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- (71) Applicant (for all designated States except US): TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) [SE/SE]; S-164 83 Stockholm (SE).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): GONZALEZ DE LANGARICA, Ester [ES/SE]; c/o Owens, Heleneborgsgatan 10 B, S-117 32 Stockholm (SE). LINDQVIST, Andreas [SE/SE]; Lovisedalsvägen 64, S-138 36 Älta (SE).
- (74) Agent: LIND, Robert; Marks & Clerk LLP, Fletcher House, Heatley Road, The Oxford Science Park, Oxford OX4 4GE (GB).
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(54) Title: METHODS AND APPARATUS FOR MEDIA TRANSMISSION IN TELECOMMUNICATIONS NETWORKS

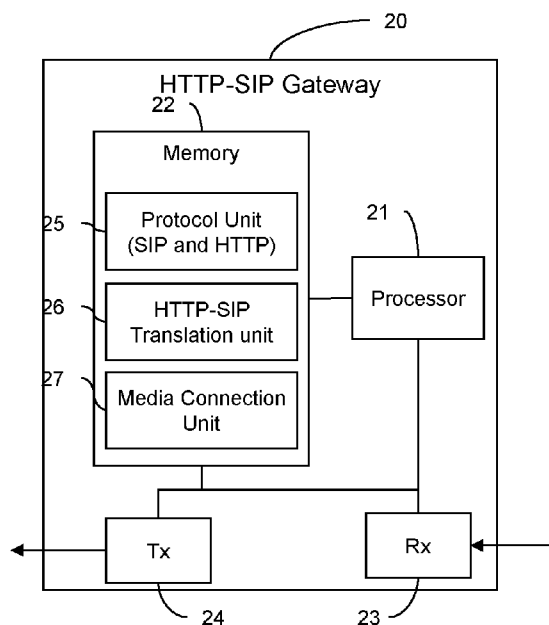


Figure 8

(57) Abstract: According to a first aspect of the present invention there is provided an apparatus configured to operate as a gateway node for supporting the transmission of media to and from a web browser provided at a User Equipment (UE) through an IP Multimedia Subsystem (IMS) core network. The apparatus comprises a receiver configured to receive HTTP messages from the UE, and to receive SIP messages from the IMS, a translation unit configured to translate the received HTTP messages to SIP messages, and to translate the received SIP messages to HTTP messages, a transmitter configured to send HTTP messages to the UE, and to send SIP messages to the IMS, and a media connection unit configured to include a connection identifier in a HTTP message sent to the UE, the connection identifier being associated with a media connection within the IMS for the UE.

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## METHODS AND APPARATUS FOR MEDIA TRANSMISSION IN TELECOMMUNICATIONS NETWORKS

### Technical Field

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The present invention relates to methods and apparatus for media transmission in telecommunications networks. More particularly, the invention relates to methods and apparatus for supporting the transmission of media to and from a web browser provided at a User Equipment through an IP Multimedia Subsystem core network.

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### Background

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The IP Multimedia Subsystem (IMS) is the technology defined by the Third Generation Partnership Project (3GPP) to provide IP Multimedia services over telecommunication networks (see 3GPP TS 22.228, TS 23.228, TS 24.229, TS 29.228, TS 29.229, TS 29.328 and TS 29.329). IMS provides key features to enrich the end-user person-to-person communication experience through the integration and interaction of services. IMS allows new rich person-to-person (client-to-client) as well as person-to-content (client-to-server) communications over an IP-based network. The IMS is able to connect to both PSTN/ISDN (Public Switched Telephone Network/Integrated Services Digital Network) as well as the Internet.

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Figure 1 illustrates schematically the architecture for the IMS core network and its relationship to an IP-Connectivity Access Network (IP-CAN). In the IMS core network, Call/Session Control Functions (CSCFs) operate as SIP proxies, and interface with other entities such as Border Gateway Control Functions (BGCFs) and Media Resource Function Controllers (MRFCs) amongst others. The 3GPP architecture defines three types of CSCFs: a Proxy CSCF (P-CSCF) is the first point of contact within the IMS for a SIP terminal; a Serving CSCF (S-CSCF) provides services to the subscriber; and an Interrogating CSCF (I-CSCF) identifies the correct S-CSCF and forwards to that S-CSCF a request received from a SIP terminal via a P-CSCF.

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The P-CSCF, as the initial SIP signalling contact point for subscribers, serves as a Back-to-Back User Agent (SIP B2BUA). The P-CSCF is responsible for forwarding SIP registration messages from the SIP terminal (e.g. the User Equipment (UE)), to

the I-CSCF and subsequent call set-up requests and responses to the S-CSCF. The P-CSCF maintains the mapping between logical subscriber SIP URI address and physical UE IP address and a security association, for both authentication and confidentiality. The P-CSCF interacts with an IMS Access Gateway (IMS-AGW), over  
5 the Iq interface, for control of the boundary at the signalling and media layers (e.g. including pinhole firewall, Network Address and Port Translations (NAPT) lawful intercept and numerous other features).

The IMS-AGW controls the transport boundary at layers 3 and 4 between subscribers  
10 and the service provider's network. This function acts as a pinhole firewall and NAT device protecting the service provider's IMS network. It controls access by packet filtering on IP address/port and opening/closing gates (pinholes) into the network. It uses NAPT to hide the IP addresses/ports of the service elements in the IMS network. Other features include QoS packet marking, bandwidth and signalling rate  
15 policing, usage metering and QoS measurements for the media flows.

In order to provide consumers with a comprehensive communication and interactive service experience on any web browser based device, telecommunications network operators want to be able to easily and quickly integrate and deploy services  
20 combining web and Internet applications with telecommunications network capabilities. It is therefore desired that telecommunication networks are able to support voice and video communications to and from web applications provided on User Equipment (UE). However, web browsers and web applications use protocols such as Hypertext Transfer Protocol (HTTP), Real-time Transport Protocol (RTP) in  
25 conjunction with the RTP Control Protocol (RTCP), and Real Time Messaging Protocol (RTMP) for delivering and controlling media. In contrast, the IMS core network 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), and media transmissions are carried using the Real-time Transport Protocol (RTP). The  
30 Session Description Protocol (SDP), carried by SIP signalling, is used to describe and negotiate the media components of the session (e.g. port numbers, protocols, codecs).

### Summary

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It is therefore an object of the present invention to provide methods and apparatus for

transmitting media to and from a web browser provided at a User Equipment through an IP Multimedia Subsystem.

According to a first aspect of the present invention there is provided an apparatus  
5 configured to operate as a gateway node for supporting the transmission of media to and from a web browser provided at a UE through an IMS core network. The apparatus comprises:

a receiver configured to receive HTTP messages from the UE, and to receive SIP messages from the IMS;

10 a translation unit configured to translate the received HTTP messages to SIP messages, and to translate the received SIP messages to HTTP messages;

a transmitter configured to send HTTP messages to the UE, and to send SIP messages to the IMS; and

a media connection unit configured to include a connection identifier in a  
15 HTTP message sent to the UE, the connection identifier being associated with a media connection within the IMS for the UE.

The media control unit can be configured to obtain the connection identifier from a SIP message received from the IMS. The media control unit can be configured to  
20 obtain the connection identifier from a specified/corresponding attribute within a SDP body of a SIP message received from the IMS. Alternatively, the media control unit can be configured to obtain the connection identifier from a specified/corresponding proprietary SIP header of a SIP message received from the IMS. As a further alternative, the media control unit can be configured to obtain the connection  
25 identifier from a header field of the SIP messages. The connection identifier may be obtained from the Call-ID or Session-ID header field of the SIP messages.

The media control unit can be configured to obtain an IP address and port number from the SIP messages received from the IMS, and to include the received IP  
30 address and port number in a HTTP message sent to the UE. The IP address and port number may relate to a IMS Access Gateway (IMS-AGW) within the IMS core network that can provide media server functionality to the UE. The SIP messages can be sent to and received from a P-CSCF in the IMS core network. The direct media connection with the IMS can be a RTMP connection or a RTP connection.  
35 The media connection within the IMS can be a RTP connection.

