a reseller field **218**, a maximum number of concurrent calls field **220**, a current number of concurrent calls field **222**, and a default local calling area identifier field **224**. Therefore, in some embodiments, the local calling area identifier generator directs the microprocessor **152** to determine a local calling area associated with the mobile telephone (**12**) by retrieving the default local calling area identifier from the default local calling area identifier field **224** of the dialing profile **200**.

Effectively, the dialing profile **200** is a record identifying calling attributes of the caller identified by the username in the username field **202**. More generally, dialing profiles **200** represent calling attributes of respective users, and are discussed in more detail in PCT publication No. WO **2008/052340**. As

described in PCT publication No. WO **2008/052340**, a dialing profile of the type shown in Figure **9**, and also other records such as direct-in-dial (DID) records, call blocking records, call forwarding records, and voicemail records, may be created whenever a user registers with the system or agrees to become a subscriber to the system.

Alternatively, the local calling area identifier generator may generate a local calling area identifier to be stored in the local calling area identifier store **245** using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**. As described above, the location identifier field (**119**) may store one or more of an IP address of the mobile telephone (**12**) in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier. One or more of these values may be used to identify a local calling area that is or is likely to be associated with the mobile telephone (**12**) in order to generate a local calling area identifier to be stored in the local calling area identifier store **245**.

For example, it has been found that services available from web sites such as http://www.ip2location.com/ and http://www.serviceobjects.com/products/dots_ipgeo.asp, for example, can produce a name of a location, and also latitude and longitude values, associated with an IP address. Using this information derived from an IP address, or other information from the location identifier field (**119**), a local calling area may be identified by hierarchical jurisdictional designations (such as country, province, and city in Canada or country, state, and city in the United States) and encoded as codes identifying the local calling area. These codes may then be stored in the local calling area identifier store **245**.

Access Code Association Table

In the illustrated embodiment, the table memory **238** (shown in Figure **8**) includes an access code association table **170**, an example of which is

illustrated in Figure **10**, for associating access codes with callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps. Although the routing controller (**30**) is illustrated in this embodiment as a separate component from the access server (**14**), it will be appreciated that in other embodiments, the routing controller (**30**) may be part of or integrated with the access server (**14**), and in these other embodiments, the access code association table **170** may be part of or integrated with the access server.

Referring to Figures **1** and **10**, the access code association table **170** generally includes a plurality of records, each having an access code field **173** storing an access code. The access codes in the access code association table **170** may thus form a pool of access codes, where each access code may identify a respective telephone number. In the illustrated embodiment, the access codes in the access code fields **173** of records of the access code association table **170** identify respective channels (illustrated by example only as **20**, **22**, and **24**) that are operably configured to cooperate with the IP network **26** via the gateway **18** to cause a call involving the mobile telephone **12** to be routed through the IP network.

Referring to Figure **10**, the exemplary access code association table **170** includes records **172**, **174**, **176**, **178**, and **180**, each having respective fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175**, a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**. Generally, a record in the access code association table **170** will be created for each access code that identifies a channel (such as the channels **20**, **22**, and **24** illustrated in Figure **1**) that is configured or configurable to establish communication through a gateway (such as the gateway **18** illustrated in Figure **1**) to an IP network (**26** in Figure **1**) in response to a call received at the channel. When a record is created in respect of a channel, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel, the access code field **173** is preferably initialized with an access code

associated with the channel, and the channel identifier field **175** is preferably initialized with an identifier of the channel. The remaining fields (for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**) are preferably initialized with default "null" values when a record is created. The fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175** preferably remain generally constant during ordinary operation of the access code association table **170**, although the values stored in the fields for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may vary as described below. It will be appreciated that in some embodiments, one or more of the fields for storing a local calling area identifier **171**, a channel identifier **175**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may not be required and be omitted.

As noted above, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel. The local calling area identifier field **171** preferably stores codes that are encoded in the same manner as the codes in the local calling area identifier store **245**, as described above, so that an access code in the local calling area identified by the codes in the local calling area identifier store **245** may be identified by searching the access code association table **170** for an access code associated with a local calling identifier in the associated local calling area identifier field **171** that matches the local calling area identifier in the local calling area identifier store **245**. It has been found that information available from web sites such as http://en.wikipedia.org/wiki/List_of_NANP_area_codes, and services available from web sites such as http://www.serviceobjects.com/demos/PhoneExchangeDemo.asp, for example, may be used to determine a local calling area associated with a given access code where, for example, the access code is a PSTN telephone number.

In the exemplary access code association table **170**, the access codes in the access code fields **173** are telephone numbers for PSTN lines, three of which are in the **604** area code in Vancouver, British Columbia, Canada, and two of which are in the **416** area code in Toronto, Ontario, Canada. It will be appreciated that the access code association table **170** is an example only, and other access code association tables may include any number of access codes, which need not be PSTN telephone numbers, and which need not be limited to particular geographical areas.

In the exemplary access code association table **170**, the access code field **173** in the record **174** stores an access code **1-604-345-2323**, which may be a local telephone number for Vancouver, British Columbia, Canada, and the callee identifier field **177** of the record **174** stores a callee identifier **1-403-789-1234**, which may be a telephone number for a callee in Calgary, Alberta, Canada for example, thereby associating the callee identifier **1-403-789-1234** with the access code **1-604-345-2323**. Furthermore, the caller identifier field **179** of the record **174** stores a caller identifier **1-416-444-1441** and the caller username field **183** stores a caller username **2001 1050 8667**, thereby associating the caller identifier **1-416-444-1441** and caller username **2001 1050 8667** with the aforementioned access code and callee identifier. The caller identifier **1-416-444-1441** may be associated with a mobile telephone normally geographically located in Toronto, Ontario, Canada, but which may be in Vancouver and is therefore using a Vancouver-based access code to place a call to a Calgary-based number, for example. In the example record **174**, the timestamp field **182** indicates that the callee identifier **1-403-789-1234**, the caller identifier **1-416-444-1441**, and the caller username **2001 1050 8667** were associated with the access code **1-604-345-2323** on June **15, 2008** at **10:31** am, and the timeout field **181** indicates that this association is to expire **10** minutes after the time indicated in the timestamp field.

Likewise, the exemplary record **178** indicates that the callee identifier **1-604-321-1234**, the caller identifier **1-416-444-1234**, and the caller username **2001**

1050 4141 were associated with the access code **1-416-234-4646** on June **15, 2008** at **2:21** pm, and the timeout field **181** of the record **178** indicates that this association is to expire within **10** minutes of the time in the timestamp field **182**.

It will also be appreciated that the access code association table **170** may, in other embodiments, be substituted with other data structures or storage media. For example, in alternative embodiments, as described below, a DID record of the type shown at **370** in Figure **11** may associate an access code with a callee identifier and with other information such as a caller identifier, a timeout value, and a timestamp value, additionally or alternatively to the access code association table **170**.

DID Bank Table Records

As described in PCT Publication No. **2008/052340**, a DID bank table record may be created and stored in a DID bank table in the database (**23** in Figure **1**) when a user registers with the system, to associate the username of the user and a host name of the node with which the user is associated, with a number on the PSTN network formatted in compliance with the E.**164** standard set by the International Telecommunication Union (ITU). However, as explained below, DID records may, in some embodiments, also associate usernames and host names with respective access codes, and may also associate access codes with respective callee identifiers and with other information such as caller identifiers, timeout values, and timestamp values.

Referring to Figure **11**, an exemplary DID bank table record is shown generally at **370**, and includes a username field **371**, a user domain field **372**, and a DID field **373**. The username field **371** may store a username of a user of the system, in which case the user domain field **372** stores a host name of the node with which the user is associated, and the DID field **373** stores an E.**164** number on the PSTN network associated with the user. Exemplary host names stored in the user domain field **372** include sp.yvr.digifonica.com for

Vancouver, British Columbia, Canada and sp.lhr.digifonica.com for London England, for example, as described in PCT Publication No. **2008/052340**. If the user has multiple telephone numbers, then multiple records of the type shown at **370** would be included in the DID bank table, each having the same username and user domain, but different DID field **373** contents reflecting the different telephone numbers associated with that user.

However, DID fields **373** of DID bank table records **370** may also store access codes, in which case the username field **371** may store a username associated with the access code. In these DID bank table records **370**, the user domain field **372** stores a host name of the node with which the access code is associated. Therefore, DID bank table records **370** may, in some embodiments, associate usernames and host names with respective access codes.

The exemplary DID bank table record **370** further includes a callee identifier field **374**, a caller identifier field **375**, a timeout field **376**, a timestamp field **377**, a local calling area identifier field **378**, a channel identifier field **379**, and a caller username field **381**, which may be used in an analogous manner to the callee identifier field **177**, the caller identifier field **179**, the timeout field **181**, the timestamp field **182**, the local calling area identifier field **171**, the channel identifier field **175**, and the caller username field **183** respectively of the access code association table **170** illustrated in Figure **10**. The DID bank table records **370** may thus associate access codes with respective local calling area identifiers, callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps, although the caller identifier field **375**, timeout field **376**, timestamp field **377**, local calling area identifier field **378**, channel identifier field **379**, and caller username field **381** may are not necessary, and one or more of these fields may be omitted in some embodiments. Furthermore, it will be appreciated that the callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may be omitted for DID table records that are not in respect

of access codes, but rather are in respect of telephone numbers of users of the system, for example, as described in PCT Publication No. **2008/052340**. The callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may also be omitted in embodiments where the access code association table **170** includes records with these types of fields.

For simplicity, the following description is directed to embodiments wherein an access code association table **170** associates access codes with respective callee identifiers, caller identifiers, timeout values, and timestamp values. However, it will be appreciated that the processes described herein for records in the access code association table **170** may additionally or alternatively be applied to DID bank table records **370** in an analogous manner.

Access Code Generator

Referring back to Figures **1**, **4**, and **8** in the illustrated embodiment as described above, the access server **14** transmits (at block **196** illustrated in Figure **7**) an access code request message **110** to the routing controller **30** in order to obtain from the routing controller **30** an access code. When an access code request message **110** is received at the access server interface **242**, the processor **232** preferably authenticates the user by making various enquiries of databases to which it has access, to determine whether or not the password in the password field **114** of the access code request message **110** matches a password stored in the database in association with the username in the username field **112**. Various functions may be used to pass encryption keys or hash codes back and forth to ensure that the transmittal of passwords is secure. If the user is successfully authenticated, the processor **232** then preferably produces an access code.

Referring to Figures **8** and **12**, a process for producing an access code is shown generally at **270**. Essentially the process **270** determines whether the

access code in a given record (referred to below as the "currently addressed record") in the access code association table shown at **170** in Figure **10** is within the local calling area identified by the local calling area identifier store **245**, and whether the access code is currently available for association with a callee identifier. In order to produce an access code in response to receiving an access code request message (**110**) from the access server (**14**), the processor **232** of the routing controller (**30**) preferably searches the pool of access codes in the access code association table (**170**) to identify an access code identifying a channel usable by the mobile telephone (**12**) to initiate a call to the callee, using the process **270** until an available access code in the local calling area identified by the local calling area identifier store **245** is identified. The access code generator thus preferably selects an access code from the pool of access codes in the access code association table (**170**), and preferably selects an access code in a local calling area associated with the mobile telephone (**12**).

Starting with the first record in the access code association table, the process **270** begins at block **272**, which directs the processor **232** of the routing controller (**30**) to determine whether the access code in the currently addressed record of the access code association table **170** is associated with the same local calling area as the mobile telephone (**12**) as identified by the contents of the local calling area identifier store **245**. If at block **272** the access code of the currently addressed record is not associated with the same local calling area as the mobile telephone (**12**), the process **270** ends, the next record in the access code association table **170** is addressed, and the process is repeated for the next record in the access code association table.

However, if at block **272** the access code of the currently addressed record is associated with the same local calling area as the mobile telephone (**12**), or if the access code request message **110** (illustrated in Figure **4**) did not include a local calling area identifier, then the process **270** continues at block **274**,

which directs the processor **232** to determine whether the access code of the currently addressed record is associated with a callee identifier. To do this, the processor **232** determines whether the callee identifier field **(177)** of the currently addressed record stores a "null" value that was assigned to it on initialization, or whether the callee identifier field instead stores a callee identifier. In other words the processor checks to see whether the currently addressed record has already been in use.

If at block **274** the callee identifier field **(177)** of the currently addressed record in the access code association table **(170)** does store a callee identifier and not the "null" value that was assigned to the callee identifier field on initialization (for example, records **174** and **178** in Figure **10**), then the access code of that record is associated with a callee identifier, and the process **270** continues at block **278**, which directs the processor **232** to determine whether the association of the callee identifier with the access code has expired. In the illustrated embodiment, the codes at block **278** direct the processor **232** to determine whether the sum of the contents of the timestamp field **(182)** and of the timeout field **(181)** in the currently addressed record of the access code association table **170** (shown in Figure **10**) is less than the current time represented by the clock **244**. If at block **278** the sum of the timeout and timestamp fields in the currently addressed record of the access code association table **170** is less than the time represented by the clock **244**, then the association of the callee identifier with the access code is not expired and the process **270** ends, the next record in the access code association table **(170)** is addressed, and the process **270** is repeated for the next record in the access code association table.

However, if at block **278** the sum of the contents of the timeout and timestamp fields **(181** and **182)** in the currently addressed record of the access code association table **(170)** is not less than the time represented by the clock **244**, then the association of the callee identifier with the access code has expired, and the process **270** continues at block **276** which directs the processor **232**

to store the contents of the access code field **173** of the currently addressed record in the access code store **250** of the temporary memory **240** of the routing controller **30**.

Referring to Figures **8**, **10**, and **12**, if at block **274** the callee identifier field in the currently addressed record does not store a callee identifier but stores instead the "null" value that was assigned to the callee identifier field on initialization (for example, records **172**, **176**, and **180**), then the access code of that record is not associated with a callee identifier, and the process **270** continues at block **276**, which directs the processor **232** to store the access code from the access code field **173** of the currently addressed record, in the access code store **250** in the temporary memory **240**.

After the selected access code is stored in the access code store **250** at block **276**, the process **270** continues at block **280**, which directs the processor **232** to store the callee identifier from the callee identifier store **246** (which identifies the mobile telephone **12** shown in Figure **1**) in the callee identifier field **177** of the currently addressed record, thereby creating an association of the callee identifier with the selected access code.

The process **270** then continues at block **282**, which directs the processor **232** to store the caller identifier from the caller identifier store **248** in the caller identifier field **179** of the currently addressed record of the access code association table **170**, thereby also storing the caller identifier in association with the selected access code.

The process **270** then continues at block **283**, which directs the processor **232** to store the caller username from the caller username store **249** in the caller username field **183** of the currently addressed record of the access code association table **170**, thereby also storing the caller username in association with the selected access code.

The process **270** then continues at block **284**, which directs the processor **232** to store timeout and timestamp values in the timeout and timestamp fields **181** and **182** of the currently addressed record of the access code association table **170**, thus further storing, in association with the selected access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire. A default value, such as **10** minutes, for example may be stored in the timeout field **181** of the currently addressed record, or where a timeout value is provided in the timeout field **144** of the access code reply message **140** shown in Figure **5**, the contents of this timeout field **144** are stored in the timeout field **181** of the currently addressed record. Also, the current time indicated by the clock **244** is preferably stored in the timestamp field **182** of the currently addressed record.

In alternative embodiments, the access code association table (**170**) might not include fields for a caller identifier, caller username, a timeout, or a timestamp. In these embodiments, one or more of blocks **282**, **283**, and **284** described above are not necessary, and one or more of the caller identifier store **248** and the caller username store **249** may be omitted.

In summary, the access code generator in the illustrated embodiment responds to receiving an access code request message **110** illustrated in Figure **4** from the access server (**14**) by first authenticating the user, and then by searching through a pool of access codes, using the process **270** shown in Figure **12**, to identify an access code that is in the local calling area identified by the local calling area identifier store (**245**) and that is not previously and validly associated with another callee identifier. It will be appreciated that in alternative embodiments, different data structures and algorithms may be preferable for identifying an access code that meets the aforementioned criteria. For example, in accordance with conventional database design that is well-known in the art, the records illustrated in the access code association table **170** illustrated in Figure **10** may alternatively be organized in a binary tree according to the value in the local calling area identifier field **171**, or in

separate tables for respective local calling area identifiers, for example, in order to enable a more efficient search of the access code association table for an access code that satisfies the aforementioned criteria. Therefore, the access code association table (**170**) and the process **270** illustrated in Figure **12** are examples only, and one of ordinary skill in the art will readily appreciate numerous alternative data structures and algorithms.

Gateway

Referring to Figure **13**, in this embodiment, the gateway (**18**) includes a processor circuit shown generally at **300**, which includes a microprocessor **302**. The processor circuit **300** also includes a program memory **304**, a memory **305**, and an I/O port **306**, all of which are in communication with the microprocessor **302**. The processor circuit **300** may include multiple processors etc., and the aforementioned components of the processor circuit **300** may alternatively be combined.

The I/O port **306** includes a channel interface **308**, which, in the illustrated embodiment, is in communication with the channels **20**, **22**, and **24** that were also illustrated in Figure **1**. Where, as in the illustrated embodiment, the channels **20**, **22**, and **24** are PSTN telephone lines in the PSTN network **29**, the channel interface **308** may, for example, be a T1 port for communication with one or more T1 lines (illustrated at **27** in Figure **1**) of a PSTN service provider, in a manner well-known in the art. The I/O port in the illustrated embodiment also includes an internet interface **309** for interfacing with the IP network **26** illustrated in Figure **1**. The program memory **304** stores blocks of codes for directing the microprocessor **302** to carry out the functions of the gateway (**18**). It has been found that the AS**5350** Universal Gateway available from Cisco Systems, Inc. of San Jose, California may, for example, be suitable as the gateway (**18**).

Referring back to Figure **1**, and also still to Figure **13**, when a call is received on one of the channels **20**, **22**, or **24**, the microprocessor **302** causes the I/O

port **306** to use the internet interface **309** to send a Session Initiation Protocol (SIP) Invite message to a pre-determined node with which the gateway **18** is associated, which in the illustrated embodiment is the first node **11**. Generally, the gateway **18** will be associated with a node that is geographically closest to the gateway, in order to minimize transmission times over the IP network **26**. In response to the SIP Invite message, the call controller **13** sends an RC request message to the routing controller **30** which makes various enquiries of the database **23** to produce a routing message that is sent back to the call controller **13**. The call controller **13** then communicates with the media relay **28** to cause a communications link including an audio path and a videophone (if a videopath call) to be established through the media relay to the same node, a different node, or to a communications supplier gateway as shown generally at **34** to carry audio, and where applicable, video traffic to the call recipient or callee.

Referring to Figure **14**, an exemplary SIP Invite message is shown generally at **310** and includes a caller identifier field **312**, a callee identifier field **314**, a digest parameter field **315**, a call identifier field **316**, an IP address field **317**, and a gateway UDP port field **318**. Examples of values for the fields in the SIP Invite message **310** are shown for illustration purposes only in Figure **14**. The caller identifier in the caller identifier field **312** is preferably in the form of the telephone number of the caller followed by the "@" symbol, which in turn is followed by the IP address of the gateway (**18**) in the IP network (**26**). The caller identifier may be determined by retrieving calling line identification (CLID) information from the signal provided by the PSTN network (**29**) to the gateway (**18**) for example Where the caller identification information is not available to the gateway (**18**), the caller identifier in the caller identifier field **312** preferably includes a generic number (such as **11111**, for example) indicating that the caller identification information was not available, followed by the "@" symbol and then by the IP address of the gateway (**18**).

The callee identifier in the callee identifier field **314** is the access code identifying the channel (**20**, **22**, or **24** in the example of Figure **1**) on which the call was placed, and which was received from the access server (**14**). In the illustrated example, the access code is the PSTN telephone number **1-604-345-1212** corresponding to the channel **20** illustrated in Figure **1**, and to the access code stored in the access code field **173** of the record **172** in the exemplary access code association table **170** illustrated in Figure **10**.

The digest parameter in the digest parameter field **315** is generated by the gateway (**18**) and may uniquely identify the SIP session that is initiated with the SIP Invite message **310**.

The call identifier in the call identifier field **316** is, in the illustrated embodiment, a four-digit hexadecimal number generated by the gateway (**18**) to identify the call, followed by the "@" symbol, which in turn is followed by the IP address of the gateway.

The IP address in the IP address field **317** is the IP address of the gateway (**18**) in the IP network (**26**), and the gateway UDP port number in the gateway UDP port field **318** includes a UDP port identifier identifying a UDP port at which the audio/video path will be terminated at the gateway (**18**).

