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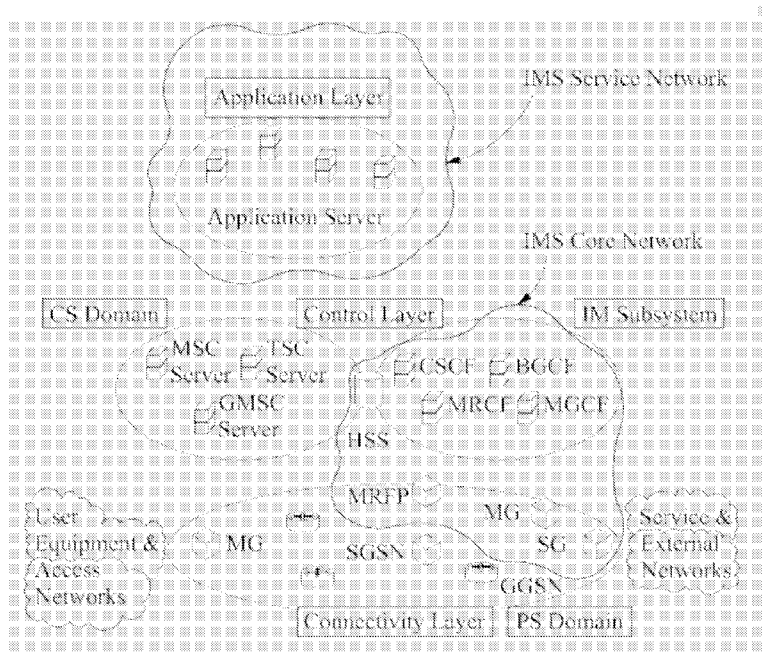
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(54) Title: MESSAGE ROUTING IN THE IP MULTIMEDIA SUBSYSTEM



(57) Abstract: A method of routing a SIP message within an IP Multimedia Subsystem, where the message originates at an IMS/SIP client attached to a visited network and contains as its destination address a TEL URI including a telephone number. The method comprises, at the IMS/SIP client, specifying that the telephone number is a local number of the visited network or of a home network of the client, including at the IMS/SIP client a phone-context within the TEL URI identifying the home network or the visited network according to the specification, and delivering the message from the client to the home network and receiving the message within the home network, and routing the message according to the phone-context contained within the TEL URI.

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Message Routing in the IP Multimedia Subsystem

Field of the Invention

- 5 The present invention relates to message routing in the IP Multimedia Subsystem and more particularly to message routing in the IP Multimedia Subsystem using public user identities in the TEL URI format.

Background to the Invention

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IP Multimedia services provide a dynamic combination of voice, video, messaging, data, etc. within the same session. By growing the number of basic applications and the media which it is possible to combine, the number of services offered to the end users will grow, and the inter-personal communication experience will be enriched. This will
15 lead to a new generation of personalised, rich multimedia communication services, including so-called “combinational IP Multimedia” services which are considered in more detail below.

IP Multimedia Subsystem (IMS) is the technology defined by the Third Generation
20 Partnership Project (3GPP) to provide IP Multimedia services over mobile communication networks (3GPP TS 22.228, TS 23.218, TS 23.228, TS 24.228, TS 24.229, TS 29.228, TS 29.229, TS 29.328 and TS 29.329 Releases 5 to 7. IMS provides key features to enrich the end-user person-to-person communication experience through the use of standardised IMS Service Enablers, which facilitate new rich person-to-
25 person (client-to-client) communication services as well as person-to-content (client-to-server) services over IP-based networks. The IMS makes use of the Session Initiation Protocol (SIP) to set up and control calls or sessions between user terminals (or user terminals and application servers). The Session Description Protocol (SDP), carried by SIP signalling, is used to describe and negotiate the media components of the session.
30 Whilst SIP was created as a user-to-user protocol, IMS allows operators and service providers to control user access to services and to charge users accordingly.

Figure 1 illustrates schematically how the IMS fits into the mobile network architecture in the case of a GPRS/PS access network. Call/Session Control Functions (CSCFs)

operate as SIP proxies within the IMS. The 3GPP architecture defines three types of CSCFs: the Proxy CSCF (P-CSCF) which is the first point of contact within the IMS for a SIP terminal; the Serving CSCF (S-CSCF) which provides services to the user that the user is subscribed to; and the Interrogating CSCF (I-CSCF) whose role is to identify the correct S-CSCF and to forward to that S-CSCF a request received from a SIP terminal via a P-CSCF.