According to a second aspect of the present invention there is provided an apparatus configured to operate as a Proxy-Call Session Control Functions, and to support the transmission of media to and from a web browser provided at a UE through an IMS, core network. The apparatus comprises:

5           a receiver configured to receive messages from an IMS-AGW and to receive messages sent on behalf of the UE;

          a transmitter configured to send messages to the IMS-AGW, and to send messages towards the UE; and

          a media connection unit configured to instruct the IMS-AGW to initiate a first  
10   media connection within the IMS for the UE and a second media connection between the IMS-AGW and the UE, and to ensure that a connection identifier is available to the UE and to the IMS-AGW, the connection identifier being used by the IMS-AGW to associate the first media connection and the second media connection.

15   The receiver can be configured to receive a SIP message that requires establishment of a media session involving the web browser provided at the UE.

The media connection unit can be configured to ensure that a H.248 Context ID used by the BGF to associate the first media connection and the second media connection  
20   is available to the UE. The media connection unit can be configured to obtain a H.248 Context ID from a message received from the IMS-AGW and to include the H.248 Context ID in a SIP message sent towards the UE. The media connection unit can be configured to include the H.248 Context ID from a specified/corresponding attribute within a SDP body of a SIP message sent towards the UE. Alternatively, the  
25   media connection unit can be configured to include the H.248 Context ID in a specified/corresponding proprietary SIP header of a SIP message sent towards the UE. The media connection unit can be configured to obtain a header field value from a received SIP message, and to instruct the IMS-AGW to use the header field value as a H.248 Context ID. The media connection unit can be configured to obtain an IP  
30   address and port number from the messages received from the IMS-AGW, and to include the received IP address and port number in a SIP message sent towards the UE.

The transmitter can be configured to send SIP messages intended for the UE to a  
35   gateway node in the access network, the gateway node translating the SIP messages to HTTP messages for sending to the web browser provided at the UE

According to a third aspect of the present invention there is provided an apparatus configured to operate as an IMS-AGW and to support the transmission of media to and from a web browser provided at a UE through an IMS core network. The apparatus comprises:

a media connection unit configured to collaborate with a P-CSCF in order to initiate a first media connection within the IMS for the UE and a second media connection to the UE, and to establish a connection identifier to be used to associate the first media connection and the second media connection; and

a media transmission unit configured to use the first media connection and the second media connection to transmit media to and/or from the UE;

wherein the media connection unit is further configured to allow the media transmission unit to transmit media to and/or from the UE, if a connection identifier included in media protocol messages received from the UE matches the connection identifier established during the collaboration with the P-CSCF

The media connection unit can be configured to establish a H.248 Context ID as the connection identifier to be used by the IMS-AGW to associate the first media connection and the second media connection. The media connection unit can be configured to assign a H.248 Context ID to associate the first media connection and the second media connection, and to include the H.248 Context ID in a message sent to the P-CSCF. Alternatively, the media connection unit can be configured to assign a value received from the P-CSCF as the H.248 Context ID. The media connection unit can also be configured to dynamically allocate an IP address and port number that must be used by the UE for establishing the second media connection, and to include the IP address and port number in a message sent to the P-CSCF. The media connection unit can then be configured to determine if a received request to establish a media connection is received at the IP address and port number sent to the P-CSCF.

The apparatus can further comprise a media translation unit configured to translate between a first media protocol used on the first media connection and a second media protocol used on the second media connection. The media translation unit can be configured to translate between RTP and RTMP.

According to a fourth aspect of the present invention there is provided an apparatus

configured to operate as a UE and to implement the transmission of media to and from a web browser provided at the UE through an IMS core network. The apparatus comprises

- 5 a HTTP client unit configured to use HTTP messages to initiate a first media connection within the IMS for the UE and a second media connection to the IMS; and
- a media connection unit configured to obtain a connection identifier from received HTTP messages, the connection identifier being associated with the first media connection and the second media connection, and to include the connection identifier in media protocol messages sent towards the IMS.

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The apparatus can be configured to communicate with a node of an access network in order to initiate the first media connection and the second media connection. The apparatus can also be configured to send the media protocol messages to an IMS-AGW at the boundary of the IMS. The apparatus can therefore further comprise a

15 receiver and a transmitter.

The HTTP client unit can be configured to initiate a RTMP connection to the IMS, and the media connection unit can be configured to include the connection identifier in RTMP messages sent towards the IMS. Alternatively, the HTTP client unit can be

20 configured to initiate a RTP connection to the IMS, and the media connection unit can be configured to include the connection identifier in RTP messages and RTCP messages sent towards the IMS.

According to a fifth aspect of the present invention there is provided a method of

25 operating a node of an access network in order to support the transmission of media to and from a web browser provided at a UE through an IMS core network. The method comprises

- for HTTP messages received from the UE, translating the HTTP messages to SIP messages and sending the SIP messages to the IMS;

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- for SIP messages received from the IMS, translating the SIP messages to HTTP messages and sending the HTTP messages to the UE; and

- including a connection identifier in a HTTP message sent to the UE, the connection identifier being associated with a media connection within the IMS for the UE.

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The connection identifier can be obtained from a SIP message received from the

IMS. The connection identifier can be obtained from a specified/corresponding attribute within a SDP body of a SIP message received from the IMS. Alternatively, the connection identifier is obtained from a specified/corresponding proprietary SIP header of a SIP message received from the IMS. As a further alternative a header  
5 field value from the SIP messages can be included as the connection identifier.

The method can further comprise receiving a SIP message including an IP address and port number that must be used by the UE for establishing a direct media connection with the IMS, and including the received IP address and port number in a  
10 HTTP message sent to the UE. The IP address and port number can relate to an IMS-AGW within the IMS core network that can provide media server functionality to the UE. The SIP messages can be sent to and received from a P-CSCF in the IMS core network.

15 According to a sixth aspect of the present invention there is provided a method of operating a P-CSCF in order to support the transmission of media to and from a web browser provided at a UE through an IMS, core network. The method comprises

communicating with an IMS-AGW to initiate a first media connection within the IMS for the UE and a second media connection between the IMS-AGW and the  
20 UE; and

ensuring that a connection identifier is available to the UE and to the IMS-AGW, the connection identifier being used by the IMS-AGW to associate the first media connection and the second media connection.

25 The step of ensuring that a connection identifier is available to the UE and to the IMS-AGW can comprise ensuring that a H.248 Context ID used by the IMS-AGW to associate the first media connection and the second media connection is available to the UE. The method may then further comprise receiving the H.248 Context ID from the IMS-AGW and including the H.248 Context ID in a SIP message sent towards the  
30 UE. The H.248 Context ID may be included in a specified/corresponding attribute within a SDP body of a SIP message sent towards the UE. Alternatively, the H.248 Context ID can be included in a specified/corresponding proprietary SIP header of a SIP message sent towards the UE. The method may alternatively comprise obtaining a header field value from the received SIP message, and sending a  
35 message to the IMS-AGW instructing the IMS-AGW to use the header field value as the H.248 Context ID.

The method can further comprise receiving, from the IMS-AGW, an IP address and port number that must be used by the UE for establishing the direct media connection with the IMS-AGW, and including the received IP address and port  
5 number in a SIP message sent towards the UE. The SIP messages intended for the UE can be sent to a node in the access network, the node translating the SIP messages to HTTP messages for sending to the web browser provided at the UE.

According to a seventh aspect of the present invention there is provided a method of  
10 operating an IMS-AGW in order to support the transmission of media to and from a web browser provided at a UE through an IMS core network. The method comprises:

communicating with a P-CSCF to initiate a first media connection within the IMS for the UE and a second media connection to the UE, and to establish a  
15 connection identifier to be used by the IMS-AGW to associate the first media connection and the second media connection;

receiving media protocol messages from the UE, the media protocol messages including a connection identifier;

confirming if the received connection identifier matches the connection  
20 identifier established during the communication with the P-CSCF; and

if so, using the first media connection and the second media connection to transmit media to and/or from the UE.