It should be noted that throughout the description of the embodiments of this invention, the IP/UDP addresses of all elements such as the gateway (**18**) will be assumed to be valid IP/UDP addresses directly accessible via the Internet or a private IP network, for example, depending on the specific implementation of the system. As such, it will be assumed, for example, that the gateway (**18**) will have an IP/UDP address directly accessible by the call controllers and the media relays on their respective nodes, and those addresses will not be obscured by Network Address Translation (NAT) or similar mechanisms. In other words, the IP/UDP information contained in SIP messages (for example the SIP Invite message or the RC Request message

which will be described below) will match the IP/UDP addresses of the IP packets carrying these SIP messages.

It will be appreciated that in many situations, the IP addresses assigned to various elements of the system may be in a private IP address space, and thus not directly accessible from other elements. Furthermore, it will also be appreciated that NAT is commonly used to share a "public" IP address between multiple devices, for example between home PCs and IP telephones sharing a single Internet connection. For example, the gateway (**18**) may be assigned an IP address such as **192.168.0.5**. This address is located in so called "non-routable" (IP) address space and cannot be accessed directly from the Internet. In order for this device to communicate with other computers located on the Internet, the IP address has to be converted into a "public" IP address, for example **24.14.102.5** assigned by the Internet Service Provider, by a device performing NAT, typically a router. In addition to translating the IP address, NAT typically also translates UDP port numbers, for example an audio path originating at the gateway (**18**) and using a UDP port **12378** at its private IP address, may have be translated to a UDP port **23465** associated with the public IP address of the NAT device. In other words, when a packet originating from the gateway (**18**) arrives at an Internet-based node, the source IP/UDP address contained in the IP packet header will be **24.14.102.5:23465**, whereas the source IP/UDP address information contained in the SIP message inside this IP packet will be **192.168.0.5:12378**. The mismatch in the IP/UDP addresses may cause a problem for SIP-based VoIP systems because, for example, a node will attempt to send messages to a private address but the messages will never get there.

Call Controller

Referring to Figure **15**, the call controller (**13**) includes a processor circuit shown generally at **320**. The processor circuit **320** includes a microprocessor **322**, program memory **324**, and an I/O port **326**. The program memory **324** and the I/O port **326** are in communication with the microprocessor **322**. The

processor circuit **320** may include a plurality of microprocessors, a plurality of program memories, and a plurality of I/O ports to be able to handle a large volume of calls. However, for simplicity, the processor circuit **320** will be described as having only one microprocessor **322**, program memory **324**, and I/O port **326**, it being understood that there may be more.

Generally, the I/O port **326** includes an input **328** for receiving messages such as the SIP Invite message from the gateway (**18**) or from a VoIP telephone (**36** in Figure **1**, for example). The I/O port **326** also has an RC request message output **330** for transmitting an RC request message to the routing controller **30** of Figure **1**, an RC message input **332** for receiving routing messages from the routing controller **30**, a gateway output **334** for transmitting messages to the gateway **18** and/or **34** shown in Figure **1** to advise the gateway **18** and/or **34** to establish an audio path, for example, and a gateway input **336** for receiving messages from the gateway **18** and/or **34**. The I/O port **326** further includes a SIP output **338** for transmitting messages to the gateway (**18** and/or **34**) or VoIP telephone (**36**, for example) to advise the gateway **18** and/or **34** or IP telephone of the IP addresses of the gateways which will establish the audio/video path. The I/O port **326** further includes a voicemail server input and output **340** and **342** respectively for communicating with the voicemail server **19** shown in Figure **1**.

While certain inputs and outputs have been shown as separate, it will be appreciated that some may be a single IP address and IP port. For example, the messages sent to the routing controller (**30**) and received from the routing controller (**30**) may be transmitted and received on the same single IP port.

The program memory **324** includes blocks of code for directing the microprocessor **322** to carry out various functions of the call controller (**13**). For example, these blocks of code include a first block **344** for causing the processor circuit **320** to execute a SIP Invite to RC Request process to produce an RC Request Message in response to a received SIP Invite

message. In addition, there is a Routing Message to Gateway message block **346** which causes the processor circuit **320** of the call controller to produce a gateway query message in response to a received routing message from the routing controller (**30**).

Referring to Figures **15** and **16**, the SIP Invite to RC Request process is shown in more detail at **344**. On receipt of a SIP Invite message of the type shown in Figure **14**, block **350** directs the processor circuit **320** to produce an RC Request Message. Block **352** then directs the processor circuit **320** to cause the RC Request Message to be sent to the routing controller **30** illustrated in Figure **1**.

Referring to Figure **17**, an exemplary RC request message is shown generally at **360** and includes a caller identifier field **362**, a callee identifier field **364**, a digest parameters field **366**, and a call identifier field **368**. These fields may be populated with the contents of the caller identifier field **312**, callee identifier field **314**, digest parameter field **315**, and call identifier field **316** respectively of the SIP Invite message **310** illustrated in Figure **14**. In other embodiments, the RC request message may further include a type field (not shown) containing a type code to indicate whether the call is from a third party or from a system subscriber. Other variations of an RC request message are explained in PCT Publication No. WO **2008/052340**. A type field (not shown) in the RC request message **360** may be advantageous in embodiments where SIP Invite messages may also be received from an IP telephone that is using VoIP software to make a voice call. However, in the embodiments that are illustrated herein, SIP Invite messages originate from the gateway (**18**), and therefore a type designation is not necessary and may be omitted from the RC request message **360**. In embodiments where a SIP Invite message may be received from an IP telephone, the SIP invite to RC request process shown in Figure **16** may require additional steps, as illustrated in Figure **5** of PCT Publication No. WO **2008/052340**.

RC Request Message Handler

As illustrated in Figure **8**, the program memory **234** includes an RC request message handler **380** which directs the routing controller (**30**) to produce a routing message in response to a received RC request message (**360**). Referring to Figure **18**A, the RC request message handler **380** begins with a first block **382** that directs the RC processor circuit (**230**) to separately store the contents of the callee identifier field **364** and caller identifier field **362** of the RC request message (**360**) in the callee identifier store **246** and the caller identifier store **248** respectively of Figure **8**.

Block **384** then directs the RC processor circuit (**230**) to use the contents of the caller username store **249** to locate and retrieve from the database (**23**) a dialing profile **200** associated with the caller, as described above and illustrated in Figure **9**, for example. The retrieved dialing profile may then be stored in the temporary memory **240**, for example.

The RC request message handler **380** continues at block **386**, which directs the processor circuit (**230**) of the routing controller to determine whether the contents of the current number of concurrent calls field **222** of the dialing profile **200** shown in Figure **9** are less than the contents of the maximum number of concurrent calls field **220** of the dialing profile for the caller and, if so, block **388** directs the processor circuit to increment the contents of the current number of concurrent calls field **222** and the processor circuit (**230**) is directed to point A in Figure **18**B. If the contents of the current number of concurrent calls field **222** are equal to or greater than the contents of the maximum number of concurrent calls field **220**, then block **390** directs the processor circuit (**230**) to send an error message back to the call controller (**13**) to cause the call controller to notify the caller that the maximum number of concurrent calls has been reached and no further calls can exist concurrently, including the presently requested call.

Assuming that block **386** allows the call to proceed, the RC processor circuit (**230**) is directed to perform certain checks on the callee identifier in the callee identifier field **246** in Figure **8**. These checks are shown in greater detail in Figure **18**B.

Referring to Figure **18**B, the RC processor circuit (**230**) is directed to a first block **392** that causes it to determine whether a digit pattern of the callee identifier includes a pattern that matches the contents of the international dialing digits (IDD) field **208** in the dialing profile **200** (shown in Figure **9**) associated with the caller. If so, then block **394** directs the RC processor circuit (**230**) to set a call type code identifier variable maintained by the processor to indicate that the call is an international call, and block **396** directs the processor to produce a reformatted callee identifier by reformatting the callee identifier into a predefined digit format. In this embodiment, this is done by removing the pattern of digits matching the IDD field contents (**208**) of the caller dialing profile **200** to effectively shorten the callee identifier. Then, block **398** directs the RC processor circuit (**230**) to determine whether or not the callee identifier has a length which meets criteria establishing it as a number compliant with the E.**164** Standard set by the ITU. If the length does not meet these criteria, then block **400** directs RC processor circuit (**230**) to send back to the call controller (**13**) a message indicating the length is not correct. The process **380** is then ended. At the call controller **13**, routines (not shown) stored in the program memory **324** may direct the processor circuit (**320** of Figure **15**) to respond to the incorrect length message by transmitting a message back to the mobile telephone (**12** shown in Figure **1**) to indicate that an invalid number has been dialled.

If the length of the amended callee identifier meets the criteria set forth at block **398**, then block **402** directs the RC processor circuit (**230**) to make a database request to the database (**23**) to determine whether or not the amended callee identifier is found in the DID field (**373**) of a record such as shown in Figure **11** in the DID bank table. If at block **402** the RC processor

circuit (**230**) receives a response from the database (**23**) indicating that the reformatted callee identifier produced at block **396** is found in the DID field (**373**) of a record in the DID bank table, then the callee is a subscriber to the system and the call is classified as a private network call by directing the processor to block **404**, which directs the RC processor circuit (**230**) to copy the contents of the corresponding username field (**371** in Figure **11**) from the callee DID bank table record (**370** in Figure **11**) into the callee identifier store (**246** in Figure **8**). Thus, the RC processor circuit (**230**) locates a subscriber username associated with the reformatted callee identifier. The processor (**232**) is then directed to point B in Figure **18A**.

Calls to Subscribers in Different Nodes

Referring back to Figure **1**, as noted above, the gateway **18** is preferably associated with a pre-determined node, which in the illustrated embodiment is the first node **11**. Referring back to Figure **18A**, block **406** directs the processor (**232** of Figure **8**) to execute a process to determine whether or not the node associated with the reformatted callee identifier in the callee identifier store (**246** in Figure **8**, which, at block **404**, was set to be a username of the callee) is the same node that is associated with the gateway **18** illustrated in Figure **1**.

To do this, the processor (**232**) may, for example, identify a node associated with the gateway (**18**) by using an IP address associated with the gateway to determine a node identifier of the gateway. An IP address associated with the gateway (**18**) may, for example, be obtained from either the caller identifier field **362** or the call identifier field **368** of the RC request message **360** illustrated in Figure **17**, as each of these fields includes a portion following an "@" symbol that indicates an IP address of the gateway. In order to determine a node identifier associated with the gateway (**18**) using the IP address associated with gateway (**18**), the processor **232** (illustrated in Figure **8**) may access a gateway node association table stored in the database **23** (illustrated in Figure **1**).

Referring to Figure **19**, an exemplary gateway node association table is shown generally at **480**. The exemplary gateway node association table **480** includes first and second records **482** and **484**, each having a respective gateway IP address field **486** and a respective node identifier field **488**. It will be appreciated that the exemplary gateway node association table **480** is an example for illustration purposes only. The values in the gateway IP address fields **486** are preferably initialized when a gateway (such as the gateway **18** illustrated in Figure **1**) is installed as part of the system (**10**), and are preferably updated as the IP addresses of the respective gateways may change from time to time. The values in the node identifier fields **488** are also preferably initialized when a gateway (such as the gateway **18** illustrated in Figure **1**) is installed as part of the system (**10**).

As indicated above, the reformatted callee identifier in the callee identifier store (**246** in Figure **8**) was set at block **404** in Figure **18B** to be a username of the callee from the username field **371** (illustrated in Figure **11**), and in this embodiment, a prefix of the username of the callee preferably indicates a node associated with the callee. In the illustrated embodiment, the left-most digit in the username of the callee is a continent code, which is a sufficient prefix to identify a node associated with the callee. However, it will be appreciated that in other embodiments, other prefixes or other information may identify the associated node. Preferably, the values in the node identifier fields **488** correspond to the prefixes of the usernames in the username fields **371** (illustrated in Figure **11**), so that the node associated with the callee is the same node that is associated with the gateway **18** illustrated in Figure **1** if the prefix of the username of the callee matches the node identifier associated with the gateway (**18**). Therefore, in the illustrated embodiment, if the reformatted callee identifier in the callee identifier store (**246** in Figure **8**) is **2001 1050 8667**, for example, then in the example of Figure **19**, the node associated with the callee is the same node as the node identified by the continent code "**2**" that is associated with the gateway associated with the IP

address **20.14.102.5** in the record **482**, but is not the same node as the node identified by the continent code "**5**" that is associated with the gateway associated with the IP address **104.12.131.12** in the record **484**.

Referring back to Figure **18A**, if at block **406** the prefix of the username of the callee does not match the node identifier associated with the gateway (**18**), then the call is a "cross-domain" call, and block **408** in Figure **18A** directs the processor (**232** in Figure **8**) to set a call type flag in the temporary memory (**240** in Figure **8**) to indicate the call is a cross-domain call. Then, block **410** of Figure **18A** directs the processor (**232** of Figure **8**) to produce a routing message identifying an address on the private network with which the callee identified by the contents of the callee ID buffer is associated and to set a time to live for the call at a maximum value of **99999**, for example. Routing messages and time to live values, and also a method of determining the node in the system with which the callee is associated, are further described in PCT Publication No. WO **2008/052340**. Once a routing message is produced at block **410**, block **412** directs the processor (**232** in Figure **8**) to cause the routing message to be sent to the call controller **13** shown in Figure **1**, and the process ends.

Referring back to Figure **18B**, if at block **392**, the callee identifier stored in the callee identifier store (**246** in Figure **8**) does not begin with an international dialing digit, then block **414** directs the processor (**232**) to determine whether or not the callee identifier begins with the same national dial digit code as assigned to the caller. To do this, the processor (**232**) is directed to refer to the retrieved caller dialing profile as shown in Figure **9**. In Figure **9**, the national dialing digit code **206** is the number **1**. Thus, if the callee identifier begins with the number **1**, then the processor (**232**) is directed to block **416** in Figure **18B**.

Block **416** directs the processor (**232** of Figure **8**) to examine the callee identifier to determine whether or not the digits following the NDD digit identify

an area code that is the same as any of the area codes identified in the local area codes field **212** of the caller dialing profile **200** shown in Figure **9**. If not, block **418** of Figure **18**B directs the processor (**232**) to set the call type flag to indicate that the call is a national call. If the digits following the NDD digit identify an area code that is the same as a local area code associated with the caller as indicated by the caller dialing profile, block **420** directs the processor (**232**) to set the call type flag to indicate a local call, national style. After executing block **418** or **420**, block **422** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a re-formatted callee identifier by removing the national dialled digit and prepending a caller country code identified by the country code field **210** of the caller dialing profile shown in Figure **9**. The processor (**232**) is then directed to block **398** of Figure **18**B to perform other processing as already described above.

If at block **414**, the callee identifier does not begin with a national dialled digit, block **424** directs the processor (**232**) to determine whether the callee identifier begins with digits that identify the same area code as the caller. Again, the reference for this is the retrieved caller dialing profile shown in Figure **9**. The processor (**232**) determines whether or not the first few digits of the callee identifier identify an area code corresponding to the contents of any area code identifier stored in the local area code field **212** of the retrieved caller dialing profile **200** (illustrated in Figure **9**). If so, then block **426** directs the processor (**232**) to set the call type flag to indicate that the call is a local call. It should be noted that the call will not necessarily be a local call in every case where the first few digits of the callee identifier identify an area code corresponding to the contents of an area code identifier stored in the local area code field **212** (illustrated in Figure **9**), and other determinations of when a call is to be considered local may be appropriate. However, it has been found that the determination described above for block **424** is satisfactory for some purposes. Next, block **428** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a reformatted callee

identifier by prepending the caller country code to the callee identifier, the caller country code being determined from the country code field **210** of the retrieved caller dialing profile **200** shown in Figure **9**. The processor (**232**) is then directed to block **398** for further processing as described above.

If at block **424**, the callee identifier does not start with the same area code as the caller, block **430** directs the processor (**232** of Figure **8**) to determine whether the number of digits in the callee identifier, *i.e.* the length of the callee identifier, is within the range of digits indicated by the caller minimum local number length field **214** and the caller maximum local number length field **216** of the retrieved caller dialing profile **200** shown in Figure **9**, and whether there is more than one area code identifier stored in the local area code field **212** of the retrieved caller dialing profile. If the number of digits in the callee identifier is within the aforementioned range and there is only one area code identifier stored in the local area code field (**212**), then block **432** directs the processor (**232**) to set the call type flag to indicate a local call and block **434** directs the processor (**232**) to format the callee identifier into a pre-defined digit format to produce a reformatted callee identifier by prepending to the callee identifier the caller country code (as indicated by the country code field **210** of the retrieved caller dialing profile **200** shown in Figure **9**) followed by the caller area code as indicated by any of the local area codes stored in the local area code field **212** of the caller dialing profile **200** shown in Figure **9**. The processor (**232**) is then directed to block **398** of Figure **18B** for further processing as described above.

If at block **430**, the callee identifier has a length that does not fall within the range specified by the caller minimum local number length field (**214** in Figure **9**) and the caller maximum local number length field (**216** in Figure **9**), or if there is more than one area code identifier stored in the local area code field **212** of the retrieved caller dialing profile **200** illustrated in Figure **9**, then block **436** directs the processor (**232**) to send an error message back to the call controller (**13**), and the process ends.

In alternative embodiments, such as those illustrated in PCT Publication No. WO **2008/052340**, an additional block (**402** in Figure **8**B of PCT Publication No. WO **2008/052340**) may determine whether the callee identifier is a valid username. However, in the embodiment disclosed herein, the callee identifier is assumed to be a telephone number of the callee, and not a username.

From Figure **18**B, it will be appreciated that there are certain groups of blocks of codes that direct the processor **232** in Figure **8** to determine whether the callee identifier has certain features such as an international dialing digit, a national dialing digit, an area code and a length that meet certain criteria, and cause the processor **232** to reformat the callee identifier stored in the callee identifier store **246** in Figure **8**, as necessary into a predetermined target format including only a country code, area code, and a normal telephone number, for example, to cause the callee identifier to be compatible with the E.**164** number plan standard in this embodiment. This enables block **402** in Figure **18**B to have a consistent format of callee identifiers for use in searching through the DID bank table records **370** of the type shown in Figure **11** to determine how to route calls to subscribers on the same system. Effectively, therefore blocks **392**, **414**, **424**, and **430** establish call classification criteria for classifying the call as a public network call or a private network call. Block **402** classifies the call, depending on whether or not the formatted callee identifier has a DID bank table record, and this depends on how the call classification criteria are met.

Calls to Non-Subscribers

Not all calls will be to subscribers, and this will be detected by the processor **232** of Figure **8** when it executes block **402** in Figure **18**B, and does not find a DID bank table record (**370** illustrated in Figure **11**) that is associated with the callee, in the DID bank table. When this occurs, the call is classified as a public network call, by directing the processor (**232**) to point C in Figure **18**C.

Referring to Figure **18C**, block **438** directs the processor (**232**) to determine whether the formatted callee identifier in the callee identifier store **246** in Figure **8** corresponds to an access code in the access code field **173** of a record in the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier. Because the callee identifier in the callee identifier store **246** in Figure **8** has been formatted as described above with reference to Figure **18B**, block **438** may involve determining whether an access code in the access code field **173** of a record of the access code association table **170** (illustrated in Figure **10**) matches the formatted callee identifier in the callee identifier store **246** in Figure **8**, and also whether a callee identifier (as opposed to the "null" value assigned on initialization) is stored in the callee identifier field **177** in association with the access code. As noted above, for simplicity, this description is directed to embodiments wherein an access code association table **170** associates access codes with respective callee identifiers, caller identifiers, timeout values, and timestamp values, although it will be appreciated that the processes described herein for records in the access code association table **170** may additionally or alternatively be applied to DID bank table records **370** in an analogous manner.

If at block **438** the formatted callee identifier in the callee identifier store **246** in Figure **8** is the same as an access code in the access code field (**173**) of a record of the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier, then block **440** directs the processor (**232**) to determine whether the caller identifier in the caller identifier store **248** (illustrated in Figure **8**) is the same as the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**), and thus whether the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**) identifies the mobile telephone identified by the caller identifier in the caller identifier store **248**. If not, then block **442** directs the processor (**232**) to send an error message to the call controller (**13**), and the process ends.