A user registers with the IMS using the specified SIP REGISTER method. This is a mechanism for attaching to the IMS and announcing to the IMS the address at which a SIP user identity can be reached. The user receives a unique URI from the S-CSCF that it shall use when it initiates a dialog. In 3GPP, when a SIP terminal performs a registration, the IMS authenticates the user, and allocates a S-CSCF to that user from the set of available S-CSCFs. Whilst the criteria for allocating S-CSCFs is not specified by 3GPP, these may include load sharing and service requirements. It is noted that the allocation of an S-CSCF is key to controlling (and charging for) user access to IMS-based services. Operators may provide a mechanism for preventing direct user-to-user SIP sessions which would otherwise bypass the S-CSCF.

During the registration process, it is the responsibility of the I-CSCF to select an S-CSCF if one is not already selected. The I-CSCF receives the required S-CSCF capabilities from the home network's Home Subscriber Server (HSS), and selects an appropriate S-CSCF based on the received capabilities. [It is noted that S-CSCF allocation is also carried out for a user by the I-CSCF in the case where the user is called by another party, and the user is not currently allocated an S-CSCF.] When a registered user subsequently sends a session request (e.g. SIP INVITE) to the IMS, the request will include the P-CSCF and S-CSCF URIs so that the P-CSCF is able to forward the request to the selected S-CSCF. This applies both on the originating and terminating sides (of the IMS). [For the terminating call the request will include the P-CSCF address and the UE address.]

30

In the IMS, users are allocated one or more "public user identities". Users' home operators are responsible for this allocation. A public user identity is either a SIP URI or a TEL URI. A SIP URI typically has the format

sip:firstname.lastname@operator.com

whereas a TEL URI represents a phone number. A TEL URI representing a phone number in international format looks like:

+44-123-456-7890.

5 The use of TEL URIs allows the IMS to break out calls, from an IMS client, to a circuit switched network, as well as allowing subscribers of a circuit switched network to reach IMS subscriber. It also allows IMS subscribers to continue to use traditional telephone numbers, rather than SIP URIs, to reach other IMS subscribers. The use of TEL URIs to establish calls to IMS subscribers requires the IMS to perform a look-up operation to map TEL URIs to SIP URIs.

10

The handling of SIP messages containing a TEL URI as a destination field is not yet well defined for the IMS, although it might be assumed that where telephone numbers are specified in only a local format (i.e. in a format that is not globally unique), routing will require the inclusion within the TEL URI of a "phone-context" as defined in the IETF RFC 3966. A phone-context is a parameter which identifies the domain (e.g. network) within which the local format number exists.

15

Summary of the Present Invention

20 In the conventional circuit switched world, in the event that a caller dials a telephone number that does not have a national and international dialling prefix, the number is assumed to be a number within the local network. Similarly, if the dialled number has a national prefix but not an international prefix, the number is assumed to be a number within the country of the caller. In the case of a cellular telephone user, additionally, when the user is roaming abroad, these same rules are applied within the visited network, i.e. a dialled number that does not have a national and international dialling prefix is assumed to be a number within the visited network, etc. This way of handling roaming users is a result of the need to handle call routing solely within the visited network.

25

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In the case of the IMS, SIP message routing is handled primarily within a user's home network, with the role of the visited network being to route the messages from a user to the home network. This approach ensures that authorisation and policy control can be properly enforced by the home network for its subscribers. This approach presents an

opportunity to introduce greater flexibility into message routing in comparison, for example, to that which is possible in the conventional circuit switched world.

5 It is an object of the present invention to enable IMS/SIP users to decide in roaming situations where a local number is to be valid, either within the visited network or the user's home network. This is achieved by adding appropriate phone-context to a TEL URI in dependence upon a user's selection.

10 According to a first aspect of the present invention there is provided a method of routing a SIP message within an IP Multimedia Subsystem, the message originating at an IMS/SIP client attached to a visited network and containing as its destination address a TEL URI including a telephone number, the method comprising:

at the IMS/SIP client, specifying that the telephone number is a local number of the visited network or of a home network of the client;

15 including at the IMS/SIP client a phone-context within the TEL URI identifying the home network or the visited network according to the specification; and

delivering the message from the client to the home network and receiving the message within the home network, and routing the message according to the phone-context contained within the TEL URI.