The connection identifier to be used by the IMS-AGW to associate the first media  
25 connection and the second media connection can be a H.248 Context ID. The method can then further comprise assigning a H.248 Context ID to associate the first media connection and the second media connection, and sending the H.248 Context ID to the P-CSCF. Alternatively, the method may further comprise receiving a message from the P-CSCF, the message instructing the IMS-AGW to use a specified  
30 value as the H.248 Context ID, and assigning the specified value as the H.248 Context ID.

To initiate a first media connection within the IMS for the UE and a second media connection to the UE the method can comprise dynamically allocating an IP address  
35 and port number that must be used by the UE for establishing the second media connection, and sending the IP address and port number to the P-CSCF. The

method may then further comprise receiving a request from to establish a media connection, and determining if the request is received at the IP address and port number sent to the P-CSCF.

5 According to an eighth aspect of the present invention there is provided a method of operating a UE in order to implement the transmission of media to and from a web browser provided at the UE, through an IMS core network. The method comprises using HTTP messages in order to initiate a first media connection within the IMS for the UE and a second media connection to the IMS;

10 receiving a connection identifier in the HTTP messages, the connection identifier being associated with the first media connection and the second media connection; and

including the connection identifier in media protocol messages sent towards the IMS.

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The UE can communicate with a node of an access network in order to initiate the first media connection and the second media connection. The second media connection can be between the UE and an IMS-AGW at the boundary of the IMS. The media protocol messages are then sent to the IMS-AGW.

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The second media connection can be a RTMP connection, and the connection identifier is then included in RTMP messages. Alternatively, the second media connection can be a RTP connection, and the connection identifier is then included in RTP messages and RTCP messages.

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According to an additional aspect there is also provided a computer program comprising computer program code means adapted to perform all the steps of any of the fifth to eighth aspects when said program is run on a computer. In addition, there is provided a computer program according to the additional aspect embodied on a computer readable medium.

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#### Brief Description of the Drawings

Figure 1 illustrates schematically the architecture for the IMS core network and its relationship to an IP-CAN;

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Figure 2 illustrates schematically a network configuration suitable for implementing

the methods described herein;

Figure 3 is a flow diagram illustrating an example of the process of a web browser initiating a media session via the IMS according to a method described herein;

Figure 4 is a flow diagram illustrating an example of the process of a web browser initiating a media session via the IMS according to a method described herein;

Figure 5 is a flow diagram illustrating an example of the process of a web browser initiating a media session via the IMS according to a method described herein;

Figure 6 is a flow diagram illustrating an example of the process of a web browser initiating a media session via the IMS according to a method described herein;

Figure 7 illustrates schematically an example of a UE suitable for implementing the methods described herein;

Figure 8 illustrates schematically an example of a gateway node suitable for implementing the methods described herein;

Figure 9 illustrates schematically an example of a P-CSCF suitable for implementing the methods described herein; and

Figure 10 illustrates schematically an example of an IMS-AGW suitable for implementing the methods described herein.

#### Detailed Description

There will now be described methods and apparatus for transmitting media to and from a web browser provided at a User Equipment (UE) through an IP Multimedia Subsystem (IMS). According to these methods, a functionality entity referred to herein as a HTTP-to-SIP Gateway (H2S GW) is provided within the access network to enable the web browser to setup and control sessions within the IMS and thereby enable the transmission of media through the IMS to and from the web browser.

It is proposed herein that the H2S GW communicate with the UE using HTTP-REST and communicate with a Proxy-Call Session Control Function (P-CSCF) at the border of the IMS core network and the access network using SIP. REST (Representational State Transfer) is an approach for getting information content from a website by reading a designated web page that contains an XML (Extensible Markup Language) file that describes and includes the desired content. The H2S GW will therefore be required to translate between HTTP-REST and SIP, and will act as an IMS terminal emulator for control signalling. The UE can then directly establish a session with a media handling node of the IMS core network, such as an IMS Access Gateway

(IMS-AGW), in order to send and/or receive media. An IMS-AGW at the boundary between the access network and the IMS core network therefore acts as a media server with respect to the UE, and may therefore be required handle the conversion between RTP used for media transmission by the IMS and RTMP or RTP/RTCP that may be used by the web browser provided at the UE. Figure 2 illustrates schematically a network configuration suitable for implementing the methods described herein.

In order to be able to implement the above proposed method, the IMS-AGW must be able to correlate any media protocol messages received from the UE with a RTP connection (or at least the resources reserved for the RTP connection) that has been initiated/established for the UE in the IMS (i.e. as a result of the SIP signalling from the H2S GW). In addition, in a scenario in which the UE uses HTTP for control signalling, the HTTP signalling does not provide a mechanism to convey the IP address of the UE to the P-CSCF, as the HTTP signalling is routed between the P-CSCF and the UE via the H2S GW and possibly via other HTTP proxies. Consequently, when the P-CSCF communicates with the IMS-AGW, in order to create a context and reserve resources for a RTP connection in the IMS and for a direct media connection to the UE, the P-CSCF will not be able to provide the IMS-AGW with the IP address of the UE. Therefore, even if the IMS-AGW can correlate received media protocol messages with a corresponding RTP connection, the IMS-AGW may not be able to confirm that these media protocol messages are actually from the UE for which the RTP connection has been initiated/established.

According to a first embodiment, the IMS-AGW is configured to dynamically allocate an IP address (from several fixed IP addresses available to the IMS-AGW) and port number for the direct media connection with the UE. Consequently, for each direct media connection that the IMS-AGW has with a UE, the media protocol messages received from the UE for this direct media connection will be received on a specifically allocated port. The IMS-AGW can therefore correlate any media protocol messages received on this specified port with the RTP connection in the IMS that has been negotiated/initiated/established for the UE. To do so, the P-CSCF is configured to include the IP address and port number allocated by the IMS-AGW in the SDP of a SIP message sent to the H2S GW (e.g. a SIP 200 OK message if on the originating side or a SIP INVITE message if on the terminating side). The H2S GW is then also configured to include the IP address and port number received from

the P-CSCF in a HTTP message sent to the UE. The UE is configured to use the IP address and port number received from H2S GW to establish the direct media connection with the IMS-AGW.

- 5 Whilst this first embodiment enables the IMS-AGW to correlate any media protocol messages received on the specifically allocated port with the RTP connection, the IMS-AGW will still be unable to confirm that these media protocol messages are actually from the UE for which the RTP connection has been initiated/established, and not from another UE that may have malicious intent. In particular, if IMS-AGW
- 10 the cannot confirm that media messages are from the UE for which media connections have been initiated/established, then any UE could send media traffic to random ports of the IMS-AGW ports and this media would eventually go through. In order to solve this problem, the P-CSCF is configured to use the control signalling that initiates the media connections to ensure that a connection identifier is available
- 15 to both the UE and the IMS-AGW. The UE can therefore be configured to include this connection identifier in any media protocol messages sent to the IMS-AGW, thereby enabling the IMS-AGW to confirm that these messages are from the UE for which the media connections are intended.
- 20 In this regard, a P-CSCF uses the H.248 protocol to communicate with a IMS-AGW in order to initiate media connections. To do so, the P-CSCF sends a H.248 Add command to the IMS-AGW in order to create a H.248 context and reserve resources for a RTP connection in the IMS and for a direct media connection to the UE. The resulting H.248 context will be assigned a Context ID which can therefore be used as
- 25 a connection identifier.

- In a first alternative, the IMS-AGW is configured to assign a Context ID to the H.248 context created for the media connections and to send the assigned Context ID to the P-CSCF in the reply to the H.248 Add command. The P-CSCF is then configured
- 30 to include the received Context ID in a SIP message sent to the H2S GW. To do so, the P-CSCF can either include the Context ID as an attribute within the SDP body of the SIP message, or can include the Context ID as a proprietary SIP header. The H2S GW is therefore configured to obtain the Context ID from the received SIP message and to include this Context ID in a HTTP message sent to the UE. The UE
- 35 is configured to include the Context ID received from H2S GW in media protocol messages that are sent to the IMS-AGW, thereby enabling the IMS-AGW to confirm

that these messages are from the UE for which the media connections are intended by comparing the Context-ID received from the UE with the Context-ID assigned to the H.248 context.