But if at block **440** the caller identifier in the caller identifier store **248** (illustrated in Figure **8**) corresponds to the caller identifier in the caller identifier field (**179**) of the record of the access code association table (**170**), then the routing controller (**30**) will produce a routing message that will cause the call controller to establish communication through the IP network (**26**) to the callee in response to a call received at a channel (**20**, **22**, or **24**). Preferably, block **444** includes codes that direct the processor (**232**) to determine whether the association of the access code with the callee identifier has expired, and thus whether the usability of the access code to initiate a call to the callee has expired, in the manner described above for block **278** in Figure **12**. If at block **444** the association of the access code with the callee identifier has expired, then block **442** directs the processor (**232**) to send an error message to the call controller (**13**), and the process ends. Thus the routing controller produces a routing message that causes the call controller to establish the call only when the association of the access code with the callee identifier has not expired.

It will be appreciated that in alternative embodiments, one or more of the caller identifier, timeout, and timestamp fields **179**, **181**, and **182** may be omitted from the access code association table **170** illustrated in Figure **10**, and in these embodiments, one or more of the blocks **440**, **442**, and **444** may also be omitted.

If at block **444** the association of the access code with the callee identifier has not expired, or if one or both of blocks **440** and **444** is omitted, then block **446** directs the processor (**232**) to store the callee identifier from the callee identifier field **177** of the record of the access code association table (**170**) in the callee identifier store **246** illustrated in Figure **8**. The processor (**232**) is then directed to point A in Figure **18**B to repeat the steps illustrated in Figure **18**B using the callee identifier retrieved from the callee identifier field (**177**) in the record of the access code association table (**170**).

However, if at block **438** the formatted callee identifier in the callee identifier store **246** in Figure **8** does not correspond to an access code in a record of the access code association table **170** illustrated in Figure **10** that is associated with a callee identifier, then block **448** of Figure **18**B causes the processor (**232**) to set the contents of the callee identifier store **246** of Figure **8** to be the newly formatted callee identifier, i.e., a number compatible with the E.**164** standard. Then, block **450** of Figure **18**B directs the processor (**232**) to generate a routing message identifying a gateway to the public network usable by the call controller (**13**) to establish a "public system" call. In one embodiment, block **450** includes codes that, for example, direct the processor (**232**) to search a database of route or master list records and to search a database of supplier records to identify at least one supplier operable to supply a communications link for the call, and to load a routing message buffer with supplier information, time to live values, and timeout values. An example of an implementation of these steps is described with reference to blocks **410**, **412**, **560**, **562**, **563**, **564**, **566**, and **571** in Figures **8**B and **8**D in PCT Publication No. WO **2008/052340**. Next, block **452** directs the processor **232** of Figure **10** to send the routing message to the call controller **13** in Figure **1**, and the process ends.

Calls to Subscribers Within the Same Node

Referring back to Figure **18**A, if at block **406**, the prefix of the username of the callee matches the node identifier associated with the gateway (**18**), then the call is on one domain, and block **454** directs the processor (**232**) to use the callee identifier in the callee identifier store **246** illustrated in Figure **8** (which, at block **404**, was set to be a username of the callee) to locate and retrieve a dialing profile for the callee. The dialing profile may be of the type shown in Figure **9**, for example. Block **456** of Figure **18**A then directs the processor **232** of Figure **8** to get call block, call forward, and voicemail records from the database **23** of Figure **1**, based on the username identified in the callee dialing profile retrieved by the processor at block **454**. Exemplary call block,

call forward, and voicemail records are described in PCT Publication No. WO **2008/052340**.

Then block **458** directs the processor **232** of Figure **8** to determine whether or not the caller identifier received in the RC request message matches a block pattern stored in the call block record associated with the callee and retrieved at block **454**. If the caller identifier matches a block pattern, then block **460** directs the processor to send a drop call or non-completion message to the call controller (**13**) and the process is ended. If the caller identifier does not match a block pattern associated with the callee, then block **462** directs the processor (**232**) to determine whether or not call forwarding is required, as described in PCT Publication No. WO **2008/052340**.

If at block **462**, the call forwarding record for the callee indicates that no call forwarding is required, then the processor (**232**) is directed to block **464**, which directs the processor (**232**) to generate a routing message identifying an address on the private network, associated with the callee for a "private system" call. In one embodiment, block **464** includes codes that, for example, direct the processor (**232**) to store, in a routing message buffer, a username and domain of the callee, time to live values, and an IP address of the current node, to determine whether or not the user identified by the callee identifier has paid for voicemail service and if so, to store voicemail information in the routing message buffer. An example of an implementation of these steps is described with reference to blocks **609**, **620**, **640**, **642**, and **644** in Figures **8A** and **8C** in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference. Next, block **466** directs the processor **232** of Figure **8** to cause the routing message to be sent to the call controller **13** in Figure **1**, and the process ends.

But if at block **462**, the call forwarding record for the callee indicates that call forwarding is required, then block **468** directs the processor (**232**) to search the dialing profile table to find a dialing profile record as shown in Figure **9**, for

the user identified by the destination number field of the call forward record, as illustrated in PCT Publication No. WO **2008/052340**. The processor (**232**) is further directed to store the username and domain for that user and a time to live value in a routing message buffer, an example of which is described in PCT Publication No. WO **2008/052340**. This process is repeated for each call forwarding record associated with the callee identified by the callee identifier store **246** in Figure **8** to add to the routing message buffer all call forwarding usernames and domains associated with the callee.

Referring to Figures **1**, **18A**, and **18C**, the routing message sent at one of blocks **412**, **452**, and **466** is received at the call controller **13** and the call controller interprets the receipt of the routing message as a request to establish a call. Referring to Figure **15**, the program memory **324** of the call controller **13** includes a routing to gateway routine depicted generally at **346**.

Where a routing message received at the call controller **13** is of the type produced at block **464** shown in Figure **18A**, indicating that the callee is a system subscriber on the same node as the gateway (**18**) (such as a user of the VoIP telephone **36** illustrated in Figure **1**), the routing to gateway routine **346** may direct the microprocessor **322** to cause a message to be sent back through the IP network **26** shown in Figure **1** to the VoIP telephone (**36**), using the IP address of the VoIP telephone (**36**) that is available from the callee username.

Alternatively, if the routing message received at the call controller **13** is of the type produced at block **410** shown in Figure **18A**, identifying a domain associated with another node in the system, the call controller **13** may send a SIP invite message along the high speed/high data throughput link **17** in communication with the other node. The other node may function as explained above and in PCT Publication No. WO **2008/052340**, in response to receipt of a SIP invite message.

If the routing message received at the call controller **13** is of the type produced at block **450** shown in Figure **18**C, indicating that the callee is not a subscriber to the system (such as a user of the PSTN telephone **32** that is in communication with the IP network **26** through the gateway **34** as illustrated in Figure **1**), the call controller sends one or more SIP invite messages to the suppliers identified in the routing message to identify the IP address of a supplier that is able to carry the call, such as the IP address of the gateway **34** illustrated in the example of Figure **1**. A process for identifying the IP address of a supplier that is able to carry the call is given in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference. In some cases, the gateway of the supplier that is able to carry the call will be the gateway **18** illustrated in Figure **1**, that is, the same gateway through which the caller telephone (**12**) initiated the call. For simplicity, the following description assumes that the gateways **18** and **34** are distinct gateways. It will be understood that in some cases, they may be the same gateway, but in these cases, the following steps may still be applied.

Referring to Figure **1**, the IP address of the gateway **34** is sent in a message from the call controller **13** to the media relay **28**, which responds with a message indicating an IP address to which the gateway **18** should send its audio/video traffic, and an IP address to which the gateway **34** should send its audio/video for the call. The call controller conveys the IP address at which the media relay **28** expects to receive audio/video from the gateways **18** and **34**, to the gateways **18** and **34** in one or more messages. The gateway **18** replies to the call controller **13** with an IP address at which it would like to receive audio/video, and the call controller conveys that IP address to the media relay **28**. The call may then be conducted between the caller and callee through the media relay **28** and the gateways **18** and **34**.

If the call controller **13** receives a routing message of the type produced at block **464** shown in Figure **18**A, indicating that the callee is a system subscriber on the same node as the gateway (**18**) (such as a user of the VoIP

telephone **36** illustrated in Figure **1**), and which has at least one call forwarding number and/or a voicemail number, the call controller attempts to establish a call to the callee VoIP telephone **36** by seeking from the callee telephone a message indicating an IP address to which the media relay **28** should send audio/video. If no such message is received from the callee telephone, no call is established. If no call is established within a pre-determined time, the call controller **13** attempts to establish a call with the next user identified in the call routing message in the same manner. This process is repeated until all call forwarding possibilities have been exhausted, in which case the call controller communicates with the voicemail server **19** identified in the routing message to obtain an IP address to which the media relay **28** should send audio/video and the remainder of the process mentioned above for establishing IP addresses at the media relay and the caller telephone is carried out to establish audio/video paths to allowing the caller to leave a voicemail message with the voicemail server.

When an audio/video path through the media relay **28** is established, a call timer maintained by the call controller **13** preferably logs the start date and time of the call and logs the call ID and an identification of the route (i.e., audio/video path IP address) for later use in billing.

Terminating the Call

Referring back to Figure **1**, in the event that the caller terminates a call, the gateway **18** sends a SIP bye message to the call controller **13**. Similarly, in the event that the callee terminates the call, the gateway **34** or the VoIP telephone **36** of the callee sends a SIP bye message to the call controller **13**. Exemplary SIP bye messages are described in PCT Publication No. WO **2008/052340**. The SIP bye message is received at the call controller **13**, and the call controller executes a process that involves decrementing the contents of the current number of concurrent calls field **222** dialing profile **200** of the caller as illustrated in Figure **9**, generating an RC call stop message (not shown), sending the RC call stop message to the routing controller **30**, and

sending a "bye" message to the party that did not terminate the call. An exemplary RC call stop message, and an example of how these steps may be implemented, are described in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference.

When the routing controller **30** receives the RC call stop message from the call controller **13**, the routing controller executes an RC call stop message process that involves making various updates to subscriber, reseller, and supplier account records (not shown) following the call. Examples of subscriber, reseller, and supplier account records, and of updates to subscriber, reseller, and supplier account records, are described in PCT Publication No. WO **2008/052340**, which is incorporated herein by reference.

While specific embodiments of the invention have been described and illustrated, such embodiments should be considered illustrative of the invention only and not as limiting the invention.

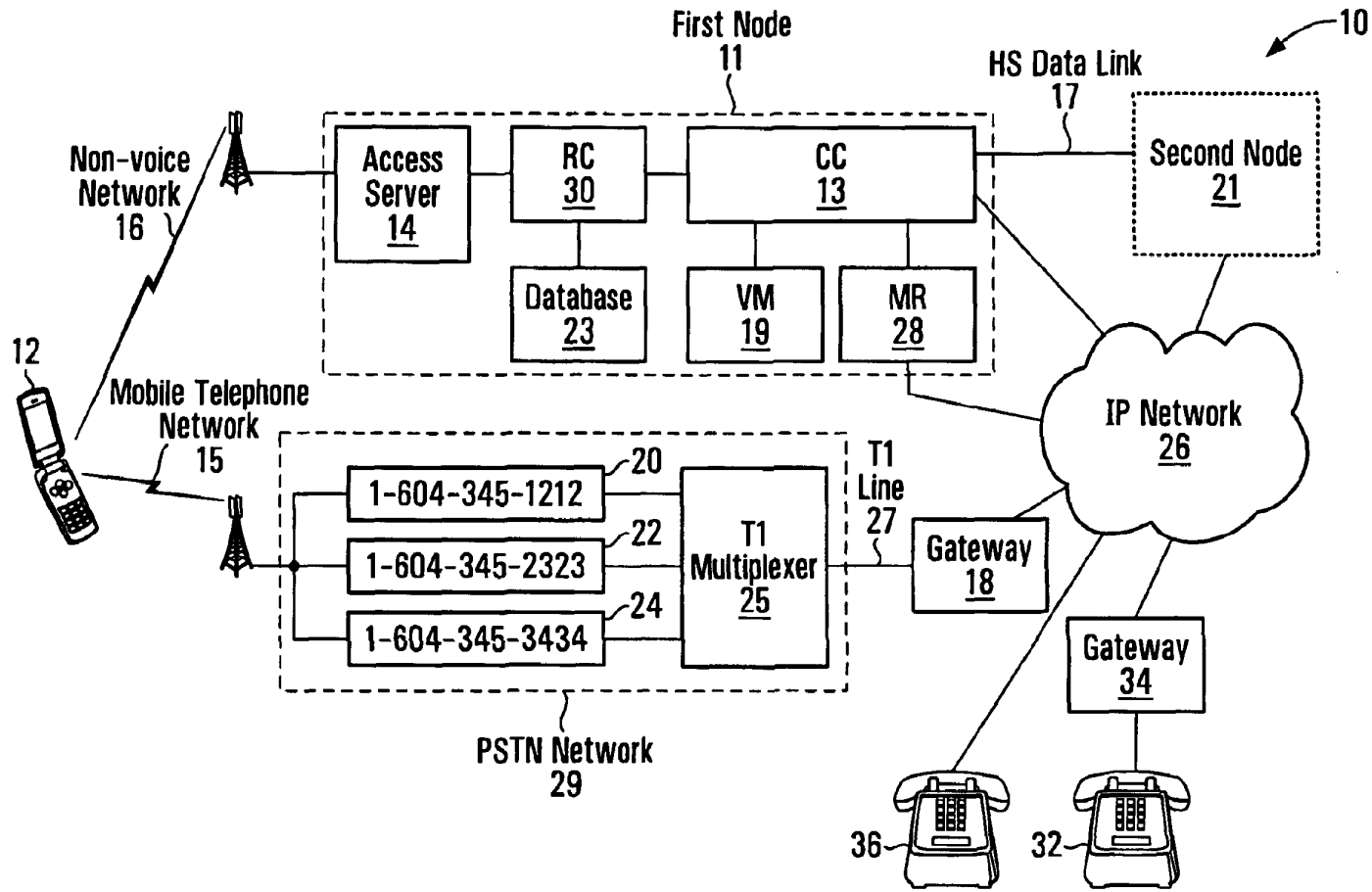


FIG. 1

PCT/CA2009/001062

T-Mobile Exhibit 1002
Part 1 of 6

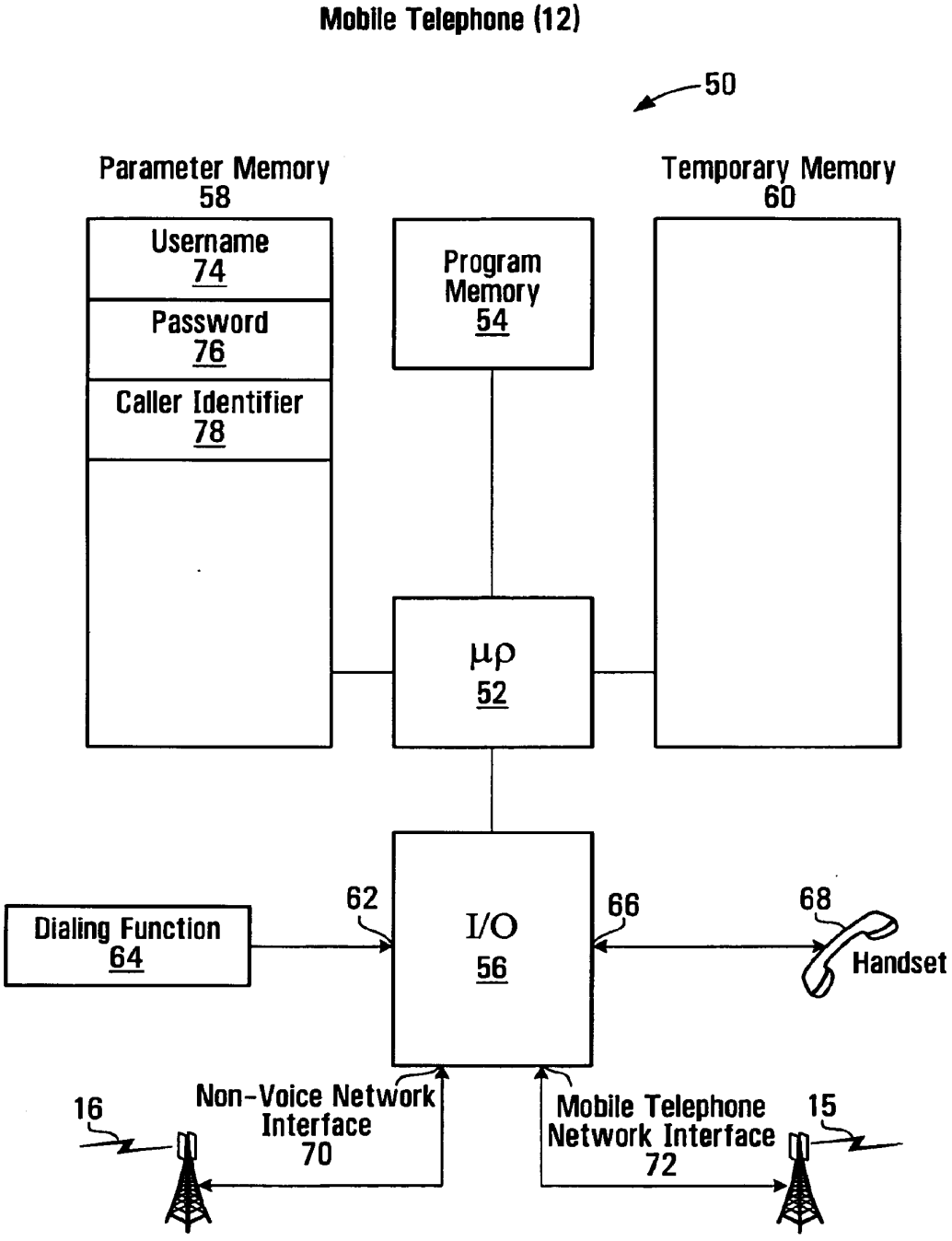

Mobile Telephone (12)
50
Parameter Memory
58
Username
74
Password
76
Caller Identifier
78
Program
Memory
54
Temporary Memory
60
μρ
52
I/O
56
62
66
68
Dialing Function
64
Handset
16
Non-Voice Network
Interface
70
Mobile Telephone
Network Interface
72
15