20

An example of a SIP message that may be routed by the method of the invention is a SIP INVITE message.

25 Typically, said phone-context is one of a set of global number digits and a domain name.

In one embodiment of the invention, the step of specifying that the telephone number is a local number of the visited network or of a home network of the client, comprises accepting a user selection via a user interface.

30

Preferably, the phone-context identifying the home network is preconfigured into a device in which the IMS/SIP client resides. More preferably, where the IMS/SIP client resides in a mobile wireless terminal, the phone-context identifying the home network is preconfigured into an ISIM or USIM of the terminal. The phone-context identifying the

visited network may be obtained by the IMS/SIP client from the visited network, e.g. at the radio protocol layers of the terminal.

Where the visited network is a cellular network, the phone-context may contain
5 identifications of the Mobile Network Code and Mobile Country Code of the visited network.

According to a second aspect of the present invention there is provided a user terminal comprising an IMS/SIP client, the IMS/SIP client being arranged in use to include in an
10 outgoing SIP message a TEL URI used by the IMS network to route the message, and comprising means for selecting one of a visited network and home network phone-context for inclusion in the TEL URI to identify the network within which a telephone number also contained in the TEL URI is valid.

15 Preferably, the terminal comprises means for allowing a user to select one of the phone-contexts for inclusion in a TEL URI.

According to a third aspect of the present invention there is provided a Serving Call/Session Control Function for use in an IP Multimedia Subsystem and comprising
20 means for receiving a SIP message containing a TEL URI, means for determining whether or not the S-CSCF has responsibility for the domain name or telephone number contained in the TEL URI, and, if it does not have responsibility, for using the domain name or number to perform a DNS query to obtain the address of an Interrogating Call/Session Control Function in the visited network which does have responsibility for
25 the domain name or number.

According to a fourth aspect of the present invention there is provided an Interrogating Call/Session Control Function for use in an IP Multimedia Subsystem and comprising
30 means for receiving a SIP message from a Serving Call/Session Control Function, the message containing a TEL URI in turn containing a telephone number in a local format, the Interrogating Call/Session Control Function comprising means for converting the number into a global format prior to querying the location of the number with a Home Subscriber Server.

According to a fifth aspect of the present invention there is provided a system for routing a SIP message within an IP Multimedia Subsystem, the message originating at an IMS/SIP client attached to a visited network and containing as its destination address a TEL URI including a telephone number, the system comprising:

5 at the IMS/SIP client, processing means for specifying that the telephone number is a local number of the visited network or of a home network of the client, and for including a phone-context within the TEL URI identifying the home network or the visited network according to the specification; and

10 sending means for delivering the message from the client to the home network, and receiving means for receiving the message within the home network, and routing means for routing the message according to the phone-context contained within the TEL URI.

Brief Description of the Drawings

15

Figure 1 illustrates schematically the IP Multimedia Subsystem implemented over a 3GPP network;

20 Figure 2 is a signalling diagram illustrating SIP level signalling associated with a SIP session establishment procedure where a user applies a visited phone-context to the procedure; and

Figure 3 is a signalling diagram illustrating SIP level signalling associated with a SIP session establishment procedure where a user applies a home phone-context to the procedure.

25 Detailed Description of Certain Embodiments

User terminals that are required to make use of the services provisioned by an IP Multimedia Subsystem incorporate an IMS/SIP client (software functionality). This client exchanges SIP signalling with other SIP entities of the IMS, as well as with peer
30 IMS/SIP clients.

RFC3966 is concerned with specifying the structure of a TEL URI for use in routing messages across an IP based network such as the IMS. It is envisaged that TEL URIs will be used to route SIP messages, supplementing the specific SIP URIs as described

above. More particularly, RFC3966 specifies that a TEL URI will contain a phone number part. In the event that this phone number is not a globally unique number however, the TEL URI must include a phone-context. A phone-context can be provided by a global number digit set, for example the initial digits of an E.164 number or
5 Mobile Station International ISDN (e.g. +441234), or by a domain name, e.g. operator.com. For the purpose of this discussion, it is assumed that the phone-context is provided by a domain name.

The IMS/SIP client is modified according to the present proposal to allow a user of a
10 terminal roaming in a visited network to specify whether a dialled number which is not a global telephone number, i.e. which does not have an international dialling prefix, is a local number within the visited network or within the user's home network. The IMS/SIP client includes the appropriate phone-context within the TEL URI according to the user's selection. A user may make a selection on a per-call basis, or may configure
15 a setting of the IMS/SIP client so that the appropriate phone-context is added automatically.