5 Figure 3 is a flow diagram illustrating an example of the process of a web browser initiating a RTMP audio session via the IMS according to the first alternative of the first embodiment described above. In this example, the Context ID is used as a connection identifier and is communicated to the UE as an attribute within the SDP body of a SIP message. The steps performed are as follows:

- 10 A1. The user of an originating UE starts a voice call from their web browser. For example, the use may press on a button within a web page presented on the Graphical User Interface (GUI) of the UE.
- A2. The web browser/HTTP client of the originating UE generates a corresponding HTTP-REST message indicating that it wants to establish a  
15 voice call. This HTTP-REST message will include some of the parameters/attributes for the call, such as the media protocol to be used and the codecs that are supported.
- A3. The HTTP-REST message is received by a H2S GW in the originating access network. The H2S GW translates the HTTP-REST message to an equivalent  
20 SIP INVITE message and transmits the SIP INVITE message towards the IMS. In this example, as the user wants to establish a voice call using RTMP, the media description line of the SDP body of the SIP INVITE message specifies that the media type is audio and that RTMP is to be used to transport the media.
- 25 A4. The SIP INVITE message is received by an P-CSCF on the originating side of the IMS core network that serves the UE. The originating P-CSCF therefore sends a H.248 Add command to an IMS-AGW on the originating side of the IMS core network.
- A5. Upon receipt of the H.248 Add command, the originating IMS-AGW creates a  
30 H.248 context and reserves resources for a RTP connection in the IMS and for a RTMP connection to the UE. In this example, this includes the originating IMS-AGW dynamically allocating an IP address and port number for the RTMP connection with the UE. The originating IMS-AGW also assigns a Context ID (e.g. ctxtID-o) to the H.248 context created for the  
35 media connections.

- A6. The originating IMS-AGW sends a reply to the H.248 Add command and includes the assigned Context ID and the IP address and port number allocated for the RTMP connection with the UE.
- 5 A7. The originating P-CSCF sends the SIP INVITE through the IMS core network to an P-CSCF on the terminating side that serves the called UE.
- A8. The SIP INVITE message is received by the terminating P-CSCF, which therefore sends a H.248 Add command to a IMS-AGW on the terminating side of the IMS core network.
- 10 A9. Upon receipt of the H.248 Add command, the terminating IMS-AGW creates a H.248 context and reserves resources for a RTP connection in the IMS and for a RTMP connection to the UE. In this example, this includes the terminating IMS-AGW dynamically allocating an IP address and port number for the RTMP connection with the UE. The terminating IMS-AGW also assigns a Context ID (e.g. ctxtID-t) to the H.248 context created for the media
- 15 connections on the terminating side.
- A10. The terminating IMS-AGW sends a reply to the H.248 Add command and includes the assigned Context ID and the IP address and port number allocated for the RTMP connection with the UE.
- 20 A11. The terminating P-CSCF includes the received Context ID as an attribute within the SDP body of the SIP INVITE message, together with the allocated IP address and port number (e.g. in the connection information), sends the SIP INVITE towards the UE.
- 25 A12. The SIP INVITE message is received by a H2S GW in the terminating access network. The terminating H2S GW translates the SIP INVITE message to an equivalent HTTP-REST message inviting the user to establish a voice call and including both the received Context ID and the allocated IP address and port number. The terminating H2S GW transmits the HTTP-REST message to the terminating/called UE.
- 30 A13. The terminating UE receives the HTTP-REST message inviting the user to establish a voice call from the web browser of the terminating UE, and thereby obtains the IP address and port number that is to be used for the RTMP connection to the terminating IMS-AGW and the Context ID. The web browser/HTTP client of the terminating UE generates a HTTP-REST message indicating that the user has accepted the call, and sends the HTTP-
- 35 REST message to the terminating H2S GW.

5 A14. The web browser of the terminating UE also generates an RTMP connect command message and includes the Context ID received from the terminating H2S GW as a parameter of the command message. The web browser then sends the RTMP connect command message to the IP address and port number received from the terminating H2S GW.

10 A15. The terminating IMS-AGW receives RTMP connect command message on the port allocated to the RTMP connection initiated for the UE and is therefore able to correlate the RTMP command message with the RTP connection initiated in the IMS. The terminating IMS-AGW is also able to confirm that the RTMP command is from the terminating UE by comparing the Context-ID received in the message with the Context-ID assigned to the H.248 context. An RTMP connection is therefore established between the terminating IMS-AGW and the terminating UE, and an RTP connection is established between the terminating IMS-AGW and the originating IMS-AGW through the IMS.

15 A16. The HTTP-REST message sent by the terminating UE is received by the terminating H2S GW. The terminating H2S GW translates the HTTP-REST message to an equivalent SIP 200 OK message and transmits the SIP 200 OK message towards the IMS.

20 A17. The SIP 200 OK message is received by the terminating P-CSCF. The terminating P-CSCF then sends a H.248 Modify command to the terminating IMS-AGW and includes the Context ID assigned by the IMS-AGW to the corresponding H.248 context. For example, this H.248 Modify command may be used to modify the attributes of the reserved resources, such as the codec, bitrate etc, in accordance with attributes specified by the terminating UE.

A18. The terminating IMS-AGW sends a reply to the H.248 Modify command.

A19. The terminating P-CSCF sends the SIP 200 OK message through the IMS core network to the originating P-CSCF.

30 A20. The SIP 200 OK message is received by the originating P-CSCF. The originating P-CSCF then sends a H.248 Modify command to the originating IMS-AGW and includes the Context ID assigned by the originating IMS-AGW to the corresponding H.248 context. For example, this H.248 Modify command may be used to modify the attributes of the reserved resources, such as the codec, bitrate etc, in accordance with attributes specified by the terminating UE.

35 A21. The originating IMS-AGW sends a reply to the H.248 Modify command.

A22.The originating P-CSCF includes the Context ID received from the originating IMS-AGW as an attribute within the SDP body of the SIP INVITE message, together with the allocated IP address and port number, sends the SIP 200 OK message towards the originating UE.

5 A23.The SIP 200 OK message is received by the originating H2S GW. The originating H2S GW translates the SIP 200 OK message to an equivalent HTTP-REST message indicating that the called user has accepted the call and including both the Context ID and the allocated IP address and port number received from the originating P-CSCF. The originating H2S GW  
10 transmits the HTTP-REST message to the originating UE.

A24.The originating UE receives the HTTP-REST message indicating that the called user has accepted the call, and thereby obtains the IP address and port number that is to be used for the RTMP connection to the originating IMS-AGW and the corresponding Context ID. The web browser of the  
15 originating UE generates an RTMP connect command message and include the Context ID received from the originating H2S GW as a parameter of the command message. The web browser then sends the RTMP connect command message to the IP address and port number received from the originating H2S GW.

20 A25.The originating IMS-AGW receives RTMP connect command message on the port allocated to the RTMP connection initiated for the originating UE and is therefore able to correlate the RTMP command message with the RTP connection initiated in the IMS. The originating IMS-AGW is also able to confirm that the RTMP command is from the originating UE by comparing the  
25 Context-ID received in the message with the Context-ID assigned to the H.248 context. An RTMP connection is therefore established between the originating IMS-AGW and the originating UE, and an RTP connection is established between the originating IMS-AGW and the terminating IMS-AGW through the IMS.

30

In a second alternative of the first embodiment, the P-CSCF is configured to set the Context ID assigned to the H.248 context to the value of a SIP identifier that is associated with the SIP message that initiate the session. For example, this dialog/session identifier could be the SIP Call-ID used to identify the SIP dialog, or  
35 could by the SIP Session-ID used to identify the media session. To do so, the P-CSCF is configured to include the SIP identifier in the Context ID attribute of the

H.248 Add command sent to the IMS-AGW in order to create the H.248 context. The H2S GW will have selected the SIP identifier and included this in the SIP message sent to the P-CSCF, and is therefore also configured to include the SIP identifier in a HTTP message sent to the UE. The UE is configured to include the SIP identifier received from H2S GW in media protocol messages that are sent to the IMS-AGW. The SIP identifier is therefore used as the connection identifier that enables the IMS-AGW to confirm that the media protocol messages are from the UE for which the media connections are intended, as the IMS-AGW can compare the SIP identifier received from the UE with the Context-ID assigned to the H.248 context.