FIG. 2

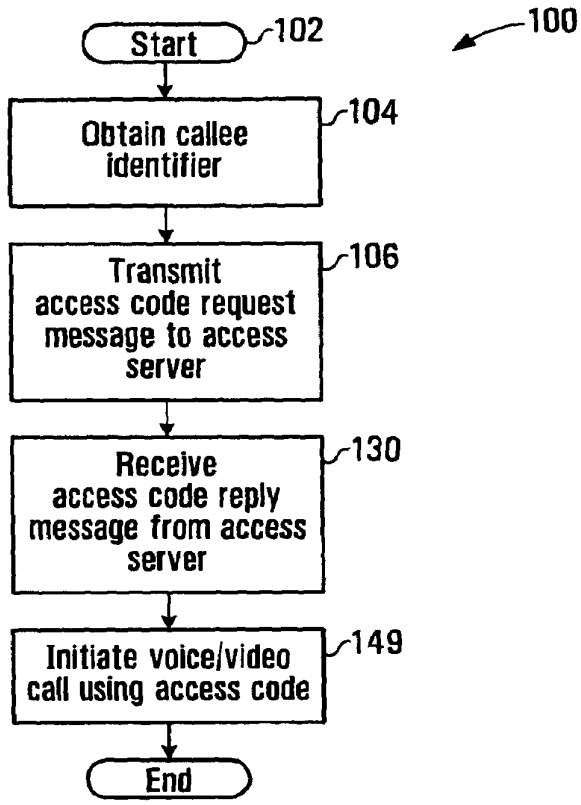


FIG. 3

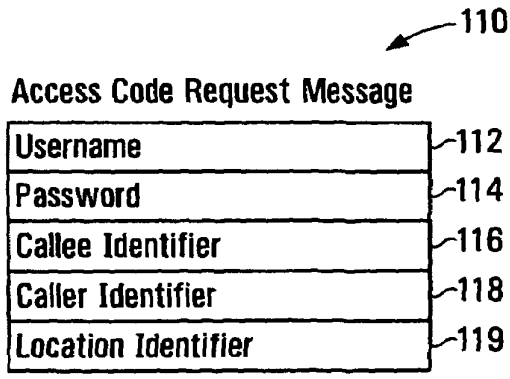


FIG. 4

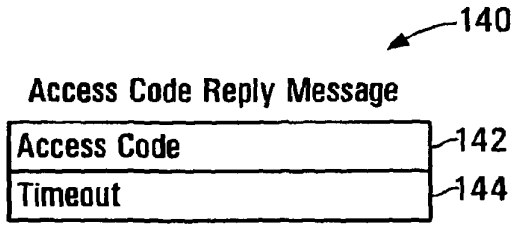


FIG. 5

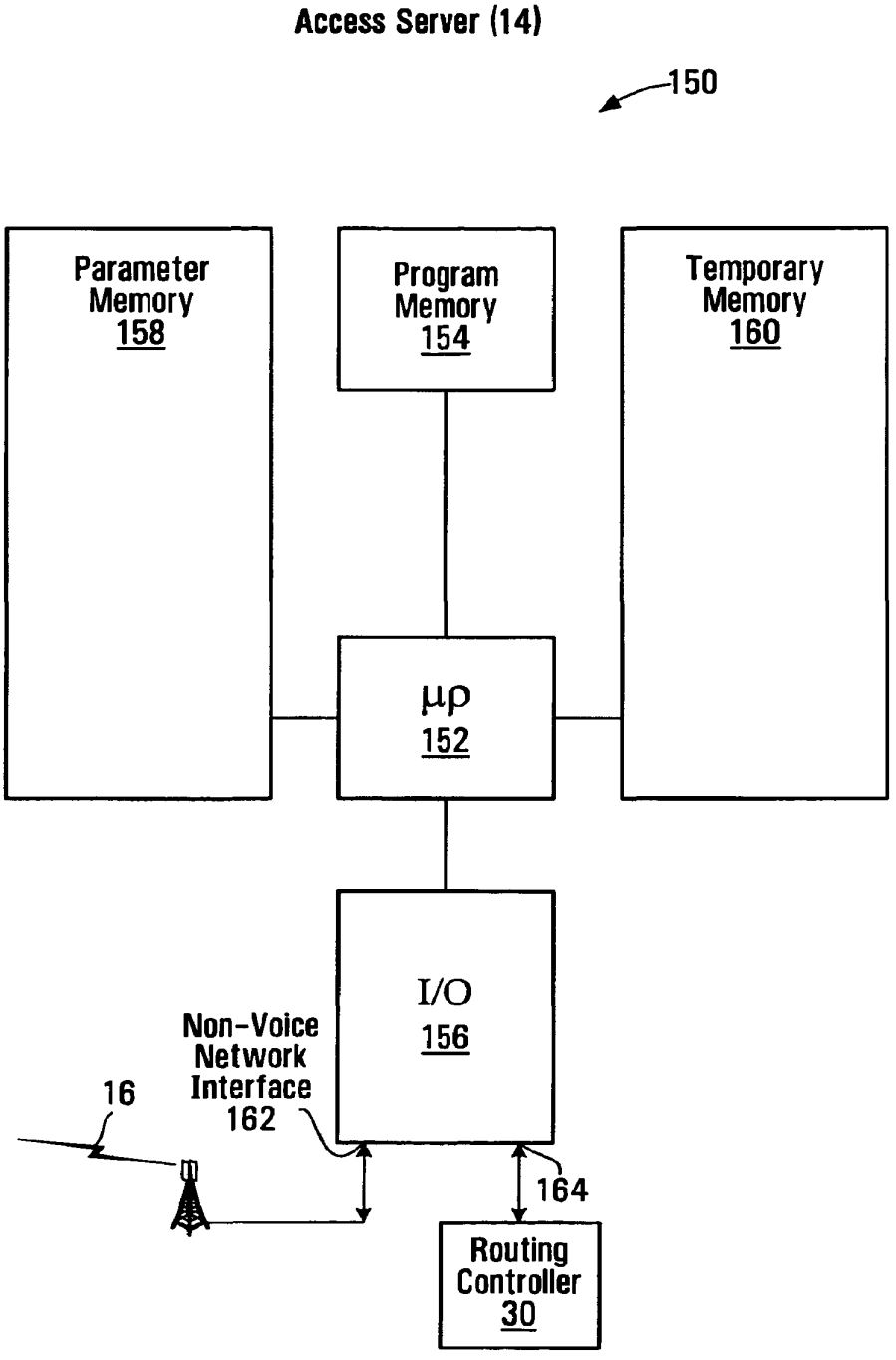

Access Server (14)
150
Parameter Memory 158
Program Memory 154
Temporary Memory 160
μρ 152
I/O 156
Non-Voice Network Interface 162
16
164
Routing Controller 30

FIG. 6

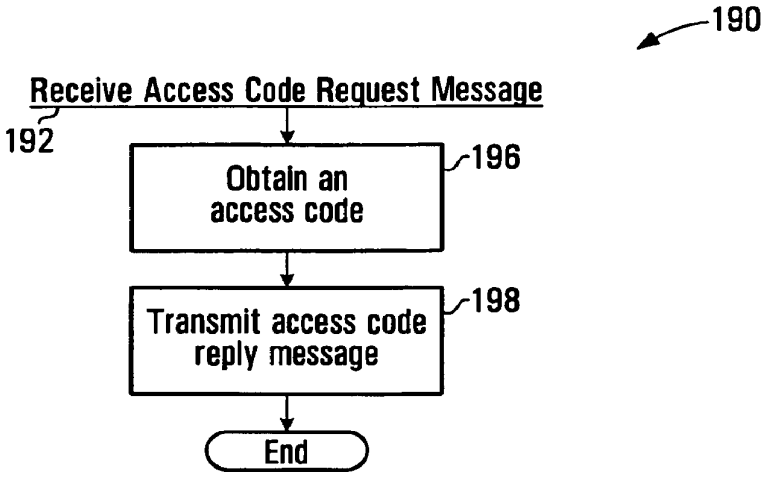

190
Receive Access Code Request Message
192
Obtain an access code
196
Transmit access code reply message
198
End

FIG. 7

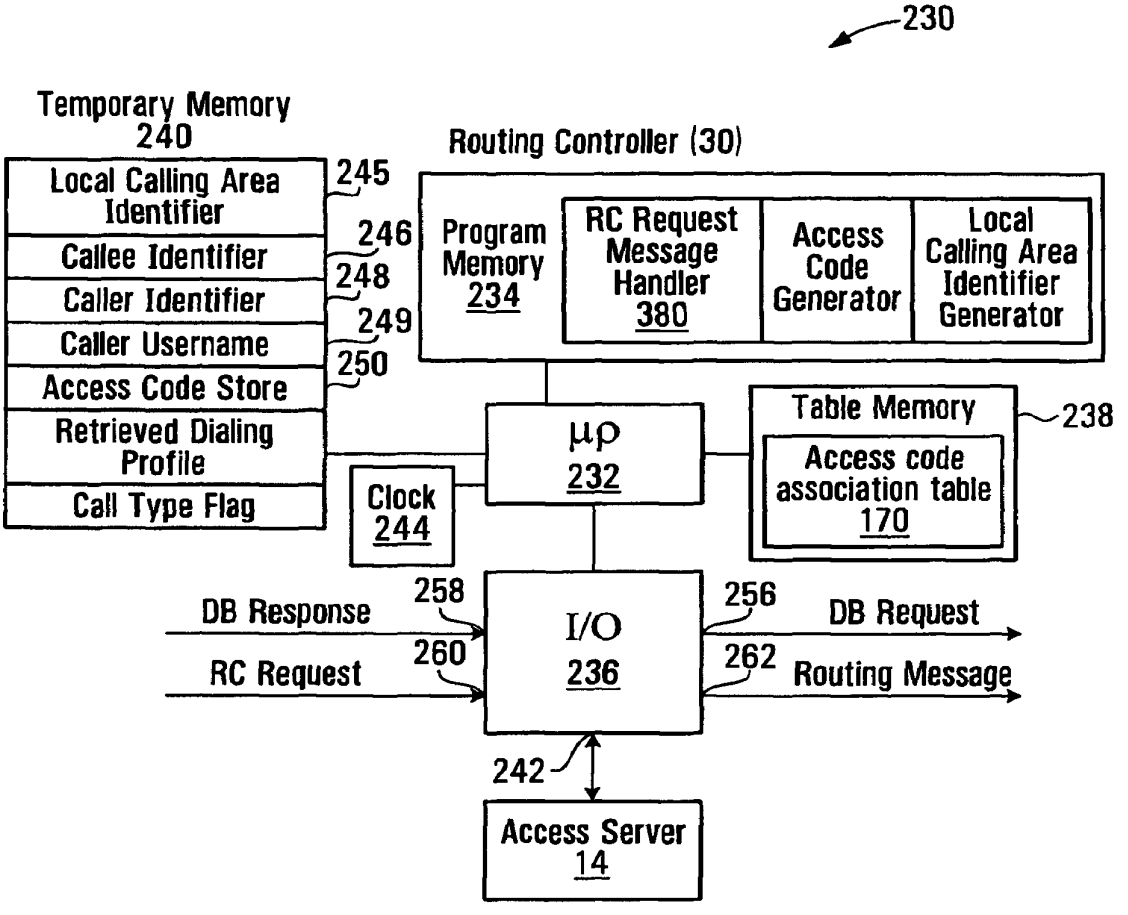

230
Temporary Memory
240
Local Calling Area Identifier
Callee Identifier
Caller Identifier
Caller Username
Access Code Store
Retrieved Dialing Profile
Call Type Flag
245
246
248
249
250
Routing Controller (30)
Program Memory 234
RC Request Message Handler 380
Access Code Generator
Local Calling Area Identifier Generator
μp 232
Clock 244
Table Memory
238
Access code association table 170
DB Response
RC Request
258
260
I/O 236
256
262
DB Request
Routing Message
242
Access Server 14

FIG. 8

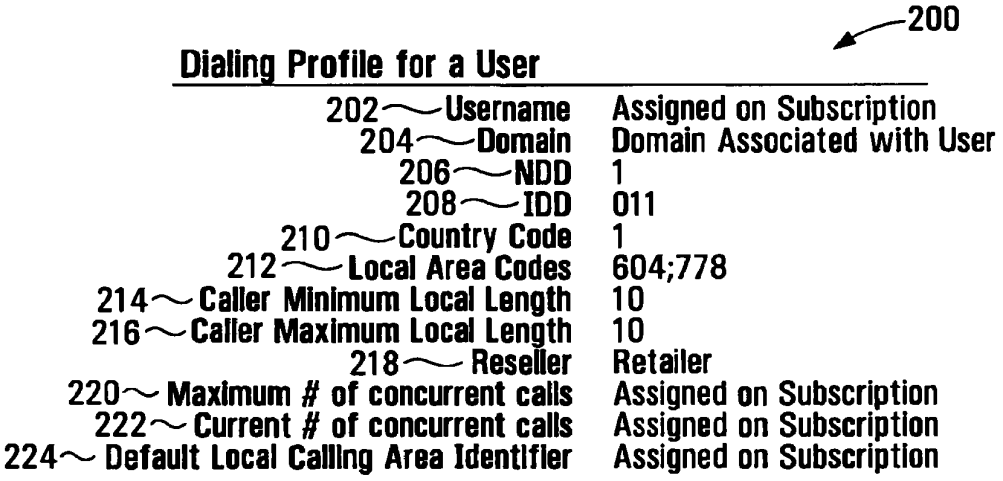
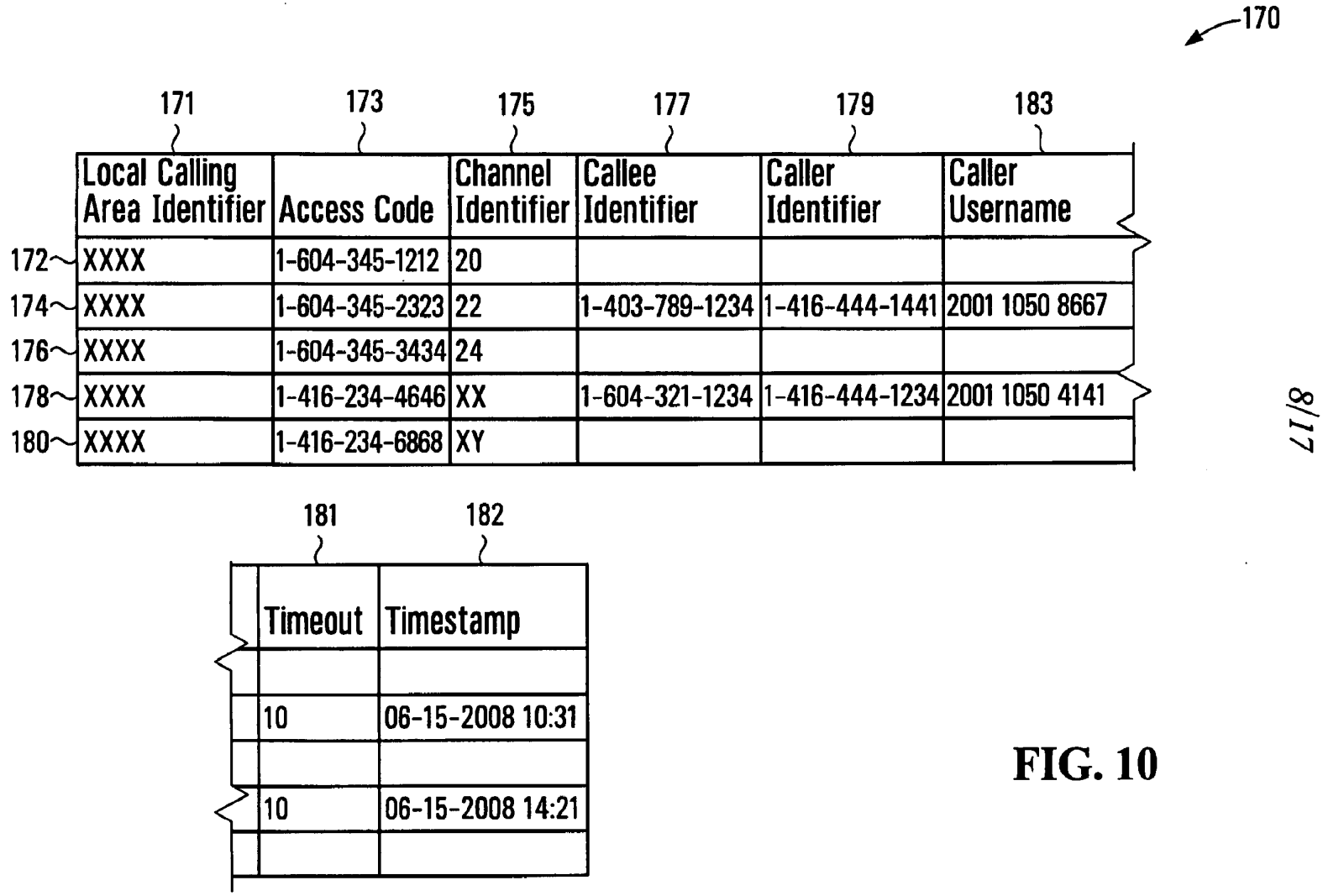

200
Dialing Profile for a User
202 Username
Assigned on Subscription
204 Domain
Domain Associated with User
206 NDD
1
208 IDD
011
210 Country Code
1
212 Local Area Codes
604;778
214 Caller Minimum Local Length
10
216 Caller Maximum Local Length
10
218 Reseller
Retailer
220 Maximum # of concurrent calls
Assigned on Subscription
222 Current # of concurrent calls
Assigned on Subscription
224 Default Local Calling Area Identifier
Assigned on Subscription

FIG. 9



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FIG. 10

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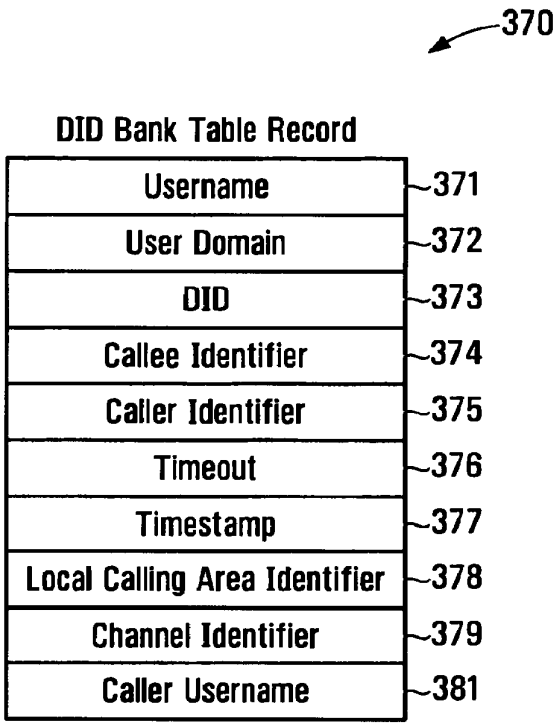

370
DID Bank Table Record
Username
371
User Domain
372
DID
373
Callee Identifier
374
Caller Identifier
375
Timeout
376
Timestamp
377
Local Calling Area Identifier
378
Channel Identifier
379
Caller Username
381

FIG. 11

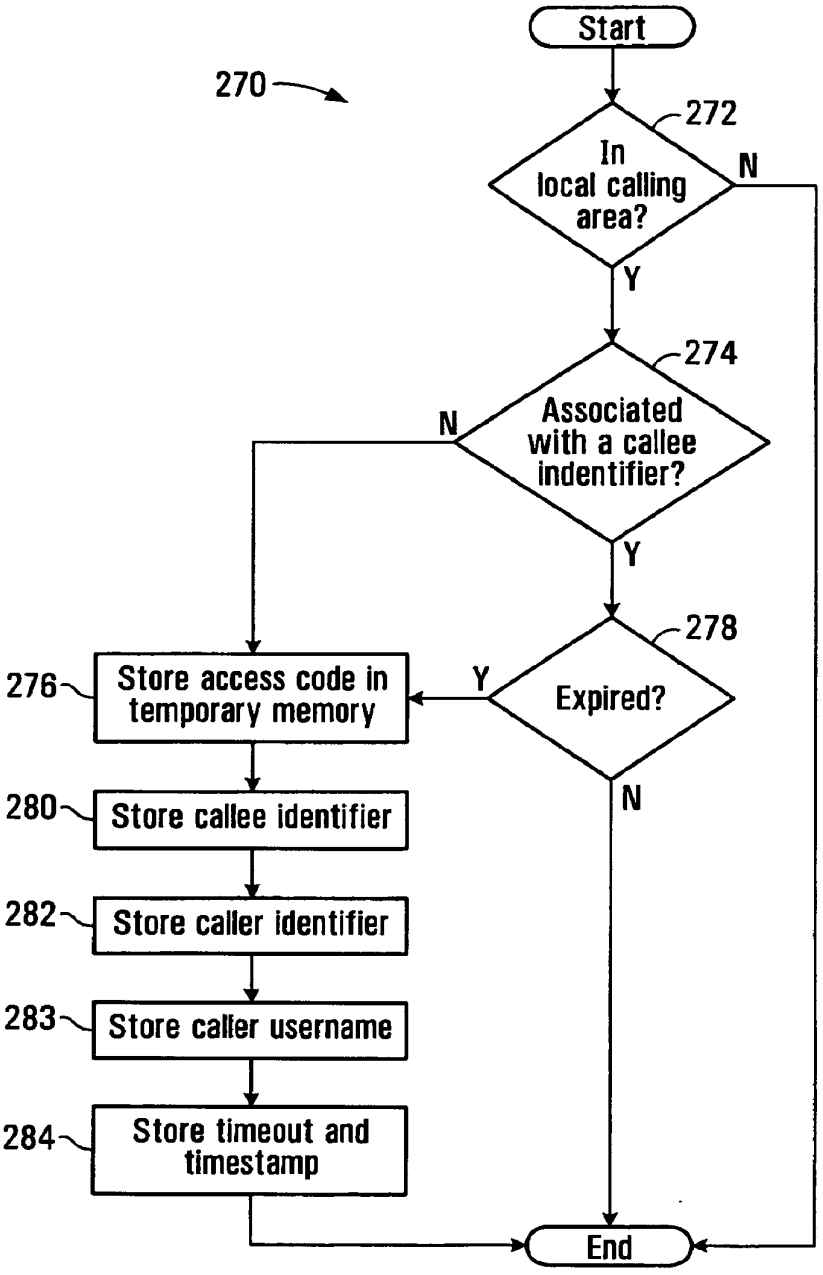

Start
270
272
In local calling area?
N
Y
274
Associated with a callee indentifier?
N
Y
278
Expired?
Y
N
276
Store access code in temporary memory
280
Store callee identifier
282
Store caller identifier
283
Store caller username
284
Store timeout and timestamp
End