Consider a user roaming in a visited network, and that the user wishes to dial a directory enquiry service. Assuming that the local number for this service is the same within the
20 visited network and the home network, e.g. "118", the user has a choice as to which service he or she may use. In the event that the user wishes to use the service of the visited network, the SIP/IMS client will prepare a TEL URI having the following example structure:

tel:118;phone-context=term.ims.mnc015.mcc234.3gppnetwork.org

25 where "ims.mnc", ".mcc" and ".3gppnetwork.org" are pre-defined strings according to section 13.2 Home Network Domain Name in 3GPP TS 23.003, and "term." allows the TEL URI to be used by the home network to find a terminating I-CSCF. "015" is an example of a Mobile Network Code (MNC), whilst "234" is an example of a Mobile Country Code (MCC). The IMS/SIP client obtains the MNC and the MCC from certain
30 lower protocol layers, e.g. from the radio layers using an appropriate API.

In the event that the user chooses to use the 118 directory service of his or her home network, the TEL URI structure will look like:

tel:118;phone-context=ims.mnc008.mcc240.3gppnetwork.org

where “008” is an example of a Mobile Network Code (MNC), and “240” is an example of a Mobile Country Code (MCC). In this case however, the UE uses the MCC and MNC of the IMSI stored in the USIM or SIM of the terminal, these identifying the user’s home network. Where an ISIM is available in the terminal, the IMS/SIP client will include a home domain, stored in the ISIM, in the TEL URI:

tel:118;phone-context=vodafone.se.

Of course, it may be that the same dialled local number means different things to the visited and the home network. For example, 118 may be a directory service in one network, and an emergency call number in another. In this case, it is even more critical to enable a user to select the network in which the dialled number resides.

Considering now the routing procedures within the IMS, it will be understood that, according to normal 3GPP procedures, all non-REGISTER SIP requests are routed to the S-CSCF. A user terminal (UE) will already have obtained the address (or name) of the P-CSCF within the visited network using the P-CSCF discovery procedure during the PDP context activation or immediately after the PDP context activation using DHCP. The UE will also have obtained the name (or address) of the S-CSCF in its home network as a result of Service-Route in the REGISTER response. It is the S-CSCF in the user’s home network which first analyses the Request-URI that contains the TEL URI with the entered local number.

In the case where the phone-context includes the home domain name of the user, the S-CSCF in the home network can add the proper global prefix and do an ENUM query to obtain the destination network of the request (expected behavior in IMS). Alternatively, the S-CSCF can define an originating trigger for the local number based on the assumption that the local number is a Public Service Identity (PSI). The next hop (and probably the final) destination will then be an Application Server associated with the originating trigger.

30

An example signalling flow is illustrated in Figure 2, for the case where the user has selected as the phone context the visited network. The steps of the flow are as follows:

1. The UE sends a session request (INVITE) to the P-CSCF found in the P-CSCF discovery procedure according to 3GPP. The request also includes the name (or

address) of the home network S-CSCF based on the Service-Route content obtained from the earlier REGISTER response. This is in-line with normal 3GPP procedures.

2. The P-CSCF uses the Route header to find the S-CSCF of the home network according to normal 3GPP procedures, and the message is routed to that S-CSCF.
3. As the phone-context includes the domain name of the visited network, the S-CSCF will determine that it is not responsible for the domain in the phone-context. The S-CSCF will then use the domain name to query a DNS with an SRV query to find the I-CSCF in the visited network. [In the same way that is done by the visited P-CSCF to find the originating I-CSCF at registration.] The retrieved I-CSCF name is then included by the S-CSCF in the Route header of the request. The I-CSCF in the visited network acts as a terminating I-CSCF. The behavior in this step is not defined in 3GPP.
4. The I-CSCF then queries the location of the telephone number contained in the TEL URI from the Home Subscriber Server (HSS). The value in the Request-URI should then be defined as a "PSI user" in the HSS. If the TEL URI is a local number for a public user identity, either the HSS must support public user identities with this form of local TEL URI, or the I-CSCF must convert the local number to a global number before querying the HSS. [This public user identity behaviour for the TEL URI with global format is defined for terminating requests that originate from a Media Gateway Control Function (MGCF)]
5. The HSS returns to the I-CSCF the name of the S-CSCF within the visited network which is allocated to the called number.
6. The I-CSCF can then route the request to the appropriate S-CSCF within the visited network.
7. The S-CSCF within the visited network uses the identity in the Request-URI as a key to find the user identity (PSI or public user identity). The S-CSCF sends the request to the application server identified in the trigger match. The application server then performs the terminating service indicated by the local number in the Request-URI.