Figure 4 is a flow diagram illustrating an example of the process of a web browser initiating a RTMP audio session via the IMS according to the second alternative of the first embodiment described above. Steps B1 to B25 are substantially the same as those of Figure 3. However, on both the originating side and the terminating side, rather than allowing the IMS-AGW to set the Context ID of the H.248 context, in steps B4 and B8 the P-CSCF instructs the IMS-AGW to set the SIP Call-ID as the Context-ID. In addition, rather than communicating the Context ID to the UE via the P-CSCF and H2S GW, in steps B12 and B23 the H2S GW is configured to communicate SIP Call-ID to the UE, the SIP Call-ID having been obtained from the SIP signalling. In steps B14 and B24 the UE then includes the SIP Call-ID in the RTMP messages sent to the IMS-AGW, and in steps B15 and B25 the IMS-AGW compares compare the Call-ID received from the UE with the Context-ID assigned to the H.248 context.

In the first embodiment described above, the IMS-AGW is configured to dynamically allocate an IP address and port number for the direct media connection with the UE. However, there may be circumstances in which the IMS-AGW must use pre-configured default port numbers for direct media connections with the UE, and therefore cannot rely on the IP address and port number to correlate any received media protocol messages with a RTP connection in the IMS that has been initiated/established for the UE. For example, a typical RTMP server listens for RTMP requests on port 1935 by default and on port 80 for RTMP Tunnelling requests (wherein RTMPT is RTMP encapsulated within HTTP). Consequently, a typical RTMP client will first try to connect to a RTMP server using port 1935 and, if unsuccessful, will then encapsulate the RTMP request in HTTP and try to connect using port 80. Therefore, if the web browser is provided with a typical RTMP client,

then the IMS-AGW must be configured to act as a typical RTMP server towards the RTMP client (for sessions originating and terminating at the UE) and must use the pre-configured default port numbers for direct media connections with the UE.

- 5 Therefore, according to a second embodiment, the IMS-AGW is configured to use a connection identifier to correlate media protocol messages received from the UE with the RTP connection initiated for the UE, and to confirm that these messages are from the UE for which these media connections are intended. To do so, the P-CSCF is configured to use the control signalling that initiates the media connections to ensure  
10 that a connection identifier is available to both the UE and the IMS-AGW. The UE can therefore be configured to include this connection identifier in any media protocol messages sent to the IMS-AGW.

In a first alternative of the second embodiment, the Context ID assigned to the H.248  
15 context by the IMS-AGW is used as the connection identifier, and is communicated to the UE via the P-CSCF and H2S GW. The UE is then configured to include the Context ID received from H2S GW in media protocol messages that are sent to the IMS-AGW. Figure 5 is a flow diagram illustrating an example of the process of a web browser initiating a RTMP audio session via the IMS according to the first alternative  
20 of the second embodiment described above. Steps C1 to C25 are substantially the same as those of Figure 3. However, on both the originating side and the terminating side, rather than the IMS-AGW dynamically allocate an IP address and port number to the RTMP connection with the UE, in steps C5 and C9 the IMS-AGW creates a H.248 context and reserves resources for the media connections but uses the default  
25 port 1935 for the RTMP connection with the UE, and it is this default port number that is communicated to the UE. The IMS-AGW therefore receives a RTMP connect command message on the default port and is required to compare the Context-ID received in the message with the Context-ID assigned to the H.248 context in order to correlate the RTMP command message with the RTP connection initiated in the  
30 IMS. This comparison also enables the IMS-AGW to confirm that the RTMP command is from the intended UE.

In a second alternative of the second embodiment, the SIP identifier included in the SIP message that initiates the session is used as the connection identifier, and is  
35 provided to the IMS-AGW by the P-CSCF when the P-CSCF sets the SIP identifier as the Context ID of the H.248 context. The UE is then configured to include the SIP

identifier received from H2S GW in media protocol messages that are sent to the IMS-AGW. Figure 6 is a flow diagram illustrating an example of the process of a web browser initiating a RTMP audio session via the IMS according to the first alternative of the second embodiment described above. Steps D1 to D25 are substantially the same as those of Figure 4. However, on both the originating side and the terminating side, rather than the IMS-AGW dynamically allocate an IP address and port number to the RTMP connection with the UE, in steps D5 and D9 the IMS-AGW creates a H.248 context and reserves resources for the media connections but uses the default port 1935 for the RTMP connection with the UE, and it is this default port number that is communicated to the UE. The IMS-AGW therefore receives a RTMP connect command message on the default port and is required to compare the Call-ID received in the message with the Context-ID assigned to the H.248 context in order to correlate the RTMP command message with the RTP connection initiated in the IMS. This comparison also enables the IMS-AGW to confirm that the RTMP command is from the intended UE.

The examples described above and illustrated in Figures 3 to 6 relate to a web browser initiating a session in which RTMP media is transmitted through the IMS. However, the methods and apparatus described are equally application to sessions in which a web browser wants to transmit RTP/RTCP media through the IMS. In particular, as detailed above, given that the web browser will use HTTP for the control signalling, the IMS-AGW will not be able to confirm that RTP/RTCP messages received from the UE are actually from the UE for which an RTP connection has been initiated/established in the IMS. A connection identifier must therefore be available to both the UE and the IMS-AGW, such that the UE can include this connection identifier in any media protocol messages sent to the IMS-AGW, and the IMS-AGW can compare the connection identifier received from the UE with a connection identifier allocated to the corresponding H.248 context. To do so, the web browser/UE can be configured to include this connection identifier as the Synchronization Source (SSRC) within any RTP and RTCP messages sent to the IMS-AGW. Including the connection identifier in both RTP and RTCP messages prevents malicious users from using either.

In addition, the examples described above and illustrated in Figures 3 to 6 relate to a web browser initiating a session in which RTMP media is transmitted through the IMS to a terminating web browser, such that the RTMP media is translated to RTP for

transmission through the IMS and this RTP media is then translated back to RTMP for transmission to the terminating UE. However, the methods and apparatus described are equally applicable to sessions in which a web browser wants to transmit RTMP media to a SIP client at a terminating UE. In such a scenario, the  
5 originating side of the call would proceed in accordance with the methods and apparatus described above, whilst the terminating side of the call would not require the involvement of a H2S GW, as the P-CSCF could communicate directly with the terminating UE using SIP. Furthermore, the terminating IMS-AGW would also not be required to translate the RTP media back to RTMP, as it would be able to allow the  
10 RTP media from the IMS to pass through to the terminating UE.

Figure 7 illustrates schematically an example of a UE 10 for implementing the transmission of media to and from a web browser provided at the UE through an IMS in accordance with the methods described above. The UE 10 can be implemented  
15 as a combination of computer hardware and software. The UE 10 comprises a processor 11, a memory 12, a receiver 13 and a transmitter 14. The memory 12 stores the various programs/executable files that are implemented by the processor 11, and also provides a storage unit for any required data. The programs/executable files stored in the memory 12, and implemented by the processor 11, include but are  
20 not limited to a rule a web browser/HTTP client unit 15, a media unit 16, and a media connection unit 17.

Figure 8 illustrates schematically an example of a H2S GW 20 for implementing the transmission of media to and from a web browser provided at a UE through an IMS in  
25 accordance with the methods described above. The H2S GW 20 can be implemented as a combination of computer hardware and software. The H2S GW 20 comprises a processor 21, a memory 22, a receiver 23 and a transmitter 24. The memory 22 stores the various programs/executable files that are implemented by the processor 21, and also provides a storage unit for any required data. The  
30 programs/executable files stored in the memory 22, and implemented by the processor 21, include but are not limited to a protocol unit 25 (e.g. for implementing the SIP and HTTP protocols), a HTTP-SIP translation unit 26, and media connection unit 27.

35 Figure 9 illustrates schematically an example of a P-CSCF 30 for implementing the transmission of media to and from a web browser provided at a UE through an IMS in

accordance with the methods described above. The P-CSCF 30 can be implemented as a combination of computer hardware and software. The P-CSCF 30 comprises a processor 31, a memory 32, a receiver 33 and a transmitter 34. The memory 32 stores the various programs/executable files that are implemented by the processor 31, and also provides a storage unit for any required data. The programs/executable files stored in the memory 32, and implemented by the processor 31, include but are not limited to a protocol unit 35 (e.g. for implementing the SIP and H.248 protocols), , and a media connection unit 36.