FIG. 12

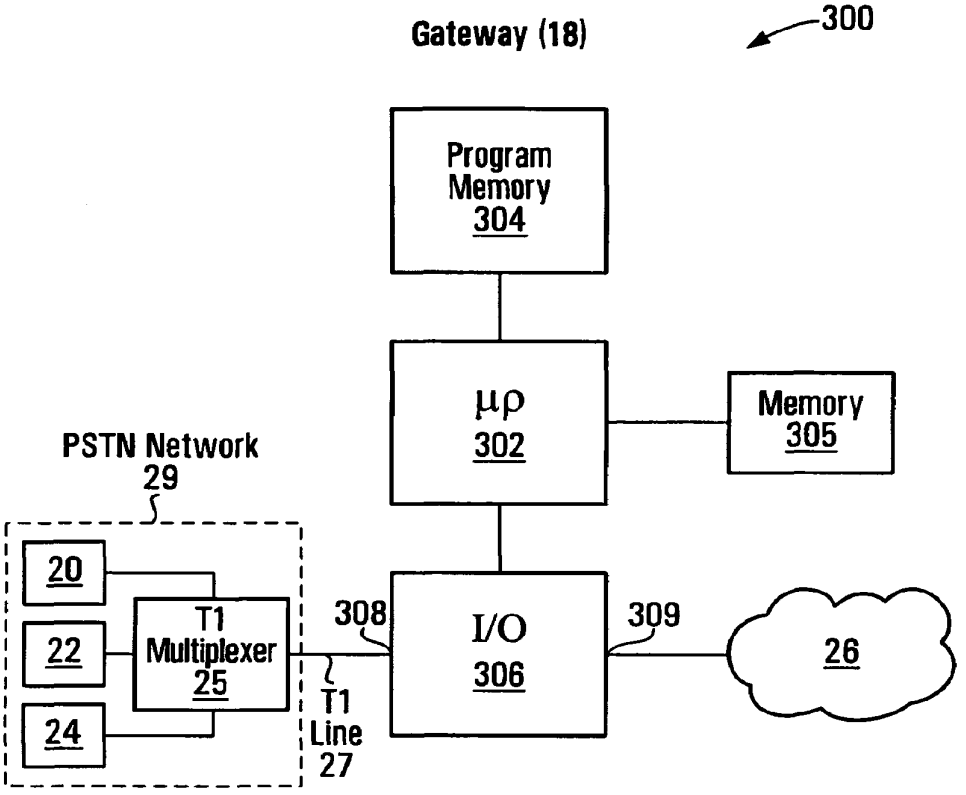


FIG. 13

310

SIP Invite Message

312	Caller Identifier	1-604-678-1234@20.14.102.5
314	Callee Identifier	1-604-345-1212
315	Digest Parameter	XXXXXXX
316	Call Identifer	FF10@20.14.102.5
317	IP Address	20.14.102.5
318	Gateway UDP Port	12378

FIG. 14

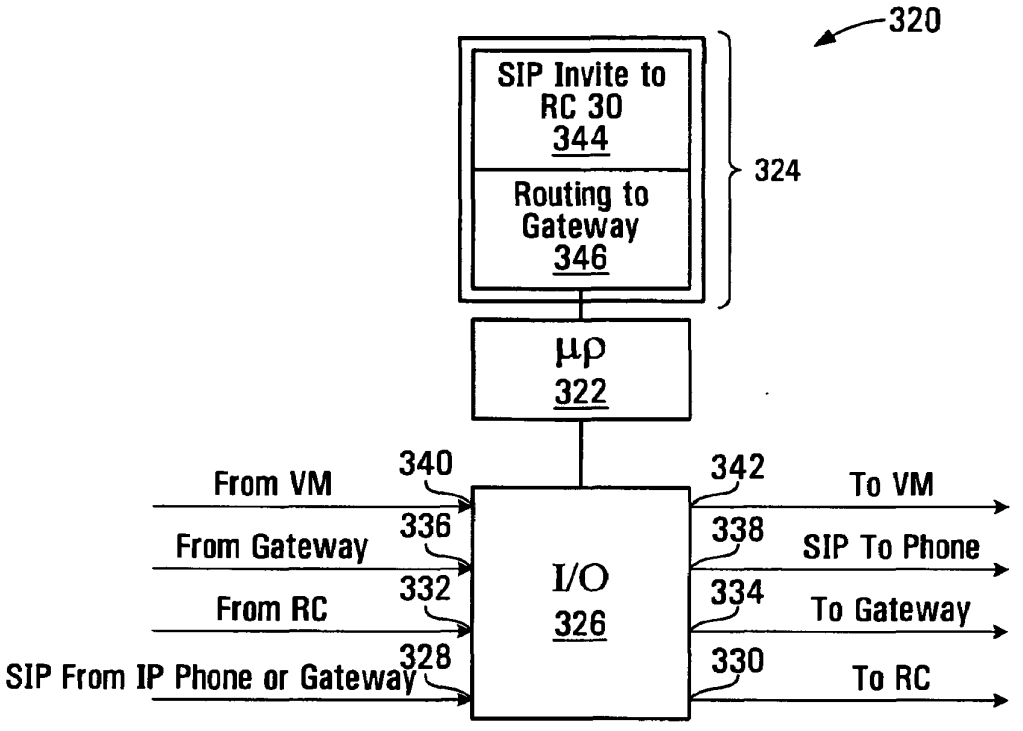

Call Controller (13)
320
SIP Invite to RC 30
344
Routing to Gateway
346
324
μρ
322
From VM
340
From Gateway
336
From RC
332
SIP From IP Phone or Gateway
328
I/O
326
342
To VM
338
SIP To Phone
334
To Gateway
330
To RC

FIG. 15

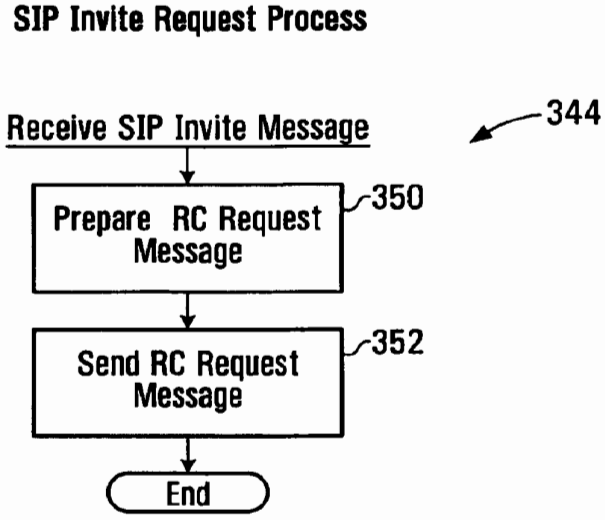

SIP Invite Request Process
Receive SIP Invite Message
344
Prepare RC Request Message
350
Send RC Request Message
352
End

FIG. 16

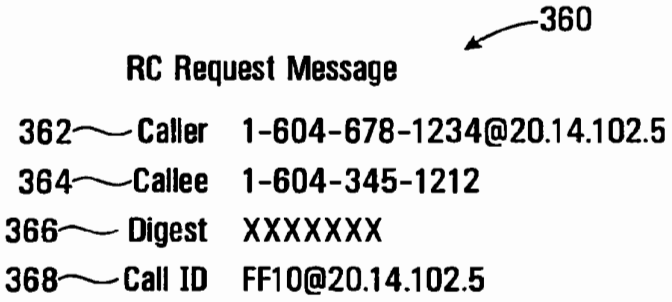

360
RC Request Message
362 Caller 1-604-678-1234@20.14.102.5
364 Callee 1-604-345-1212
366 Digest XXXXXXX
368 Call ID FF10@20.14.102.5

FIG. 17

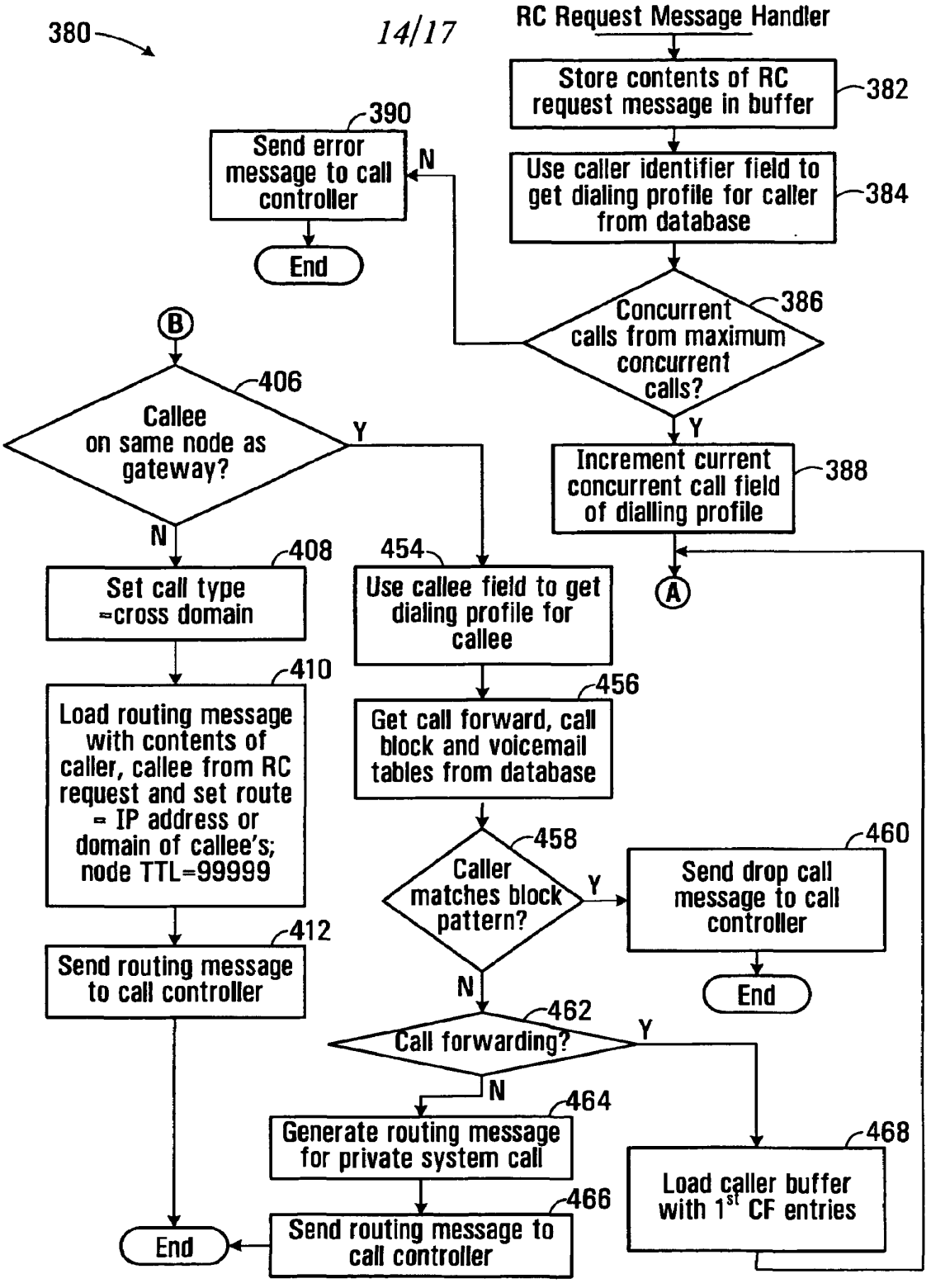

380
14/17
RC Request Message Handler
Store contents of RC request message in buffer
382
Use caller identifier field to get dialing profile for caller from database
384
Concurrent calls from maximum concurrent calls?
386
N
Y
Send error message to call controller
390
End
Increment current concurrent call field of dialling profile
388
A
B
Callee on same node as gateway?
406
Y
N
Set call type =cross domain
408
Load routing message with contents of caller, callee from RC request and set route = IP address or domain of callee's; node TTL=99999
410
Send routing message to call controller
412
End
Use callee field to get dialing profile for callee
454
Get call forward, call block and voicemail tables from database
456
Caller matches block pattern?
458
Y
N
Send drop call message to call controller
460
End
Call forwarding?
462
Y
N
Generate routing message for private system call
464
Send routing message to call controller
466
End
Load caller buffer with 1st CF entries
468

FIG. 18A

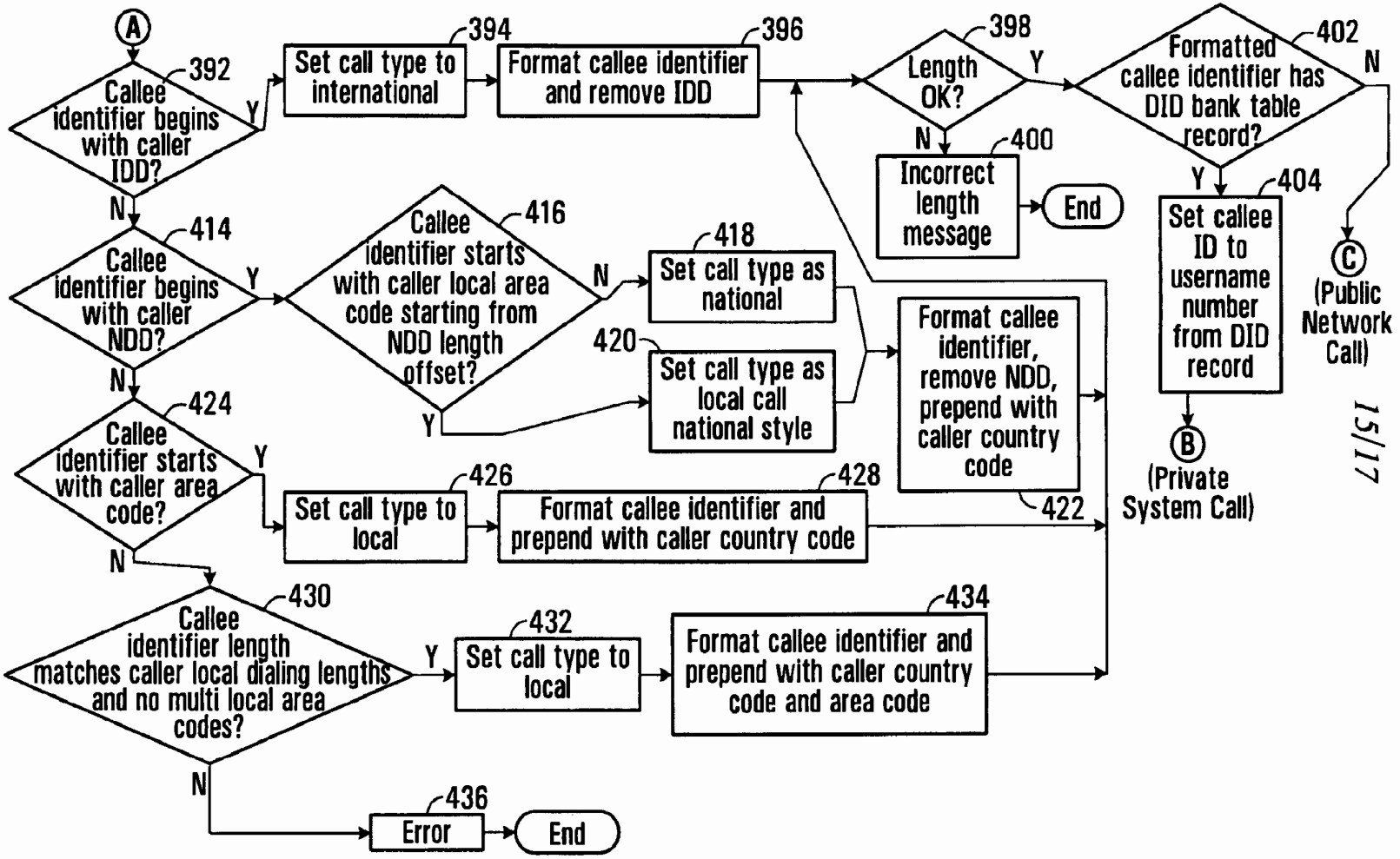


FIG. 18B

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Part 1 of 6

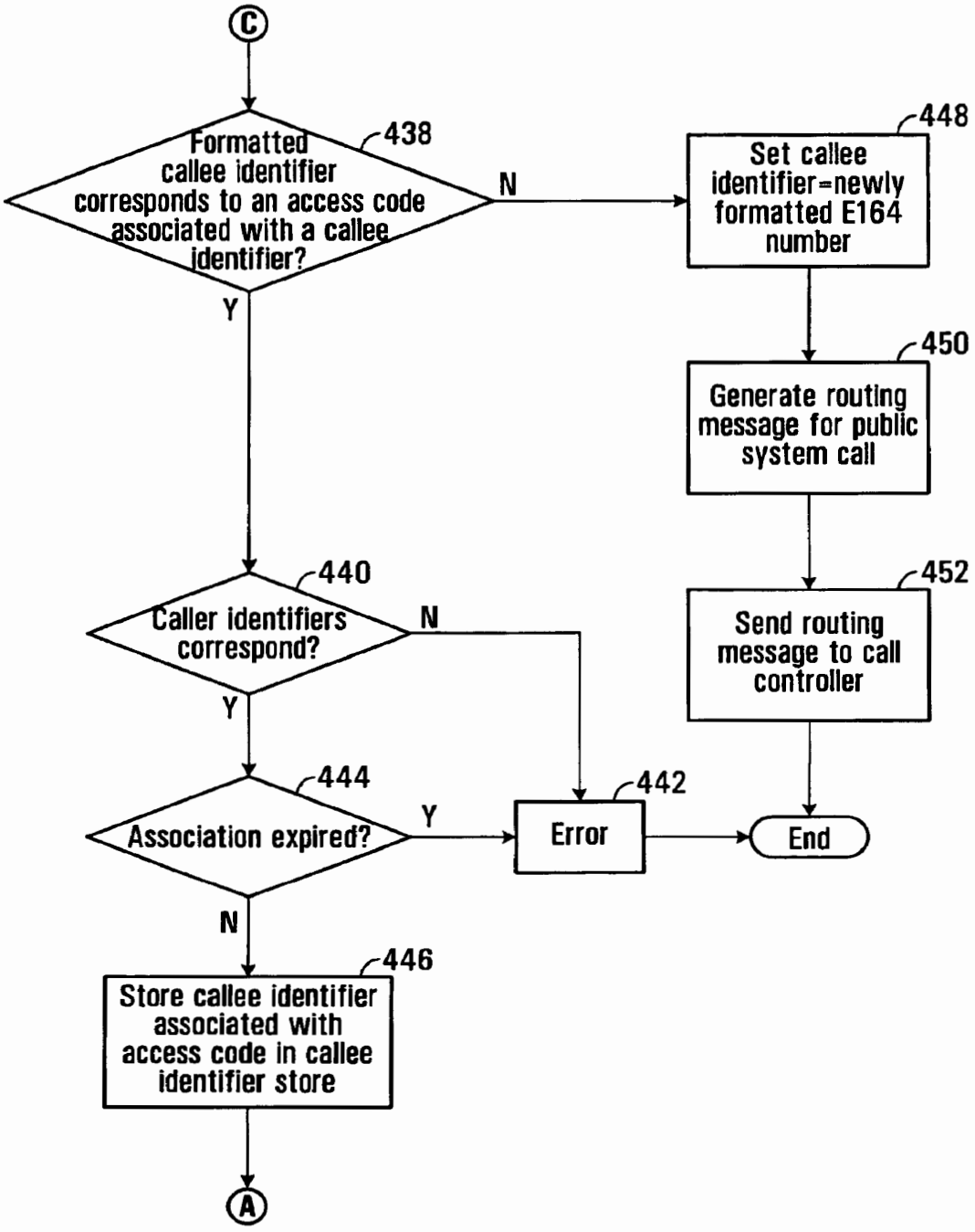

C
Formatted callee identifier corresponds to an access code associated with a callee identifier?
438
N
Y
448
Set callee identifier=newly formatted E164 number
450
Generate routing message for public system call
452
Send routing message to call controller
440
Caller identifiers correspond?
N
Y
444
Association expired?
Y
442
Error
End
N
446
Store callee identifier associated with access code in callee identifier store
A

FIG. 18C

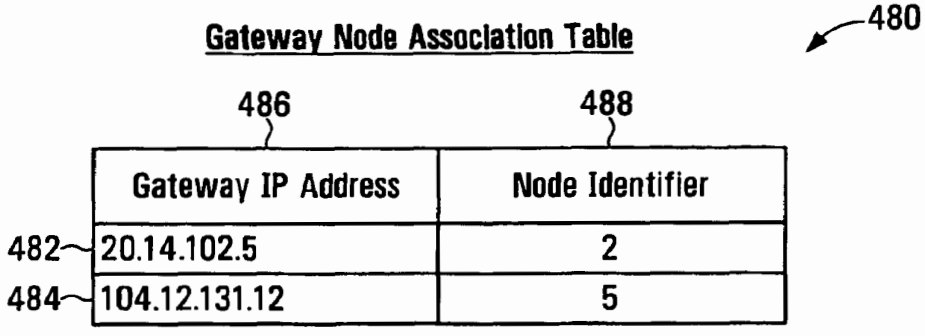

Gateway Node Association Table
480
486
488
Gateway IP Address
Node Identifier
482
20.14.102.5
2
484
104.12.131.12
5

FIG. 19

Box No. VIII (i) DECLARATION: IDENTITY OF THE INVENTOR

The declaration must conform to the standardized wording provided for in Section 211; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (i). If this Box is not used, this sheet should not be included in the request.