- The solution presented here also works when General Packet Radio Service (GPRS) roaming is used instead of IMS roaming (assuming the visited network also has an IMS network), where routing of messages is via a Gateway GPRS Support Node (GGSN) which is (typically) located in the home network. Routing via a GGSN in the home network prohibits IMS routing. A signalling flow for GPRS roaming, where again it is assumed that the TEL URI contains a phone-context identifying the visited network, is illustrated in Figure 3. It will be noted that in this case the initial request (INVITE) is routed directly to the P-CSCF of the home network.
- 10 It will be appreciated by the person of skill in the art that various modifications may be made to the above described embodiments without departing from the scope of the present invention. For example, whilst the above embodiments have been concerned with users of mobile wireless terminal, the invention may be applied to fixed terminal or wired mobile terminals (such as laptop computers) which are attached to one network, 15 whilst also having a subscription to, or access to, a home network.

CLAIMS:

1. A method of routing a SIP message within an IP Multimedia Subsystem, the message originating at an IMS/SIP client attached to a visited network and containing as its destination address a TEL URI including a telephone number, the method comprising:
 - 5 at the IMS/SIP client, specifying that the telephone number is a local number of the visited network or of a home network of the client;
 - including at the IMS/SIP client a phone-context within the TEL URI identifying the home network or the visited network according to the specification; and
 - 10 delivering the message from the client to the home network and receiving the message within the home network, and routing the message according to the phone-context contained within the TEL URI.
- 15 2. A method according to claim 1, wherein said message is a SIP INVITE message.
3. A method according to claim 1 or 2, wherein said phone-context is one of a set of global number digits and a domain name.
- 20 4. A method according to any one of the preceding claims wherein the step of specifying that the telephone number is a local number of the visited network or of a home network of the client, comprises accepting a user selection via a user interface.
5. A method according any one of the preceding claims, wherein the phone-context identifying the home network is preconfigured into a device in which the IMS/SIP client resides.
- 25 6. A method according to claim 5, wherein the IMS/SIP client resides in a mobile wireless terminal, and the phone-context identifying the home network is preconfigured into an ISIM or USIM of the terminal.
- 30 7. A method according to any one of the preceding claims, wherein the phone-context identifying the visited network is obtained by the IMS/SIP client from the visited network.

8. A method according to claim 7 when appended to claim 6, wherein the phone-context identifying the visited network is provided to the IMS/SIP client from radio protocol layers of the terminal.

5

9. A method according to claim 8, wherein the phone-context contains identifications of the Mobile Network Code and Mobile Country Code of the visited network.

10 10. A user terminal comprising an IMS/SIP client, the IMS/SIP client being arranged in use to include in an outgoing SIP message a TEL URI used by the IMS network to route the message, and comprising means for selecting one of a visited network and home network phone-context for inclusion in the TEL URI to identify the network within which a telephone number also contained in the TEL URI is valid.

15

11. A terminal according to claim 10 and comprising means for allowing a user to select one of the phone-contexts for inclusion in a TEL URI.

12. A Serving Call/Session Control Function for use in an IP Multimedia Subsystem and comprising means for receiving a SIP message containing a TEL URI, means for determining whether or not the S-CSCF has responsibility for the domain name or telephone number contained in the TEL URI, and, if it does not have responsibility, for using the domain name or number to perform a DNS query to obtain the address of an Interrogating Call/Session Control Function in the visited network which does have
20
25 responsibility for the domain name or number.

13. An Interrogating Call/Session Control Function for use in an IP Multimedia Subsystem and comprising means for receiving a SIP message from a Serving Call/Session Control Function, the message containing a TEL URI in turn containing a
30 telephone number in a local format, the Interrogating Call/Session Control Function comprising means for converting the number into a global format prior to querying the location of the number with a Home Subscriber Server.