Figure 10 illustrates schematically an example of an IMS-AGW 40 for implementing the transmission of media to and from a web browser provided at a UE through an IMS in accordance with the methods described above. The IMS-AGW 40 can be implemented as a combination of computer hardware and software. The IMS-AGW 40 comprises a processor 41, a memory 42, a receiver 43 and a transmitter 44. The memory 42 stores the various programs/executable files that are implemented by the processor 41, and also provides a storage unit for any required data. The programs/executable files stored in the memory 42, and implemented by the processor 41, include but are not limited to a protocol unit 45 (e.g. for implementing the H.248, RTP-RTCP and RTMP protocols), a media translation/transmission unit 46, and a media connection unit 47.

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-described examples relate to the process of a web browser initiating an audio session through an IMS, the above-described methods and apparatus could equally be used to establish a video session through the IMS. In addition, the above-described methods and apparatus can be extended to add additional media to session, such as adding video to an already established audio session.

Claims

1. An apparatus configured to operate as a gateway node for supporting the transmission of media to and from a web browser provided at a User Equipment, UE, through an IP Multimedia Subsystem, IMS, core network, the apparatus comprising:
  - a receiver configured to receive Hypertext Transfer Protocol, HTTP, messages from the UE, and to receive Session Initiation Protocol, SIP, messages from the IMS;
  - a translation unit configured to translate the received HTTP messages to SIP messages, and to translate the received SIP messages to HTTP messages;
  - a transmitter configured to send HTTP messages to the UE, and to send SIP messages to the IMS; and
  - a media connection unit configured to include a connection identifier in a HTTP message sent to the UE, the connection identifier being associated with a media connection within the IMS for the UE.
2. An apparatus according to claim 1, wherein the media control unit is configured to obtain the connection identifier from a corresponding attribute within a Session Description Protocol, SDP, body of a SIP message received from the IMS.
3. An apparatus according to claim 1, wherein the media control unit is configured to obtain the connection identifier from a corresponding proprietary SIP header of a SIP message received from the IMS.
4. An apparatus according to claim 1, wherein the media control unit is configured to obtain the connection identifier from a header field of the SIP messages.
5. An apparatus according to any preceding claim, wherein the media control unit is configured to obtain an IP address and port number from the SIP messages received from the IMS, and to include the received IP address and port number in a HTTP message sent to the UE.
6. An apparatus configured to operate as a Proxy-Call Session Control Function, P-CSCF, and to support the transmission of media to and from a web browser

provided at a User Equipment, UE, through an IP Multimedia Subsystem, IMS, core network, the apparatus comprising:

a receiver configured to receive messages from an IMS Access Gateway, IMS-AGW, and to receive messages sent on behalf of the UE;

a transmitter configured to send messages to the IMS-AGW, and to send messages towards the UE; and

a media connection unit configured to instruct the IMS-AGW to initiate a first media connection within the IMS for the UE and a second media connection between the IMS-AGW and the UE, and to ensure that a connection identifier is available to the UE and to the IMS-AGW, the connection identifier being used by the IMS-AGW to associate the first media connection and the second media connection.

7. An apparatus according to claim 6, wherein the media connection unit is configured to obtain a H.248 Context ID from a message received from the IMS-AGW and to include the H.248 Context ID in a SIP message sent towards the UE.

8. An apparatus according to claim 7, wherein the media connection unit is configured to include the H.248 Context ID from a corresponding attribute within a Session Description Protocol, SDP, body of a SIP message sent towards the UE.

9. An apparatus according to claim 7, wherein the media connection unit is configured to include the H.248 Context ID in a corresponding proprietary SIP header of a SIP message sent towards the UE.

10. An apparatus according to claim 6, wherein the media connection unit is configured to obtain a header field value from a received SIP message, and to instruct the IMS-AGW to use the header field value as a H.248 Context ID.

11. An apparatus according to any of claims 6 to 10, wherein the media connection unit is configured to obtain an IP address and port number from the messages received from the IMS-AGW, and to include the received IP address and port number in a SIP message sent towards the UE.

12. An apparatus configured to operate as an IMS Access Gateway, IMS-AGW, and to support the transmission of media to and from a web browser provided at a

User Equipment, UE, through an IP Multimedia Subsystem, IMS, core network, the apparatus comprising:

- a media connection unit configured to collaborate with a Proxy-Call Session Control Function, P-CSCF, in order to initiate a first media connection within the IMS for the UE and a second media connection to the UE, and to establish a connection identifier to be used to associate the first media connection and the second media connection; and

- a media transmission unit configured to use the first media connection and the second media connection to transmit media to and/or from the UE;

- wherein the media connection unit is further configured to allow the media transmission unit to transmit media to and/or from the UE, if a connection identifier included in media protocol messages received from the UE matches the connection identifier established during the collaboration with the P-CSCF

13. An apparatus as claimed in claim 12, wherein the media connection unit is configured to assign a H.248 Context ID to associate the first media connection and the second media connection, and to include the H.248 Context ID in a message sent to the P-CSCF.

14. An apparatus as claimed in claim 12, wherein the media connection unit is configured to assign a value received from the P-CSCF as the H.248 Context ID.

15. An apparatus as claimed in any of claims 12 to 14, wherein the media connection unit is configured to dynamically allocate an IP address and port number that must be used by the UE for establishing the second media connection, and to include the IP address and port number in a message sent to the P-CSCF.

16. An apparatus configured to operate as a User Equipment, UE, and to implement the transmission of media to and from a web browser provided at the UE, through an IP Multimedia Subsystem, IMS, core network, the apparatus comprising:

- a Hypertext Transfer Protocol, HTTP, client unit configured to use HTTP messages to initiate a first media connection within the IMS for the UE and a second media connection to the IMS;

- a media connection unit configured to obtain a connection identifier from received HTTP messages, the connection identifier being associated with the first

media connection and the second media connection, and to include the connection identifier in media protocol messages sent towards the IMS.

17. An apparatus as claimed in claim 16, wherein the HTTP client unit configured to initiate a Real Time Messaging Protocol, RTMP, connection to the IMS, and the media connection unit configured is to include the connection identifier in RTMP messages sent towards the IMS.

18. An apparatus as claimed in claim 16, wherein the HTTP client unit configured to initiate a Real-time Transport Protocol, RTP, connection to the IMS, and the media connection unit configured is to include the connection identifier in RTP messages and RTP Control Protocol, RTCP, messages sent towards the IMS.

19. A method of operating a node of an access network in order to support the transmission of media to and from a web browser provided at a User Equipment, UE, through an IP Multimedia Subsystem, IMS, core network, the method comprising:

for Hypertext Transfer Protocol, HTTP, messages received from the UE, translating the HTTP messages to Session Initiation Protocol, SIP, messages and sending the SIP messages to the IMS;

for SIP messages received from the IMS, translating the SIP messages to HTTP messages and sending the HTTP messages to the UE; and

including a connection identifier in a HTTP message sent to the UE, the connection identifier being associated with a media connection within the IMS for the UE.

20. A method according to claim 19, wherein the connection identifier is obtained from a corresponding attribute within a Session Description Protocol, SDP, body of a SIP message received from the IMS.

21. A method according to claim 19, wherein the connection identifier is obtained from a corresponding proprietary SIP header of a SIP message received from the IMS.

22. A method according to claim 19, wherein a header field value from the SIP messages is included as the connection identifier.

23. A method according to any of claims 19 to 22, and further comprising:  
receiving a SIP message including an IP address and port number that must be used by the UE for establishing a direct media connection with the IMS; and  
including the received IP address and port number in a HTTP message sent to the UE.

24. A method of operating a Proxy-Call Session Control Function, P-CSCF, in order to support the transmission of media to and from a web browser provided at a User Equipment, UE, through an IP Multimedia Subsystem, IMS, core network, the method comprising:

communicating with an IMS Access Gateway, IMS-AGW, to initiate a first media connection within the IMS for the UE and a second media connection between the IMS-AGW and the UE; and

ensuring that a connection identifier is available to the UE and to the IMS-AGW, the connection identifier being used by the IMS-AGW to associate the first media connection and the second media connection.