Declaration as to the identity of the inventor (Rules 4.17(i) and 51*bis*.1(a)(i)):

Declaration as to the identity of the inventor (Rules 4.17(i) and 51bis.1(a)(i)):

in relation to this international application

BJORSELL, Johan Emil Viktor of PO Box 29164 RPO South Granville Pose, Vancouver, British Columbia, Canada V6J 0A6 is an inventor of the subject matter for which protection is sought by way of this international application.

X

BJORSELL, Johan Emil Viktor

SOBOLYEV, Maksym of 506-210 Eleventh Street, New Westminster, British Columbia, Canada V3M 4C9 is an inventor of the subject matter for which protection is sought by way of this international application.

SOBOLYEV, Maksym

HUTTUNEN, Pentti Kalevi of 76-3180 East 58th Avenue, Vancouver, British Columbia, Canada V5S 3S8 is an inventor of the subject matter for which protection is sought by way of this international application.

HUTTUNEN, Pentti Kalevi

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (i)".

Sheet No. 4 5

Box No. VIII (i) DECLARATION: IDENTITY OF THE INVENTOR

The declaration must conform to the standardized wording provided for in Section 211; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (i). If this Box is not used, this sheet should not be included in the request.

Declaration as to the identity of the inventor (Rules 4.17(i) and 51*bis*.1(a)(i)):

Declaration as to the identity of the inventor (Rules 4.17(i) and 51bis.1(a)(i)):

in relation to this international application

BJORSELL, Johan Emil Viktor of PO Box 29164 RPO South Granville Pose, Vancouver, British Columbia, Canada V6J 0A6 is an inventor of the subject matter for which protection is sought by way of this international application.

BJORSELL, Johan Emil Viktor

SOBOLYEV, Maksym of 506-210 Eleventh Street, New Westminster, British Columbia, Canada V3M 4C9 is an inventor of the subject matter for which protection is sought by way of this international application.

SOBOLYEV, Maksym

HUTTUNEN, Pentti Kalevi of 76-3180 East 58th Avenue, Vancouver, British Columbia, Canada V5S 3S8 is an inventor of the subject matter for which protection is sought by way of this international application.

HUTTUNEN, Pentti Kalevi

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (i)".

Box No. VIII (i) DECLARATION: IDENTITY OF THE INVENTOR

The declaration must conform to the standardized wording provided for in Section 211; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (i). If this Box is not used, this sheet should not be included in the request.

Declaration as to the identity of the inventor (Rules 4.17(i) and 51*bis*.1(a)(i)):

Declaration as to the identity of the inventor (Rules 4.17(i) and 51bis.1(a)(i)):

in relation to this international application

BJORSELL, Johan Emil Viktor of PO Box 29164 RPO South Granville Pose, Vancouver, British Columbia, Canada V6J 0A6 is an inventor of the subject matter for which protection is sought by way of this international application.

BJORSELL, Johan Emil Viktor

SOBOLYEV, Maksym of 506-210 Eleventh Street, New Westminster, British Columbia, Canada V3M 4C9 is an inventor of the subject matter for which protection is sought by way of this international application.

SOBOLYEV, Maksym

HUTTUNEN, Pentti Kalevi of 76-3180 East 58th Avenue, Vancouver, British Columbia, Canada V5S 3S8 is an inventor of the subject matter for which protection is sought by way of this international application.

HUTTUNEN, Pentti Kalevi

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (i)".

Box No. VIII (ii) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT

The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (ii). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51*bis*.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

Declaration, as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent in relation to this International appliction.

Digifonica (International) Limited is entitled to apply for and be granted a patent by virtue of the following:

(i) BJORSELL, Johan Emil Viktor of PO Box 29164 RPO South Granville Pose, Vancouver, British Columbia, Canada V6J 0A6; SOBOLYEV, Maksym of 506-210 Eleventh Street, New Westminster, British Columbia, Canada V3M 4C9; and HUTTUNEN, Pentti Kalevi of 76-3180 East 58th Avenue, Vancouver, British Columbia, Canada V5S 3S8 are the inventors of the subject matter for which protection is sought by way of this application, and

(ii) an assignment from BJORSELL, Johan Emil Viktor; SOBOLYEV, Maksym; and HUTTUNEN, Pentti Kalevi to Digifonica (International) Limited dated October 16, 2008.

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (ii)".

Box No. VIII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)

The declaration must conform to the following standardized wording provided for in Section 214; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

Declaration of inventorship (Rules 4.17(iv) and 51*bis*.1(a)(iv)) for the purposes of the designation of the United States of America:

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/ ..... (if furnishing declaration pursuant pursuant to Rule 26*ter*).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications: .....

.....

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 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 PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name: BJORSELL, Johan Emil Viktor

Residence: Vancouver, British Columbia, Canada
(city and either US state, if applicable, or country)

Mailing Address: PO Box 29164, RPO South Granville Post, Vancouver, British Columbia, Canada V6J 0A6

.....

Citizenship: ~~CA~~ SWEDISH

Inventor's .....
(The signature must be that of the ~~inventor,~~ not that of the agent)

Date: 28th July 2009

Name: SOBOLYEV, Maksym

Residence: New Westminster, British Columbia, Canada
(city and either US state, if applicable, or country)

Mailing Address: 506-210 Eleventh Street, New Westminster, British Columbia, Canada V3M 4C9

.....

Citizenship: CA

Inventor's Signature: .....
(The signature must be that of the inventor, not that of the agent)

Date: .....

☒ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iv)".

Form PCT/RO/101 (declaration sheet (iv)) (April 2007)
LegalStar 2007, Form PCTREQ

See Notes to the request form

Box No. VIII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)

The declaration must conform to the following standardized wording provided for in Section 214; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

Declaration of inventorship (Rules 4.17(iv) and 51*bis*.1(a)(iv))
for the purposes of the designation of the United States of America:

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/ ..... (if furnishing declaration pursuant to Rule 26*ter*).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications: .....

.....

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 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 PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name: BJORSELL, Johan Emil Viktor

Residence: Vancouver, British Columbia, Canada
(city and either US state, if applicable, or country)

Mailing Address: PO Box 29164, RPO South Granville Post, Vancouver, British Columbia, Canada V6J 0A6

.....

Citizenship: CA

Inventor's ..... Date: .....
(The signature must be that of the inventor, not that of the agent)

Name: SOBOLYEV, Maksym

Residence: New Westminster, British Columbia, Canada
(city and either US state, if applicable, or country)

Mailing Address: 506-210 Eleventh Street, New Westminster, British Columbia, Canada V3M 4C9

MS

Citizenship: ~~CA~~ UKRAINE

Inventor's Signature: ..... Date: 27 July 2009
(The signature must be that of the inventor, not that of the agent)

☒ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iv)".

Continuation of Box No. VIII (i) to (v) **DECLARATION**

If the space is insufficient in any of Boxes Nos. VIII (i) to (v) to furnish all the information, including in the case where more than two inventors are to be named in Box No. VIII (iv), in such case, write "Continuation of Box No. VIII ..." (indicate the item number of the Box) and furnish the information in the same manner as required for the purposes of the Box in which the space was insufficient. If additional space is needed in respect of two or more declarations, a separate continuation box must be used for each such declaration. If this Box is not used, this sheet should not be included in the request.

Continuation of Box VIII (iv)

Name: HUTTUNEN, Pentti Kalevi
Residence: Vancouver, British Columbia, Canada
Mailing Address: 76-3180 East 58th Avenue, Vancouver, British Columbia, Canada V5S 3S8
Citizenship: CA

Inventors Signature _____ Date JULY 28, 2009

Form PCT/RO/101 (continuation sheet for declaration) (April 2007)
LegalStar 2007, Form PCTREQ

See Notes to the request form

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/056,277	Filing Date 01/27/2011	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY ☒ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $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).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
01/27/2011										
	Total (37 CFR 1.16(i))	* 90	Minus	** 90	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 8	Minus	***8	= 0	X $110 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/RENEE HAWKINS/

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

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

T-Mobile Exhibit 1002
Part 1 of 6

PA 1767207

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:
UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

August 27, 2009

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***61/129,898***
FILING DATE: ***July 28, 2008***

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS ***US61/129,898***

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

P. SWAIN
Certifying Officer

15992 U.S. PTO

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TITLE OF THE INVENTION (500 characters max)

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Respectfully submitted,

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P19SMALL/REV08

MOBILE GATEWAY

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates generally to telecommunication, and more particularly to methods, systems, apparatuses, and computer readable media for initiating or enabling a call with a mobile telephone to a callee.

2. Description of Related Art

Mobile telephone service providers often charge significant fees for long distance telephone calls, particularly when the mobile telephone is roaming in another mobile telephone service provider's network.

One known technique for avoiding the long distance charges of mobile telephone service providers is to use a "calling card". A "calling card" may permit the user of the mobile telephone to place a call to a local telephone number or to a less-expensive telephone number (such as a toll-free number, for example) instead of placing the call directly to the callee. The user may thus avoid the long distance charges of the mobile telephone service provider, which may be higher than the charges for using the "calling card". However, this technique can be cumbersome and undesirable, because it may require the user of the mobile telephone to follow a number of complicated or cumbersome steps in order to initiate a call to the callee, for example.

SUMMARY OF THE INVENTION

In accordance with one aspect of the invention there is provided a method of initiating a call to a callee using a mobile telephone. The method involves: receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting an access code request message to an access server, the access code request message including the callee identifier; receiving an access code reply message from the access server in response to the access code request message, the access code reply message

including an access code different from the callee identifier and associated with the callee identifier; and initiating a call with the mobile telephone using the access code to identify the callee.

Transmitting may involve transmitting the access code request message to the access server on a non-voice network.

Transmitting may involve transmitting a location identifier of a location associated with the mobile telephone to the access server.

Transmitting the location identifier may involve transmitting an IP address of the mobile telephone in a wireless IP network.

Transmitting the location identifier may involve transmitting an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Transmitting the location identifier may involve transmitting a user-configured identifier of a location associated with the mobile telephone.

Receiving the access code reply message may involve receiving the access code reply message from the access server on a non-voice network.

Receiving the access code reply message may involve receiving, in the access code reply message, an access code temporarily associated with the callee identifier.

Receiving the access code reply message may involve receiving, in the access code reply message, a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

Initiating the call may involve engaging a routing controller to route the call on the IP network to the callee.

The method may further involve: receiving from the mobile telephone the access code request message; communicating with a routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmitting the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes: means for receiving, from a user of the mobile telephone, a callee identifier associated with the callee; transmitting means for transmitting an access code request message to an access server, the access code request message including the callee identifier; means for receiving an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and means for initiating a call using the access code to identify the callee.

The transmitting means may include a non-voice network interface for transmitting the access code request message to the access server on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The means for receiving an access code reply message may include a non-voice network interface for receiving the access code reply message on a non-voice network.

The access code may include a telephone number.

The means for initiating may involve a mobile telephone network interface.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes the mobile telephone, a routing controller, and an access server. The access server includes: means for receiving from the mobile telephone the access code request message; means for communicating with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and means for transmitting the access code reply message including the access code to the mobile telephone.

In accordance with another aspect of the invention, there is provided a mobile telephone. The mobile telephone includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive, from a user of the mobile telephone, a callee identifier associated with the callee; cause an access code request message to be transmitted to an access server, the access code request message including the callee identifier; receive an

access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to cause the access code request message to be transmitted may include codes for directing the processor circuit to cause the access code request message to be transmitted to the access server using the non-voice network interface on a non-voice network.

The access code request message may further include a location identifier of a location associated with the mobile telephone.

The location identifier may include an IP address of the mobile telephone in a wireless IP network.

The location identifier may include an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The location identifier may include a user-configured identifier of a location associated with the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive an access code reply message may include codes for directing the processor circuit to cause the access code reply message to be received from the access server using the non-voice network interface on a non-voice network.

The access code may include a telephone number identifying a channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The network interface may include a mobile telephone network interface, and the codes for directing the processor circuit to initiate may include codes for directing the processor circuit to cause a call to be initiated using the mobile telephone network interface on a mobile telephone network.

In accordance with another aspect of the invention, there is provided a system for initiating a call to a callee. The system includes: the mobile telephone; a routing controller; and an access server comprising a processor circuit and a computer readable medium in communication with the processor circuit. The computer readable medium is encoded with codes for directing the processor circuit to: receive from the mobile telephone the access code request message; communicate with the routing controller to obtain from the routing controller the access code wherein the access code identifies a channel and is useable by the mobile telephone to cause the routing controller to establish a call to the callee using the channel; and transmit the access code reply message to the mobile telephone.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive, from a user of a mobile telephone, a callee identifier associated with a callee; transmit an access code request message to an access server, the access code request message including the callee identifier; receive an access code reply message from the access server in response to the access code request message, the access code reply message including an access code different from the callee identifier and associated with the callee identifier; and initiate a call using the access code to identify the callee.

In accordance with another aspect of the invention, there is provided a method for enabling a mobile telephone to initiate a call to a callee through a channel. The method involves: receiving from the mobile telephone an

access code request message including a callee identifier associated with the callee; communicating with a routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and transmitting an access code reply message including the access code to the mobile telephone.

Receiving may involve receiving the access code request message on a non-voice network.

The method may further involve causing the routing controller to produce the access code.

Producing may involve selecting the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The method may further involve determining a local calling area associated with the mobile telephone.

Determining may involve accessing a dialing profile associated with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

Determining may involve receiving an IP address of the mobile telephone in a wireless IP network.

Determining may involve receiving an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

Determining may involve receiving a user-configured identifier of a location associated with the mobile telephone.

Selecting may involve selecting an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The method may further involve causing the routing controller to establish communication through the IP network in response to a call received on the channel.

Producing may further involve storing a caller identifier associated with the mobile telephone in association with the access code.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

Producing may further involve storing the callee identifier in association with the access code.

Producing may further involve searching the pool of access codes for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

Producing may further involve storing, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

Causing the routing controller to establish communication may involve causing the routing controller to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

Transmitting may involve transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes: means for receiving from the mobile telephone an access code request message including a callee identifier associated with the callee; means for communicating with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and means for transmitting an access code reply message including the access code to the mobile telephone.

The means for receiving may include a non-voice network interface for receiving the access code request message on a non-voice network.

The system may further include means for producing the access code.

The means for producing may include a processor circuit operably configured to select the access code from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a dialing profile associated

with the caller, the dialing profile including a location field having contents identifying at least a default location of the caller.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an IP address of the mobile telephone in a wireless IP network.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The processor circuit may be operably configured to determine a local calling area associated with the mobile telephone using a user-configured identifier of a location associated with the mobile telephone.

The processor circuit may be operably configured to select an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The processor circuit may be operably configured to establish communication through the IP network in response to a call received on the channel.

The processor circuit may be operably configured to store a caller identifier associated with the mobile telephone in association with the access code.

The processor circuit may be operably configured to cause the routing controller to establish communication only if the caller identifier associated with the access code identifies the mobile telephone.

The processor circuit may be operably configured to store the callee identifier in association with the access code.

The processor circuit may be operably configured to search the pool of access codes for an access code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

The processor circuit may be operably configured to store, in association with the access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire.

The processor circuit may operably configured to establish communication only if the usability of the access code to initiate a call to the callee has not expired.

The means for transmitting may include a non-voice network interface for transmitting the access code reply message on a non-voice network.

In accordance with another aspect of the invention, there is provided a system for enabling a mobile telephone to initiate a call to a callee through a channel. The system includes a processor circuit, a network interface in communication with the processor circuit, and a computer readable medium in communication with the processor circuit and encoded with codes for directing the processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to receive may include codes for directing the processor circuit to cause the access code request message to be received using the non-voice network interface on a non-voice network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause the access code to be produced.

The codes for directing the processor circuit to cause the access code to be produced may cause the access code to be selected from a pool of access codes, where each access code in the pool of access codes identifies a respective telephone number.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause to be determined a local calling area associated with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause a dialing profile associated with the caller to be accessed, the dialing profile including a location field having contents identifying at least a default location of the caller.

The codes for directing the processor circuit to cause to be determined may cause to be received an IP address of the mobile telephone in a wireless IP network.

The codes for directing the processor circuit to cause to be determined may cause to be received an identifier of a wireless voice signal station in wireless communication with the mobile telephone.

The codes for directing the processor circuit to cause to be determined may cause to be received a user-configured identifier of a location associated with the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may further cause to be selected an access code in the local calling area associated with the mobile telephone.

Each access code in the pool of access codes may further identify a respective channel operably configured to cooperate with an IP network to cause a call involving the mobile telephone and the callee to be routed through the IP network.

The computer readable medium may be further encoded with codes for directing the processor circuit to cause communication through the IP network to be established in response to a call received on the channel.

The codes for directing the processor circuit to cause the access code to be produced may cause a caller identifier associated with the mobile telephone to be stored in association with the access code.

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the caller identifier associated with the access code identifies the mobile telephone.

The codes for directing the processor circuit to cause the access code to be produced may cause the callee identifier to be stored in association with the access code.

The codes for directing the processor circuit to cause the access code to be produced may cause the pool of access codes to be searched for an access

code associated with the callee identifier to identify the channel usable by the mobile telephone to initiate a call to the callee.

The codes for directing the processor circuit to cause the access code to be produced may cause a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire, to be stored in association with the access code.

The codes for directing the processor circuit to cause communication to be established may cause communication to be established only if the usability of the access code to initiate a call to the callee has not expired.

The network interface may include a non-voice network interface, and the codes for directing the processor circuit to transmit include codes for directing the processor circuit to cause the access code reply message to be transmitted using the non-voice network interface on a non-voice network.

In accordance with another aspect of the invention, there is provided a computer readable medium encoded with codes for directing a processor circuit to: receive from the mobile telephone an access code request message including a callee identifier associated with the callee; communicate with the routing controller to obtain from the routing controller an access code identifying the channel, the access code being different from the callee identifier and useable by the mobile telephone to initiate a call to the callee using the channel; and cause an access code reply message including the access code to be transmitted to the mobile telephone.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the invention,

Figure **1** is a block diagram of a system for enabling a mobile telephone to initiate a call through a channel to a callee in accordance with a first embodiment in the invention,

Figure **2** is a block diagram of a mobile telephone shown in Figure **1**,

Figure **3** is a flow chart of a process executed by the mobile telephone shown in Figure **1**,

Figure **4** is a schematic representation of an access code request message transmitted between the mobile telephone and an access server shown in Figure **1**,

Figure **5** is a schematic representation of an access code reply message transmitted between the mobile telephone and the access server shown in Figure **1**,

Figure **6** is a block diagram of the access server shown in Figure **1**,

Figure **7** is a flow chart of a process executed by the access server shown in Figure **1**,

Figure **8** is a block diagram of a routing controller shown in Figure **1**,

Figure **9** is a tabular representation of a dialing profile stored in a database accessible by the routing controller illustrated in Figure **1**,

Figure **10** is a tabular representation of an access code association table stored in memory accessible by the routing controller shown in Figure **1**,

Figure **11** is a schematic representation of a DID bank table record stored in a database shown in Figure **1**,

Figure **12** is a flow chart of a process executed by the routing controller illustrated in Figure **1**,

Figure **13** is a block diagram of a gateway shown in Figure **1**,

Figure **14** is a tabular representation of an SIP invite message transmitted between the gateway and a call controller illustrated in Figure **1**,

Figure **15** is a block diagram of the call controller illustrated in Figure **1**,

Figure **16** is a flow chart of a process executed by the call controller illustrated in Figure **1**,

Figure **17** is a tabular representation of an RC request message transmitted between the call controller and the routing controller illustrated in Figure **1**,

Figures **18A–18C** are a flow chart of a process executed by the routing controller illustrated in Figure **1**, and

Figure **19** is a tabular representation of a gateway node association table stored in the database illustrated in Figure **1**.