14. A system for routing a SIP message within an IP Multimedia Subsystem, the message originating at an IMS/SIP client attached to a visited network and containing as its destination address a TEL URI including a telephone number, the system comprising:

5 at the IMS/SIP client, processing means for specifying that the telephone number is a local number of the visited network or of a home network of the client, and for including a phone-context within the TEL URI identifying the home network or the visited network according to the specification; and

sending means for delivering the message from the client to the home network,
10 and receiving means for receiving the message within the home network, and routing means for routing the message according to the phone-context contained within the TEL URI.

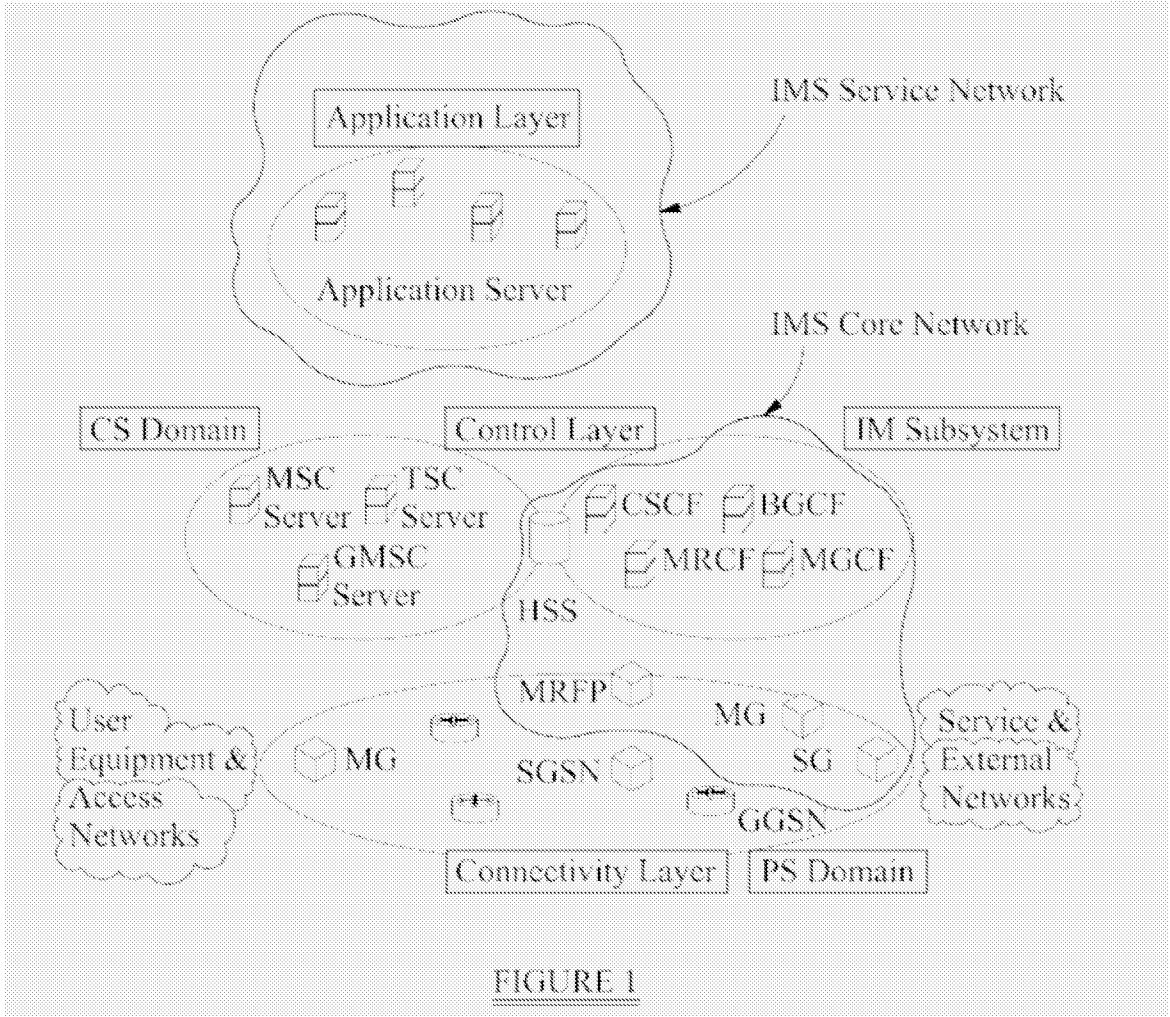


FIGURE 1

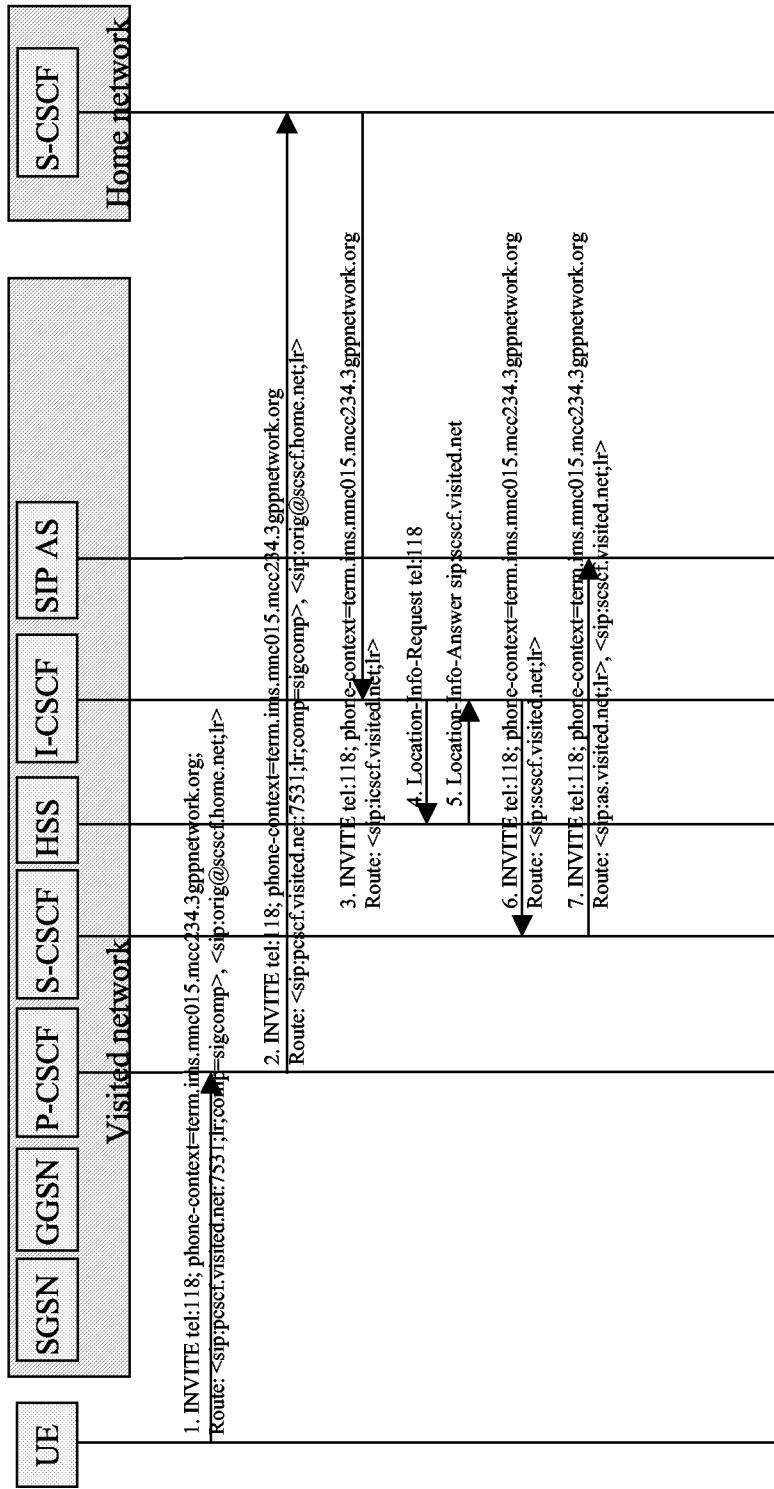


Figure 2

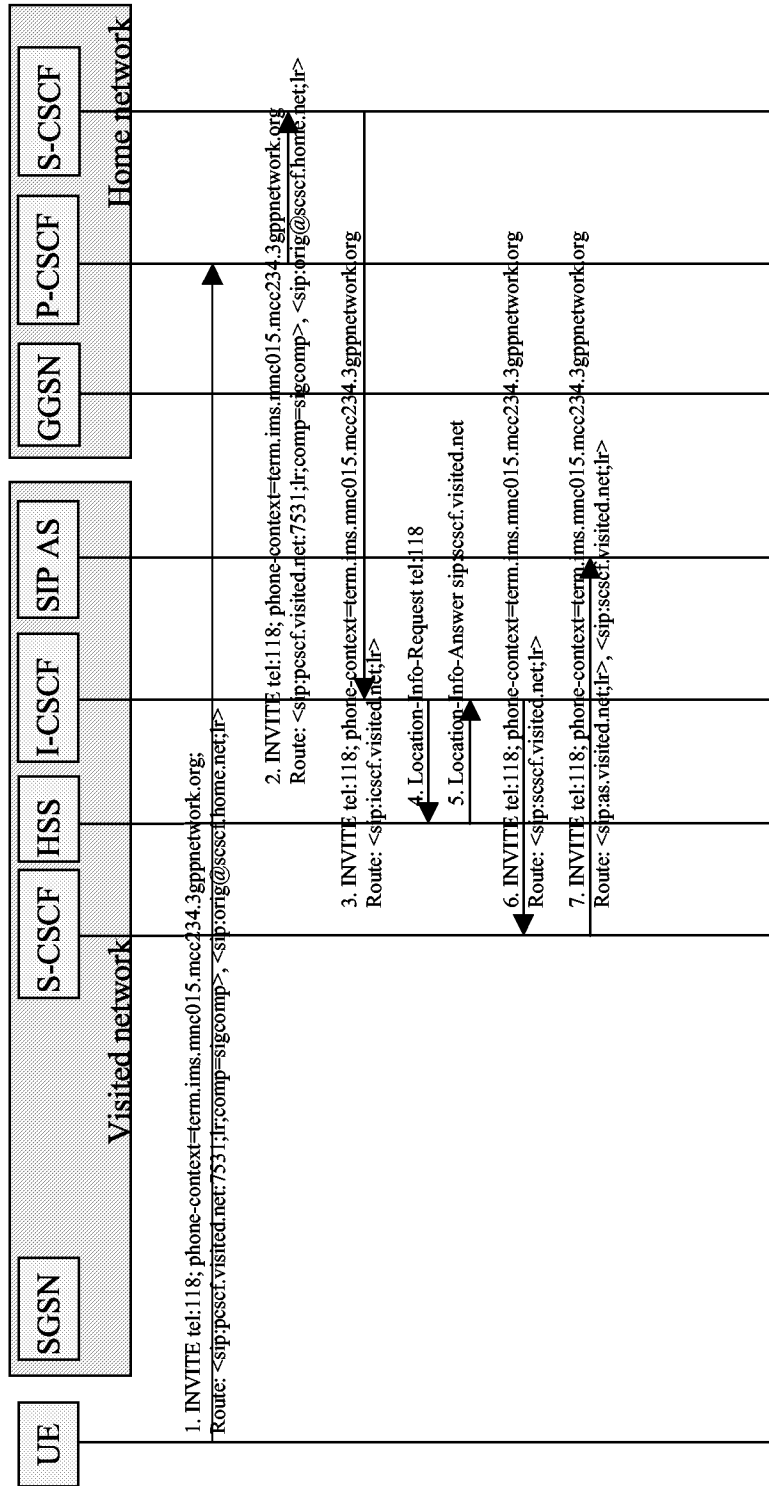


Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/060716

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06 H04M7/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L H04M

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/179762 A1 (ISOMAKI MARKUS [FI] ET AL) 25 September 2003 (2003-09-25) abstract	1-12,14
A	page 1, paragraph 6 page 1, paragraph 12 page 2, paragraph 25 page 2, paragraph 31 - page 3, paragraph 62	13
X	WO 2004/075507 A2 (NOKIA CORP [FI]; WESTMAN ILKKA [FI]; LAHTINEN LAURI [FI]; BERES ERVIN) 2 September 2004 (2004-09-02) page 34, line 1 - line 17 page 41, line 21 - page 44, line 27; claims 1-8	13
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Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search

15 November 2006

Date of mailing of the international search report

22/11/2006

Name and mailing address of the ISA/
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Fax: (+31-70) 340-3016

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KARAVASSILIS, N

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/060716

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SCHULZRINNE COLUMBIA U H: "Emergency Services for Internet Telephony based on the Session Initiation Protocol (SIP)" IETF STANDARD-WORKING-DRAFT, INTERNET ENGINEERING TASK FORCE, IETF, CH, no. 4, 8 January 2003 (2003-01-08), XPO15005201 ISSN: 0000-0004 page 5, paragraph 3.2 - page 8, paragraph 6.2 -----	1-14
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