25. A method according to claim 24, wherein the step of ensuring that a connection identifier is available to the UE and to the IMS-AGW comprises:

ensuring that a H.248 Context ID used by the IMS-AGW to associate the first media connection and the second media connection is available to the UE.

26. A method according to claim 25, and further comprising:

receiving the H.248 Context ID from the IMS-AGW and including the H.248 Context ID in a SIP message sent towards the UE.

27. A method according to claim 26, wherein the H.248 Context ID is included in a corresponding attribute within a Session Description Protocol, SDP, body of a SIP message sent towards the UE.

28. A method according to claim 26, wherein the H.248 Context ID is included in a corresponding proprietary SIP header of a SIP message sent towards the UE.

29. A method according to claim 25, and further comprising:

obtaining a header field value from the received SIP message; and  
sending a message to the IMS-AGW instructing the IMS-AGW to use the header field value as the H.248 Context ID.

30. A method according to any of claims 24 to 29, and further comprising:  
receiving, from the IMS-AGW, an IP address and port number that must be used by the UE for establishing the direct media connection with the IMS-AGW; and  
including the received IP address and port number in a SIP message sent towards the UE.

31. A method of operating an IP Multimedia Subsystem, IMS, Access Gateway, IMS-AGW, in order to support the transmission of media to and from a web browser provided at a User Equipment, UE, through an IP Multimedia Subsystem, IMS, core network, the method comprising:

communicating with a Proxy-Call Session Control Function, P-CSCF, to initiate a first media connection within the IMS for the UE and a second media connection to the UE, and to establish a connection identifier to be used by the IMS-AGW to associate the first media connection and the second media connection;

receiving media protocol messages from the UE, the media protocol messages including a connection identifier;

confirming if the received connection identifier matches the connection identifier established during the communication with the P-CSCF; and

if so, using the first media connection and the second media connection to transmit media to and/or from the UE.

32. A method as claimed in claim 31, wherein the connection identifier to be used by the IMS-AGW to associate the first media connection and the second media connection is a H.248 Context ID.

33. A method as claimed in claim 32, and further comprising:

assigning a H.248 Context ID to associate the first media connection and the second media connection; and

sending the H.248 Context ID to the P-CSCF.

34. A method as claimed in claim 32, and further comprising:

receiving a message from the P-CSCF, the message instructing the IMS-AGW to use a specified value as the H.248 Context ID; and  
assigning the specified value as the H.248 Context ID.

35. A method as claimed in any of claims 31 to 34, wherein to initiate a first media connection within the IMS for the UE and a second media connection to the UE the method comprises:

dynamically allocating an IP address and port number that must be used by the UE for establishing the second media connection; and  
sending the IP address and port number to the P-CSCF.

36. A method of operating a User Equipment, UE, in order to implement the transmission of media to and from a web browser provided at the UE, through an IP Multimedia Subsystem, IMS, core network, the method comprising:

using Hypertext Transfer Protocol, HTTP, messages in order to initiate a first media connection within the IMS for the UE and a second media connection to the IMS;

receiving a connection identifier in the HTTP messages, the connection identifier being associated with the first media connection and the second media connection; and

including the connection identifier in media protocol messages sent towards the IMS.

37. A method according to claim 36, wherein the second media connection is a Real Time Messaging Protocol, RTMP, connection, and the connection identifier is included in RTMP messages.

38. A method according to claim 36, wherein the second media connection is a Real-time Transport Protocol, RTP, connection, and the connection identifier is included in RTP messages and RTP Control Protocol, RTCP, messages.