DETAILED DESCRIPTION

Referring to Figure **1**, a system for enabling a mobile telephone to initiate a call to a callee is shown generally at **10**. The system **10** includes a first node **11**, a second node **21**, and a mobile telephone **12**.

The first and second nodes **11** and **21** in the illustrated embodiment may support "voice-over-IP" (VoIP) calls between telephones and/or videophones using the internet protocol (IP), as described in PCT Publication No. WO **2008/052340**, which is hereby incorporated by reference in its entirety herein. In the embodiment shown, the first node **11** is located in a geographical area, such as Vancouver, British Columbia, Canada, for example, and the second node **21** is located in London, England, for example. Different nodes may be located in different geographical regions throughout the world to provide telephone/videophone service to subscribers in respective regions. These nodes may be in communication with each other by high speed/high data throughput links including optical fiber, satellite, and/or cable links illustrated generally at **17**, forming a backbone to the system. These nodes may alternatively, or in addition, be in communication with each other through conventional internet services.

In the embodiment shown, the first node **11** provides telephone/videophone service to western Canadian customers from Vancouver Island to Ontario.

Another node (not shown) may be located in Eastern Canada to provide services to subscribers in that area, for example.

Other nodes of the type shown may also be employed within the geographical area serviced by a node to provide for call load sharing, for example, within a region of the geographical area serviced by the node. However, in general, all nodes may be similar and have the properties described in connection with the first node **11**.

In this embodiment, the first node **11** includes a call controller (CC) **13**, an access server **14**, a routing controller (RC) **30**, a database **23**, a voicemail server **19**, and a media relay **28**. Each of these may be implemented as separate modules on a common computer system or by separate computers, for example. The voicemail server **19** need not be included in the node and can be provided by a third party service provider. Although the access server **14** is illustrated as being part of the first node **11**, access servers in alternative embodiments may be separate from the node and may be in communication with one or more nodes, for example.

The mobile telephone **12** is configured to place calls over a mobile telephone network, illustrated generally at **15**, in a manner well-known in the art. Furthermore, the mobile telephone **12** and the access server **14** are configured to communicate with each other, preferably on a non-voice network illustrated generally at **16**, such as a "WiFi" wireless IP network or a General Packet Radio Service (GPRS) network, for example. However, in alternative embodiments, the mobile telephone **12** and the access server **14** may communicate with each other over other networks, such as a mobile telephone network using Short Message Service (SMS) messages, for example.

The system **10** further includes a gateway **18** in communication with at least one, and preferably a plurality of, channels, which are illustrated schematically

at **20**, **22**, and **24**, to which the mobile telephone **12** may initiate a call over the mobile telephone network **15**. Preferably, the channels **20**, **22**, and **24** are telephone lines in a Public Switched Telephone Network (PSTN) **29**. The channels **20**, **22**, and **24** are preferably associated with PSTN telephone numbers in a local calling area associated with the mobile telephone **12**, and thus these channels preferably depend on a geographical location of the mobile telephone. The expression "local calling area" herein refers generally to a set of telephone numbers, typically defined by a geographical region, to which telephone calls may be placed by callers within the local calling area at either no additional charge or at a lower additional charge than would be required for calls to numbers that are outside of the local calling area. However, it will be appreciated that in other embodiments, the gateway **18** may be in communication with any number of channels, which need not be PSTN telephone lines. Also, in the illustrated embodiment, the channels **20**, **22**, and **24** are associated with telephone numbers for Vancouver, British Columbia, Canada and the surrounding area, although it will be appreciated that these channels may include PSTN telephone lines associated with other areas, for example, which may not necessarily be in a local calling area associated with the mobile telephone **12**.

In the illustrated embodiment, each of the channels **20**, **22**, and **24** is configured by a PSTN service provider (which, in Canada, may be Bell Canada or Telus, for example) to direct calls that are received on the channels to the gateway **18**. In the illustrated embodiment, the PSTN service provider has configured the channels **20**, **22**, and **24** to communicate with a **T1** multiplexer **25**, which multiplexes the channels **20**, **22**, and **24** in a manner known in the art onto one or more **T1** lines **27** that are in communication with the gateway **18**. The gateway **18** is in communication with an IP network shown generally at **26**. The channels **20**, **22**, and **24** are thus configured to cooperate with the IP network **26** (via the gateway **18** in the illustrated embodiment) to cause a call involving the mobile telephone **12** and the callee

to be routed through the IP network in response to a call received at one of the channels.

Also, in the illustrated embodiment, the access server **14** is in communication with the routing controller **30** of the first node **11**, and the routing controller **30** is configurable to associate a callee identifier with one of the channels **20**, **22**, and **24**, as described below. A callee identifier associated with one of the channels **20**, **22**, and **24** may be a telephone number of a PSTN telephone **32** that is in communication with the IP network **26** through a gateway **34**, or it may be a telephone number of a VoIP telephone **36** that is directly in communication with the IP network **26**, for example. Other routing controllers **30** of other nodes, such as the second node **21**, for example, may also associate callee identifiers with other channels that are in communication with other gateways (not shown).

Mobile Telephone

Referring to Figure **2**, in this embodiment, the mobile telephone (**12**) includes a processor circuit shown generally at **50**. The processor circuit **50** includes a microprocessor **52**, a program memory **54**, an input/output (I/O) port **56**, parameter memory **58**, and temporary memory **60**. The program memory **54**, I/O port **56**, parameter memory **58**, and temporary memory **60** are all in communication with the microprocessor **52**. The processor circuit **50** may alternatively include a plurality of processors, a plurality of program memories, a plurality of temporary memories, and/or a plurality of I/O ports, or these components may alternatively be combined into a single device. However, for simplicity, the components of the processor circuit **50** are illustrated as shown in the example of Figure **2**.

In the illustrated embodiment, the I/O port **56** includes a dialing input **62** for receiving a callee identifier from a key pad, for example, or from a voice recognition unit, or from pre-stored callee identifiers stored in the parameter memory **58**, for example. For illustration purposes only, a myriad of possible

dialing functions for providing a callee identifier are represented by the block entitled dialing function **64**. A callee identifier may be a telephone number of a callee, for example.

The I/O port **56** also includes a handset interface **66** for receiving and producing signals to and from a handset **68** that may be placed close to the user's ear and mouth, for producing and receiving audible signals for and from the user. It will be appreciated that alternatively, the handset **68** may include a camera and video screen, for example, and that video or other types of signals may be transmitted additionally or alternatively to audible signals.

The I/O port **56** also includes a non-voice network interface **70** for transmitting information to, and receiving information from, the non-voice network **16** illustrated in Figure **1**, for example, and preferably interfaces with a high-speed internet connection.

The I/O port **56** in the illustrated embodiment further includes a mobile telephone network interface **72** for transmitting signals to and receiving signals from a mobile telephone service provider over a network such as a Global System for Mobile communications (GSM) or a Code Division Multiple Access (CDMA) network, such as the mobile telephone network **15** illustrated in Figure **1**, for example. Again, for simplicity, a mobile telephone network interface is illustrated, although it will be appreciated that video signals or other signals may be handled similarly when the mobile telephone (**12**) is facilitating communication of one or more of these types of signals. It will also be appreciated that alternatively, the non-voice network interface **70** and mobile telephone network interface **72** need not be distinct, but may be a single interface for communication over a single network, for example, or may be configured to communicate over a plurality of different networks, for example.

In the illustrated embodiment, the parameter memory **58** includes a username field **74** and a password field **76**, although it will be appreciated that the username and password may not be necessary, or may be input by the user as required, for example. The parameter memory **58** in the illustrated embodiment also includes a caller identifier field **78** for storing a caller identifier, which may be a telephone number associated with the mobile telephone (**12**) for identifying a "channel" such as a telephone line assigned to the mobile telephone that may be used to call back to the mobile telephone, for example. Generally, the contents of the username field **74**, the password field **76**, and the caller identifier field **78** are set once when the user first subscribes to the system.

The usernames referred to herein, such as the username in the username field **74**, preferably include a twelve digit number such as **2001 1050 8667**, for example, wherein the left-most digit is a continent code (such as **"2"** to indicate North America, for example), followed by a three-digit country code (such as **"001"** to indicate Canada and the United States, for example), a four-digit dealer code (such as **"1050"**, for example), and a unique four-digit number code (such as **"8667"**, for example), as discussed more generally in PCT Publication No. **2008/052340**. Therefore, a prefix of a username referred to herein preferably indicates a geographical region associated with the user, or with the access code, and more preferably indicates a node associated with the user or access code.

The program memory **54** stores blocks of codes for directing the microprocessor **52** to carry out the functions of the mobile telephone (**12**), which are illustrated by example below.

Referring to Figures **2** and **3**, a flow chart representing functions performed by blocks of code that direct the microprocessor **52** to initiate a call with the mobile telephone **12** to a callee is shown generally at **100**. The blocks shown in Figure **3** generally represent codes that may be stored in the program

memory **54** for example, for directing the microprocessor **52** to perform various functions relating to initiating a call with the mobile telephone **(12)** to a callee. The actual code to implement each block may be written in any suitable programming language, such as Java, C, and/or C++, for example.

The process **100** begins at **102**, in response to an interrupt produced at or for the microprocessor **52** by the dialing function **64**. Upon initiation of the process **100**, block **104** directs the microprocessor **52** to obtain a callee identifier from the dialing function **64** at the dialing input **62** of the I/O port **56** in the illustrated embodiment. The callee identifier is associated with a desired callee, and may be a telephone number of the callee, for example. The microprocessor **52** thus receives, from a user of the mobile telephone **(12)**, a callee identifier associated with a callee.

Block **106** directs the microprocessor **52** to transmit, using the non-voice network interface **70** in the illustrated embodiment, an access code request message, the access code request message including the callee identifier obtained at block **104**, to the access server **14** (illustrated in Figure **1**). In general, preferably block **106** directs the microprocessor **52** to cause an access code request message to be transmitted to the access server **14** over a non-voice network, such as an internet, using WiFi or GPRS technology for example. However, it will be appreciated that block **106** may direct the microprocessor **52** to transmit an access code request message to the access server **14** using any suitable technique, which may alternatively include a voice network, for example.

Referring to Figure **4**, an exemplary access code request message is shown generally at **110**. The access code request message **110** includes a username field **112**, a password field **114**, a callee identifier field **116**, and a caller identifier field **118**. In the illustrated embodiment, values for the username, password, and caller identifier fields **112**, **114**, and **118** are retrieved from the username, password, and caller identifier fields **74**, **76**, and

78 respectively in the parameter memory 58 of the processor circuit 50 (illustrated in Figure 2), and a value for the callee identifier field 116 is obtained from the dialing function 64 in block 104, and may be stored in the temporary memory (60), for example. It will be appreciated that the username field 112, password field 114, and caller identifier field 118 are not essential, although these fields are preferable in order to identify the user of the mobile telephone for billing purposes, for example.

Referring to Figures 1 and 4, it will be appreciated that in order to minimize charges from the mobile telephone service provider of the mobile telephone 12, the channels 20, 22, 24 will preferably be local or relatively inexpensive telephone lines associated with a geographical location, more particularly a pre-defined local calling area, associated with the mobile telephone 12. Therefore, the exemplary access code request message 110 further includes a location identifier field 119. The location identifier stored in the location identifier field 119 preferably identifies a location of the mobile telephone 12 for use in determining a local calling area associated with the mobile telephone 12.

For example, the location identifier in the location identifier field 119 may include an IP address of the mobile telephone 12 in a wireless IP network, such as the non-voice network 16 to which the non-voice network interface 70 shown in Figure 2 is connected, because this IP address may be an indicator of a geographical location of the mobile telephone 12. The location identifier may also or alternatively include an identifier of a wireless voice signal station in wireless communication with the mobile telephone. In the illustrated embodiment, the wireless voice signal station is part of the mobile telephone network 15 that is in communication with the mobile telephone 12 through the mobile telephone network interface 72 illustrated in Figure 2. In still other embodiments, the location identifier may include a user-configured identifier of a geographical location or local calling area where the mobile telephone 12 is or may be situated. The location identifier may thus be pre-determined and

stored in the parameter memory **58** shown in Figure **2** or may be acquired from non-voice network or wireless voice signal station or from user input, for example. Therefore, in summary, the location identifier in the location identifier field **119** may include one or more of an IP address of the mobile telephone **12** in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier.

As described below, the location identifier in the location identifier field **119** may be used to determine a local calling area associated with the mobile telephone **12**, within which local calling area channels (illustrated as **20**, **22**, and **24** in Figure **1**) are available to the mobile telephone **12** for the lowest cost to the user. However, it will be appreciated that the location identifier may only approximately identify a local calling area, and may not necessarily identify the lowest cost channel (illustrated as **20**, **22**, and **24** in Figure **1**) for the mobile telephone **12**. It will also be appreciated that in other embodiments, the location identifier field **119** may be omitted.

Referring back to Figure **3**, the process **100** continues at block **130**, which directs the microprocessor (**52**) to receive an access code reply message from the access server (**14**) in response to the access code request message that was transmitted at block **106**.

Referring to Figure **5**, an exemplary access code reply message is shown generally at **140**. The access code reply message **140** includes an access code field **142** and a timeout field **144**. In the illustrated embodiment, the access code field **142** stores an access code which is a telephone number associated with a telephone line associated with one of the channels **20**, **22**, or **24** in Figure **1**. It will be appreciated that the access code is different from the callee identifier in the callee identifier field **116** shown in Figure **4**, in that the access code identifies a channel, other than that provided by the callee identifier provided by the dialing function **64** in Figure **2**, that the mobile

telephone (**12**) can use to initiate a call to the callee. It will be appreciated that use of the access code facilitates avoidance of long distance or roaming charges that a mobile telephone service provider would charge for a call placed directly using the callee identifier using conventional calling processes, for example.

Still referring to Figure **5**, the timeout field **144** in the illustrated embodiment stores a value that indicates a period of time, for example a number of minutes, during which the access code in the access code field **142** is associated with the callee identifier in the callee identifier field **116** of the exemplary access code request message **110** illustrated in Figure **4**, such that the access code is only temporarily associated with the callee identifier. In one embodiment, the value stored in the timeout field **144** indicates **10** minutes, for example. It will be appreciated that in other embodiments, the timeout field **144** may not be necessary, but preferably it is included.

In the illustrated embodiment, the program codes in block **130** direct the microprocessor **52** to receive the access code reply message over a non-voice network, such as a WiFi or GPRS network (illustrated at **16** in Figure **1**) via the non-voice network interface **70** shown in Figure **2**. However, it will be appreciated that the access code reply message may be received on any suitable network, even a voice network, for example.

Referring back to Figures **2** and **3**, block **149** directs the microprocessor **52** to initiate a call with the mobile telephone (**12**) on the mobile telephone network **15** (illustrated in Figure **1**) using the access code received in the access code field **142** of the access code reply message **140** (shown in Figure **5**) to identify the callee. In the illustrated embodiment, the codes in block **149** direct the microprocessor **52** to initiate a call to the channel (**20**, **22**, or **24**) identified by the access code, using the mobile telephone network interface **72** of the I/O port **56** of the mobile telephone (**12**), to engage the mobile telephone network (**15**).

Referring to Figure **1**, in the embodiment shown, the access code in the access code field **(142)** is a telephone number identifying a channel **20**, **22**, or **24** that is in communication with the gateway **18** to the IP network **26**. Through the gateway **18**, the channel **20**, **22**, or **24** is thus operably configured to cooperate with the IP network **26** to cause a call from the mobile telephone **12** to the callee to be routed through the IP network. Routing the call through the IP network may involve engaging the routing controller **30** to route the call on the IP network **26** to the callee, as described below. However, it will be appreciated that in other embodiments, the access code need not be a telephone number, but may be any code identifying a channel through which the mobile telephone **12** can initiate a call. Alternatively, if the mobile telephone is capable of voice over IP communications, the access code may be used to identify an IP address in the IP network to which the call is routed. In this embodiment, the IP address may act as the access code. The process **100** shown in Figure **3** is then ended.

Access Server

Referring to Figure **6**, the access server **(14)** includes a processor circuit shown generally at **150**. The processor circuit **150** includes a microprocessor **152**, program memory **154**, an I/O port **156**, parameter memory **158**, and temporary memory **160**. The program memory **154**, I/O port **156**, parameter memory **158**, and temporary memory **160** are all in communication with the microprocessor **152**. The processor circuit **150** may alternatively include a plurality of microprocessors or I/O ports, for example, and the components of the illustrated processor circuit **150** may also alternatively be combined into a single device.

The program memory **154** stores blocks of codes for directing the microprocessor **152** to carry out the functions of the access server **14**. The I/O port **156** includes a non-voice network interface **162** for communicating with the non-voice network **16** illustrated in Figure **1**. The I/O port **156** also

includes a routing controller interface **164** for interfacing with the routing controller **30** illustrated in Figure **1**.

Referring to Figures **6** and **7**, a flow chart of blocks of code for directing the microprocessor **152** of the access server (**14**) to provide an access code to the mobile telephone (**12**) is shown generally at **190**. The blocks **190** in Figure **7** generally represent codes that may be stored in the program memory **154** for directing the microprocessor **152** to perform various functions to provide the access to the mobile telephone (**12**) to enable the mobile telephone to place a call through a channel (**20**, **22**, or **24**).

The process **190** begins at **192**, in response to an interrupt created by or for the microprocessor **152** when it receives an access code request message **110** (as illustrated in Figure **4**) from the mobile telephone (**12**). In the illustrated embodiment, the access code request message (**110**) is received via the non-voice network interface **162** through a non-voice network (**16**) such as a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may use different techniques for receiving the access code request message (**110**) from the mobile telephone (**12**).

The process **190** continues at block **196**, which directs the microprocessor **152** to communicate with the routing controller **30** to obtain from the routing controller an access code identifying a channel (illustrated as **20**, **22**, or **24** in Figure **1**) in communication with the gateway (**18**), wherein the access code is different from the callee identifier in the callee identifier field **116** (shown in Figure **4**) and is usable by the mobile telephone (**12**) to initiate a call to the callee using the channel, as further described below. Therefore, block **196** preferably causes an access code to be produced by retransmitting the access code request message **110** illustrated in Figure **4** that was received at **192** from the mobile telephone (**12**), to the routing controller **30** through the routing controller interface **164** of the I/O port **156**.

The process **190** continues at block **198**, which directs the microprocessor **152** to transmit an access code reply message (**140**), including the access code obtained by block **196**, to the mobile telephone (**12**). An exemplary access code reply message is shown in Figure **5**. In the illustrated embodiment, an access code reply message (**140**) is produced by the routing controller **30** in a manner described below in response to the access code request message (**110**) that was transmitted to the routing controller at block **196**, and the access code reply message (**140**) is received from the routing controller through the routing controller interface **164** of the I/O port **156**. Block **198** then causes the access code reply message that was received from the routing controller to be retransmitted to the mobile telephone (**12**). In the illustrated embodiment, the codes in block **198** direct the microprocessor **152** to transmit the access code reply message (**140**) using the non-voice network interface **162** to the non-voice network **16**, which may be a WiFi or GPRS network, for example. However, it will be appreciated that other embodiments may employ other types of networks for communicating the access code reply message (**140**) to the mobile telephone (**12**). The process **190** is then ended.

In summary, referring to Figure **1**, the access server **14** generally acts as an interface to the routing controller **30** for relaying access code request messages and access code reply messages between the mobile telephone **12** and the routing controller. Therefore, it will be appreciated that in alternative embodiments, the access server **14** and the routing controller **30** need not be separate, but may, for example, be combined in a single component.

Routing Controller (RC)

Referring to Figure **1**, generally, the routing controller **30** executes a process to facilitate communication between callers and callees. The function of a routing controller generally in a VoIP system is described in PCT Publication No. WO **2008/052340**.

Referring to Figure **8**, the routing controller (**30**) includes a processor circuit shown generally at **230**. The processor circuit **230** includes a microprocessor (or more generally a processor) **232**, program memory **234**, an I/O port **236**, table memory **238**, temporary memory **240**, and a clock **244**. The program memory **234**, I/O port **236**, table memory **238**, temporary memory **240**, and clock **244** are all in communication with the processor **232**. The processor circuit **230** may include a plurality of microprocessors, for example, and the aforementioned components of the processor circuit **230** may be combined, for example. The program memory **234** includes blocks of code for directing the processor **232** to carry out the functions of the routing controller (**30**), and the I/O port **236** includes an access server interface **242** for communicating with the access server **14**.

In the illustrated embodiment as described above, the access server (**14**) transmits (at block **196** illustrated in Figure **7**) an access code request message (**110**) to the routing controller (**30**) in order to obtain from the routing controller (**30**) an access code. When an access code request message (**110**) is received at the access server interface **242**, the processor **232** preferably stores certain values from the access code request message in stores in the temporary memory **240** for ease of retrieval. In particular, the temporary memory **240** includes a callee identifier store **246** for storing the callee identifier from the callee identifier field **116** in the access code request message **110** illustrated in Figure **4**, a caller identifier store **248** for storing the caller identifier that was stored in the caller identifier field **118** of the access code request message **110** illustrated in Figure **4**, a caller username store **249** for storing the caller username that was stored in the caller username field **112** of the access code request message **110** illustrated in Figure **4**, and an access code store **250** for storing an access code that is selected when the routing controller (**30**) receives an access code request message (**110**). The temporary memory **240** also includes a local calling area identifier store **245** for storing an identifier of a local calling area associated with the mobile

telephone (**12**). The clock **244** generally maintains and stores a representation of a current date and time.

The I/O port **236** further includes a database request port **256** through which a request to the database (**23** in Figure **1**) can be made, and also includes a database response port **258** for receiving a reply from the database (**23**). The I/O port **236** further includes a routing controller (RC) request message input **260** for receiving an RC request message (illustrated in Figure **17**) from the call controller (**13** in Figure **1**) and includes a routing message output **262** for sending a routing message back to the call controller **13**. The I/O port **236** thus acts to receive a caller identifier and a callee identifier contained in an RC request message from the call controller, the RC request message being received in response to initiation of a call by a subscriber of the system, as described below.

The program memory **234** includes blocks of codes for directing the processor **232** to carry out various functions of the routing controller (**30**). One of these blocks includes an RC request message handler **380** which directs the routing controller (**30**) to produce a routing message in response to a received RC request message, an example of which is illustrated in Figure **17**. The RC request message handler process is shown in greater detail at **380** in Figures **18A** through **18C**. Another of these blocks in the program memory **234** includes an access code generator, which is described at **270** in Figure **12**, and which directs the routing controller (**30**) to produce an access code as directed by the program codes in block **196** shown in Figure **7**. Yet another of these blocks in the program memory **234** includes a local calling area identifier generator, which directs the routing controller (**30**) to produce a local calling area identifier using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**.

Local Calling Area Identifier Generator

Referring to Figure **1**, it will be appreciated that preferably, a call made by the mobile telephone **12** using the access code obtained from the access server **14** will be a local call for the mobile telephone **12**, based on a geographical location of the mobile telephone. Therefore, blocks in the program memory **234** include a local calling area identifier generator, which directs the routing controller **30** to produce a local calling area identifier.

For example, the local calling area identifier generator may direct the microprocessor **152** to access a dialing profile associated with the caller. The dialing profile may be identified using the username in the username field **112** in the access code request message **110** illustrated in Figure **4**, and to store in the local calling area identifier field **245** a default location of the caller retrieved from the dialing profile associated with the caller.

Referring to Figure **9**, an exemplary dialing profile is illustrated generally at **200** and includes a username field **202**, a domain field **204**, and calling attributes comprising a national dialing digits (NDD) field **206**, an international dialing digits (IDD) field **208**, a country code field **210**, a local area codes field **212**, a caller minimum local number length field **214**, a caller maximum local number length field **216**, a reseller field **218**, a maximum number of concurrent calls field **220**, a current number of concurrent calls field **222**, and a default local calling area identifier field **224**. Therefore, in some embodiments, the local calling area identifier generator directs the microprocessor **152** to determine a local calling area associated with the mobile telephone (**12**) by retrieving the default local calling area identifier from the default local calling area identifier field **224** of the dialing profile **200**.

Effectively, the dialing profile **200** is a record identifying calling attributes of the caller identified by the username in the username field **202**. More generally, dialing profiles **200** represent calling attributes of respective users, and are discussed in more detail in PCT publication No. WO **2008/052340**. As

described in PCT publication No. WO **2008/052340**, a dialing profile of the type shown in Figure **9**, and also other records such as direct-in-dial (DID) records, call blocking records, call forwarding records, and voicemail records, may be created whenever a user registers with the system or agrees to become a subscriber to the system.

Alternatively, the local calling area identifier generator may generate a local calling area identifier to be stored in the local calling area identifier store **245** using the location identifier from the location identifier field **119** of the access code request message **110** illustrated in Figure **4**. As described above, the location identifier field (**119**) may store one or more of an IP address of the mobile telephone (**12**) in a wireless IP network, an identifier of a wireless voice signal station in wireless communication with the mobile telephone, and a user-configured identifier. One or more of these values may be used to identify a local calling area that is or is likely to be associated with the mobile telephone (**12**) in order to generate a local calling area identifier to be stored in the local calling area identifier store **245**.

For example, it has been found that services available from web sites such as http://www.ip2location.com/ and http://www.serviceobjects.com/products/dots_ipgeo.asp, for example, can produce a name of a location, and also latitude and longitude values, associated with an IP address. Using this information derived from an IP address, or other information from the location identifier field (**119**), a local calling area may be identified by hierarchical jurisdictional designations (such as country, province, and city in Canada or country, state, and city in the United States) and encoded as codes identifying the local calling area. These codes may then be stored in the local calling area identifier store **245**.

Access Code Association Table

In the illustrated embodiment, the table memory **238** (shown in Figure **8**) includes an access code association table **170**, an example of which is

illustrated in Figure **10**, for associating access codes with callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps. Although the routing controller (**30**) is illustrated in this embodiment as a separate component from the access server (**14**), it will be appreciated that in other embodiments, the routing controller (**30**) may be part of or integrated with the access server (**14**), and in these other embodiments, the access code association table **170** may be part of or integrated with the access server.

Referring to Figures **1** and **10**, the access code association table **170** generally includes a plurality of records, each having an access code field **173** storing an access code. The access codes in the access code association table **170** may thus form a pool of access codes, where each access code may identify a respective telephone number. In the illustrated embodiment, the access codes in the access code fields **173** of records of the access code association table **170** identify respective channels (illustrated by example only as **20**, **22**, and **24**) that are operably configured to cooperate with the IP network **26** via the gateway **18** to cause a call involving the mobile telephone **12** to be routed through the IP network.

Referring to Figure **10**, the exemplary access code association table **170** includes records **172**, **174**, **176**, **178**, and **180**, each having respective fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175**, a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**. Generally, a record in the access code association table **170** will be created for each access code that identifies a channel (such as the channels **20**, **22**, and **24** illustrated in Figure **1**) that is configured or configurable to establish communication through a gateway (such as the gateway **18** illustrated in Figure **1**) to an IP network (**26** in Figure **1**) in response to a call received at the channel. When a record is created in respect of a channel, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel, the access code field **173** is preferably initialized with an access code

associated with the channel, and the channel identifier field **175** is preferably initialized with an identifier of the channel. The remaining fields (for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182**) are preferably initialized with default "null" values when a record is created. The fields for storing a local calling area identifier **171**, an access code **173**, a channel identifier **175** preferably remain generally constant during ordinary operation of the access code association table **170**, although the values stored in the fields for storing a callee identifier **177**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may vary as described below. It will be appreciated that in some embodiments, one or more of the fields for storing a local calling area identifier **171**, a channel identifier **175**, a caller identifier **179**, a caller username **183**, a timeout **181**, and a timestamp **182** may not be required and be omitted.

As noted above, the local calling area identifier field **171** is preferably initialized with an identifier of a local calling area associated with the channel. The local calling area identifier field **171** preferably stores codes that are encoded in the same manner as the codes in the local calling area identifier store **245**, as described above, so that an access code in the local calling area identified by the codes in the local calling area identifier store **245** may be identified by searching the access code association table **170** for an access code associated with a local calling identifier in the associated local calling area identifier field **171** that matches the local calling area identifier in the local calling area identifier store **245**. It has been found that information available from web sites such as http://en.wikipedia.org/wiki/List_of_NANP_area_codes, and services available from web sites such as http://www.serviceobjects.com/demos/PhoneExchangeDemo.asp, for example, may be used to determine a local calling area associated with a given access code where, for example, the access code is a PSTN telephone number.

In the exemplary access code association table **170**, the access codes in the access code fields **173** are telephone numbers for PSTN lines, three of which are in the **604** area code in Vancouver, British Columbia, Canada, and two of which are in the **416** area code in Toronto, Ontario, Canada. It will be appreciated that the access code association table **170** is an example only, and other access code association tables may include any number of access codes, which need not be PSTN telephone numbers, and which need not be limited to particular geographical areas.

In the exemplary access code association table **170**, the access code field **173** in the record **174** stores an access code **1-604-345-2323**, which may be a local telephone number for Vancouver, British Columbia, Canada, and the callee identifier field **177** of the record **174** stores a callee identifier **1-403-789-1234**, which may be a telephone number for a callee in Calgary, Alberta, Canada for example, thereby associating the callee identifier **1-403-789-1234** with the access code **1-604-345-2323**. Furthermore, the caller identifier field **179** of the record **174** stores a caller identifier **1-416-444-1441** and the caller username field **183** stores a caller username **2001 1050 8667**, thereby associating the caller identifier **1-416-444-1441** and caller username **2001 1050 8667** with the aforementioned access code and callee identifier. The caller identifier **1-416-444-1441** may be associated with a mobile telephone normally geographically located in Toronto, Ontario, Canada, but which may be in Vancouver and is therefore using a Vancouver-based access code to place a call to a Calgary-based number, for example. In the example record **174**, the timestamp field **182** indicates that the callee identifier **1-403-789-1234**, the caller identifier **1-416-444-1441**, and the caller username **2001 1050 8667** were associated with the access code **1-604-345-2323** on June **15, 2008** at **10:31** am, and the timeout field **181** indicates that this association is to expire **10** minutes after the time indicated in the timestamp field.

Likewise, the exemplary record **178** indicates that the callee identifier **1-604-321-1234**, the caller identifier **1-416-444-1234**, and the caller username **2001**

1050 4141 were associated with the access code **1-416-234-4646** on June **15, 2008** at **2:21** pm, and the timeout field **181** of the record **178** indicates that this association is to expire within **10** minutes of the time in the timestamp field **182**.

It will also be appreciated that the access code association table **170** may, in other embodiments, be substituted with other data structures or storage media. For example, in alternative embodiments, as described below, a DID record of the type shown at **370** in Figure **11** may associate an access code with a callee identifier and with other information such as a caller identifier, a timeout value, and a timestamp value, additionally or alternatively to the access code association table **170**.

DID Bank Table Records

As described in PCT Publication No. **2008/052340**, a DID bank table record may be created and stored in a DID bank table in the database (**23** in Figure **1**) when a user registers with the system, to associate the username of the user and a host name of the node with which the user is associated, with a number on the PSTN network formatted in compliance with the E.**164** standard set by the International Telecommunication Union (ITU). However, as explained below, DID records may, in some embodiments, also associate usernames and host names with respective access codes, and may also associate access codes with respective callee identifiers and with other information such as caller identifiers, timeout values, and timestamp values.

Referring to Figure **11**, an exemplary DID bank table record is shown generally at **370**, and includes a username field **371**, a user domain field **372**, and a DID field **373**. The username field **371** may store a username of a user of the system, in which case the user domain field **372** stores a host name of the node with which the user is associated, and the DID field **373** stores an E.**164** number on the PSTN network associated with the user. Exemplary host names stored in the user domain field **372** include sp.yvr.digifonica.com for

Vancouver, British Columbia, Canada and sp.lhr.digifonica.com for London England, for example, as described in PCT Publication No. **2008/052340**. If the user has multiple telephone numbers, then multiple records of the type shown at **370** would be included in the DID bank table, each having the same username and user domain, but different DID field **373** contents reflecting the different telephone numbers associated with that user.

However, DID fields **373** of DID bank table records **370** may also store access codes, in which case the username field **371** may store a username associated with the access code. In these DID bank table records **370**, the user domain field **372** stores a host name of the node with which the access code is associated. Therefore, DID bank table records **370** may, in some embodiments, associate usernames and host names with respective access codes.

The exemplary DID bank table record **370** further includes a callee identifier field **374**, a caller identifier field **375**, a timeout field **376**, a timestamp field **377**, a local calling area identifier field **378**, a channel identifier field **379**, and a caller username field **381**, which may be used in an analogous manner to the callee identifier field **177**, the caller identifier field **179**, the timeout field **181**, the timestamp field **182**, the local calling area identifier field **171**, the channel identifier field **175**, and the caller username field **183** respectively of the access code association table **170** illustrated in Figure **10**. The DID bank table records **370** may thus associate access codes with respective local calling area identifiers, callee identifiers, caller identifiers, caller usernames, timeouts, and timestamps, although the caller identifier field **375**, timeout field **376**, timestamp field **377**, local calling area identifier field **378**, channel identifier field **379**, and caller username field **381** may are not necessary, and one or more of these fields may be omitted in some embodiments. Furthermore, it will be appreciated that the callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may be omitted for DID table records that are not in respect

of access codes, but rather are in respect of telephone numbers of users of the system, for example, as described in PCT Publication No. **2008/052340**. The callee identifier field **374**, caller identifier field **375**, timeout field **376**, and timestamp field **377** of the DID bank table record **370** may also be omitted in embodiments where the access code association table **170** includes records with these types of fields.

For simplicity, the following description is directed to embodiments wherein an access code association table **170** associates access codes with respective callee identifiers, caller identifiers, timeout values, and timestamp values. However, it will be appreciated that the processes described herein for records in the access code association table **170** may additionally or alternatively be applied to DID bank table records **370** in an analogous manner.

Access Code Generator

Referring back to Figures **1**, **4**, and **8** in the illustrated embodiment as described above, the access server **14** transmits (at block **196** illustrated in Figure **7**) an access code request message **110** to the routing controller **30** in order to obtain from the routing controller **30** an access code. When an access code request message **110** is received at the access server interface **242**, the processor **232** preferably authenticates the user by making various enquiries of databases to which it has access, to determine whether or not the password in the password field **114** of the access code request message **110** matches a password stored in the database in association with the username in the username field **112**. Various functions may be used to pass encryption keys or hash codes back and forth to ensure that the transmittal of passwords is secure. If the user is successfully authenticated, the processor **232** then preferably produces an access code.

Referring to Figures **8** and **12**, a process for producing an access code is shown generally at **270**. Essentially the process **270** determines whether the

access code in a given record (referred to below as the "currently addressed record") in the access code association table shown at **170** in Figure **10** is within the local calling area identified by the local calling area identifier store **245**, and whether the access code is currently available for association with a callee identifier. In order to produce an access code in response to receiving an access code request message (**110**) from the access server (**14**), the processor **232** of the routing controller (**30**) preferably searches the pool of access codes in the access code association table (**170**) to identify an access code identifying a channel usable by the mobile telephone (**12**) to initiate a call to the callee, using the process **270** until an available access code in the local calling area identified by the local calling area identifier store **245** is identified. The access code generator thus preferably selects an access code from the pool of access codes in the access code association table (**170**), and preferably selects an access code in a local calling area associated with the mobile telephone (**12**).

Starting with the first record in the access code association table, the process **270** begins at block **272**, which directs the processor **232** of the routing controller (**30**) to determine whether the access code in the currently addressed record of the access code association table **170** is associated with the same local calling area as the mobile telephone (**12**) as identified by the contents of the local calling area identifier store **245**. If at block **272** the access code of the currently addressed record is not associated with the same local calling area as the mobile telephone (**12**), the process **270** ends, the next record in the access code association table **170** is addressed, and the process is repeated for the next record in the access code association table.

However, if at block **272** the access code of the currently addressed record is associated with the same local calling area as the mobile telephone (**12**), or if the access code request message **110** (illustrated in Figure **4**) did not include a local calling area identifier, then the process **270** continues at block **274**,

which directs the processor **232** to determine whether the access code of the currently addressed record is associated with a callee identifier. To do this, the processor **232** determines whether the callee identifier field **(177)** of the currently addressed record stores a "null" value that was assigned to it on initialization, or whether the callee identifier field instead stores a callee identifier. In other words the processor checks to see whether the currently addressed record has already been in use.

If at block **274** the callee identifier field **(177)** of the currently addressed record in the access code association table **(170)** does store a callee identifier and not the "null" value that was assigned to the callee identifier field on initialization (for example, records **174** and **178** in Figure **10**), then the access code of that record is associated with a callee identifier, and the process **270** continues at block **278**, which directs the processor **232** to determine whether the association of the callee identifier with the access code has expired. In the illustrated embodiment, the codes at block **278** direct the processor **232** to determine whether the sum of the contents of the timestamp field **(182)** and of the timeout field **(181)** in the currently addressed record of the access code association table **170** (shown in Figure **10**) is less than the current time represented by the clock **244**. If at block **278** the sum of the timeout and timestamp fields in the currently addressed record of the access code association table **170** is less than the time represented by the clock **244**, then the association of the callee identifier with the access code is not expired and the process **270** ends, the next record in the access code association table **(170)** is addressed, and the process **270** is repeated for the next record in the access code association table.

However, if at block **278** the sum of the contents of the timeout and timestamp fields **(181** and **182)** in the currently addressed record of the access code association table **(170)** is not less than the time represented by the clock **244**, then the association of the callee identifier with the access code has expired, and the process **270** continues at block **276** which directs the processor **232**

to store the contents of the access code field **173** of the currently addressed record in the access code store **250** of the temporary memory **240** of the routing controller **30**.

Referring to Figures **8**, **10**, and **12**, if at block **274** the callee identifier field in the currently addressed record does not store a callee identifier but stores instead the "null" value that was assigned to the callee identifier field on initialization (for example, records **172**, **176**, and **180**), then the access code of that record is not associated with a callee identifier, and the process **270** continues at block **276**, which directs the processor **232** to store the access code from the access code field **173** of the currently addressed record, in the access code store **250** in the temporary memory **240**.

After the selected access code is stored in the access code store **250** at block **276**, the process **270** continues at block **280**, which directs the processor **232** to store the callee identifier from the callee identifier store **246** (which identifies the mobile telephone **12** shown in Figure **1**) in the callee identifier field **177** of the currently addressed record, thereby creating an association of the callee identifier with the selected access code.

The process **270** then continues at block **282**, which directs the processor **232** to store the caller identifier from the caller identifier store **248** in the caller identifier field **179** of the currently addressed record of the access code association table **170**, thereby also storing the caller identifier in association with the selected access code.

The process **270** then continues at block **283**, which directs the processor **232** to store the caller username from the caller username store **249** in the caller username field **183** of the currently addressed record of the access code association table **170**, thereby also storing the caller username in association with the selected access code.

The process **270** then continues at block **284**, which directs the processor **232** to store timeout and timestamp values in the timeout and timestamp fields **181** and **182** of the currently addressed record of the access code association table **170**, thus further storing, in association with the selected access code, a timestamp for use in determining when the usability of the access code to initiate a call to the callee will expire. A default value, such as **10** minutes, for example may be stored in the timeout field **181** of the currently addressed record, or where a timeout value is provided in the timeout field **144** of the access code reply message **140** shown in Figure **5**, the contents of this timeout field **144** are stored in the timeout field **181** of the currently addressed record. Also, the current time indicated by the clock **244** is preferably stored in the timestamp field **182** of the currently addressed record.

In alternative embodiments, the access code association table (**170**) might not include fields for a caller identifier, caller username, a timeout, or a timestamp. In these embodiments, one or more of blocks **282**, **283**, and **284** described above are not necessary, and one or more of the caller identifier store **248** and the caller username store **249** may be omitted.

In summary, the access code generator in the illustrated embodiment responds to receiving an access code request message **110** illustrated in Figure **4** from the access server (**14**) by first authenticating the user, and then by searching through a pool of access codes, using the process **270** shown in Figure **12**, to identify an access code that is in the local calling area identified by the local calling area identifier store (**245**) and that is not previously and validly associated with another callee identifier. It will be appreciated that in alternative embodiments, different data structures and algorithms may be preferable for identifying an access code that meets the aforementioned criteria. For example, in accordance with conventional database design that is well-known in the art, the records illustrated in the access code association table **170** illustrated in Figure **10** may alternatively be organized in a binary tree according to the value in the local calling area identifier field **171**, or in