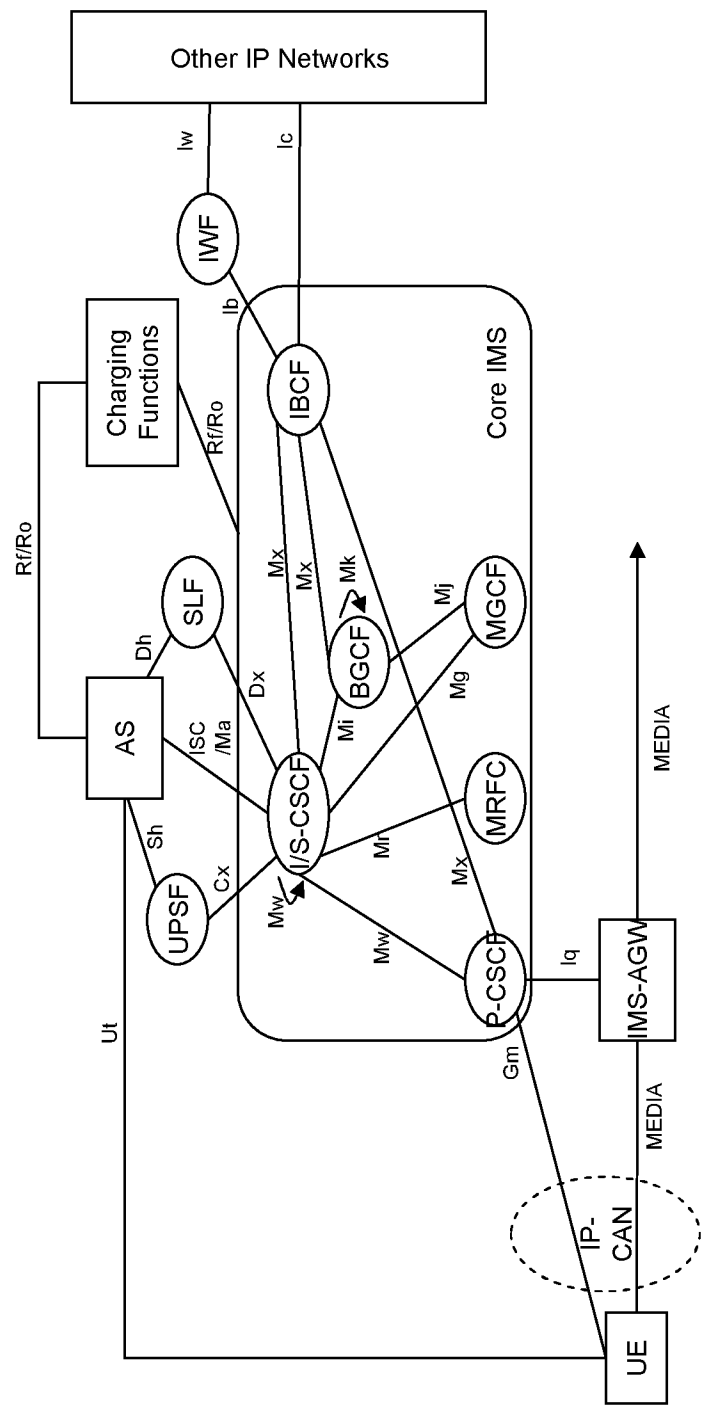


Figure 1

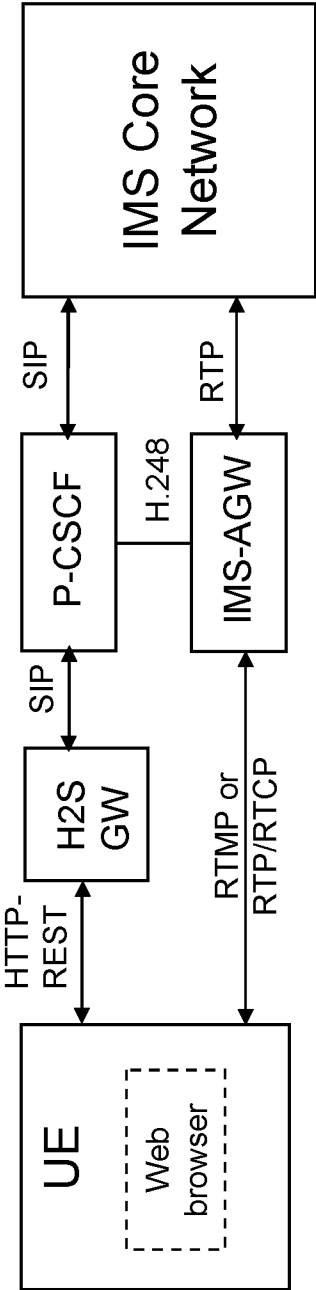


Figure 2

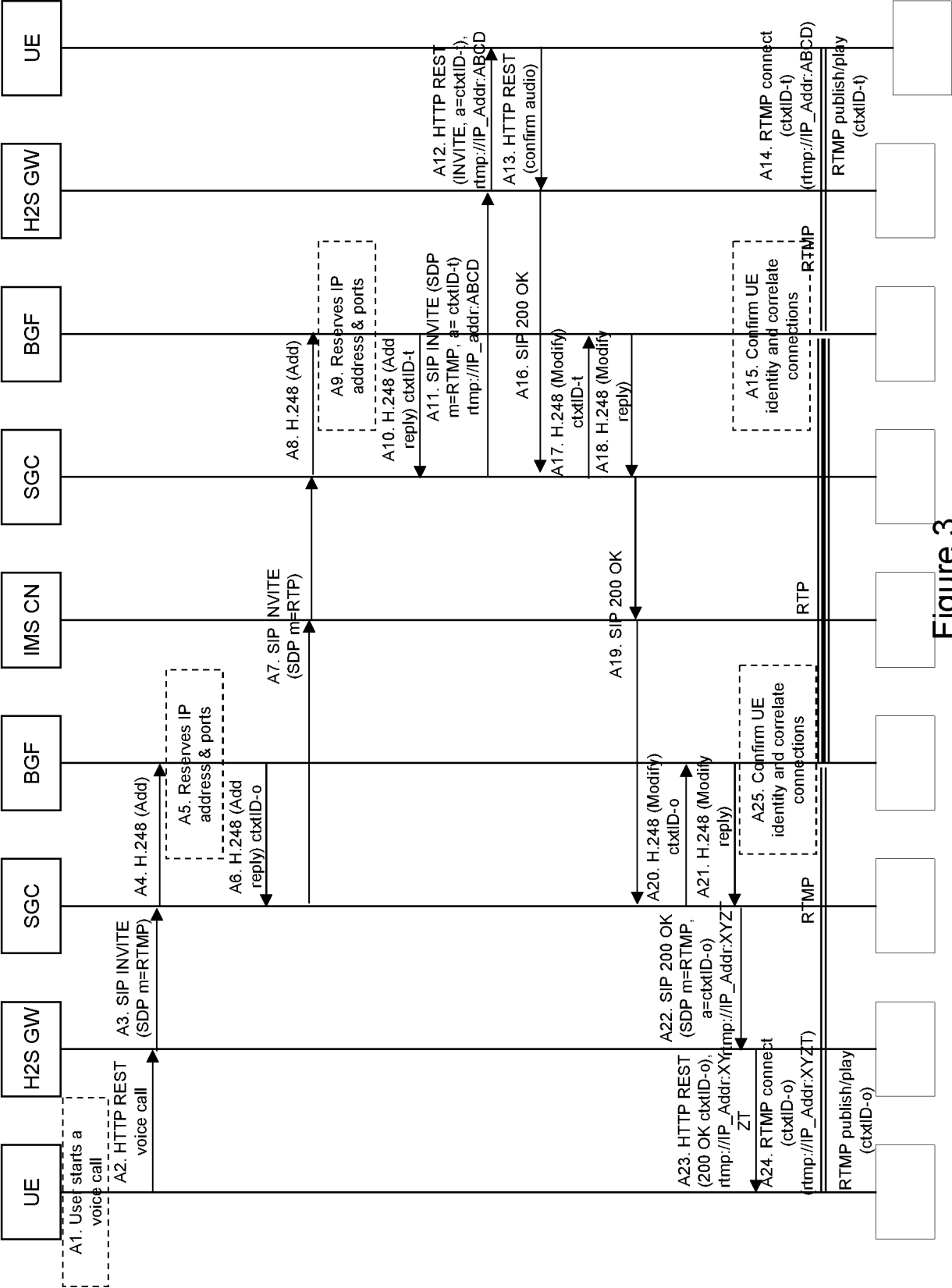


Figure 3

4/8

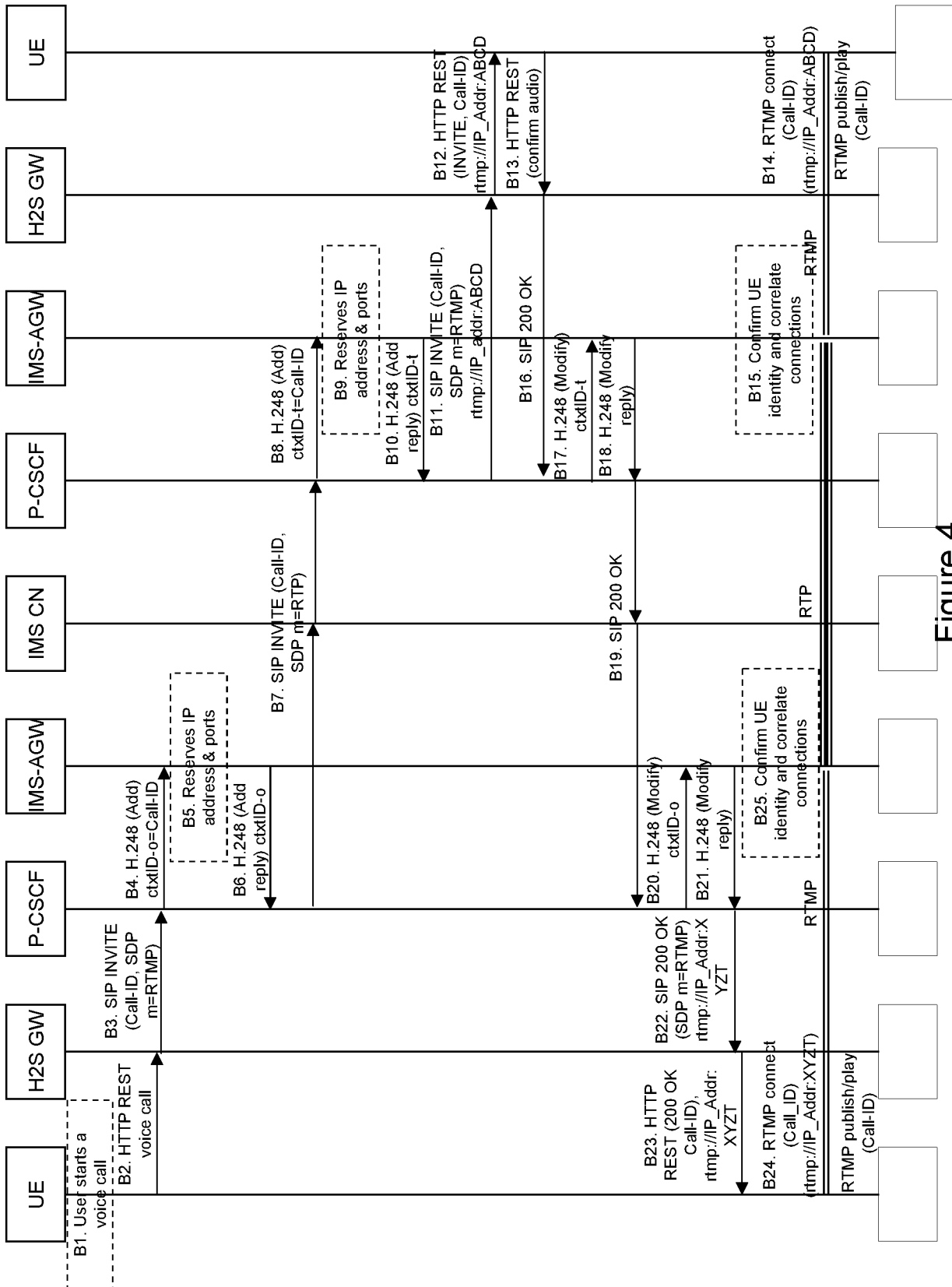


Figure 4

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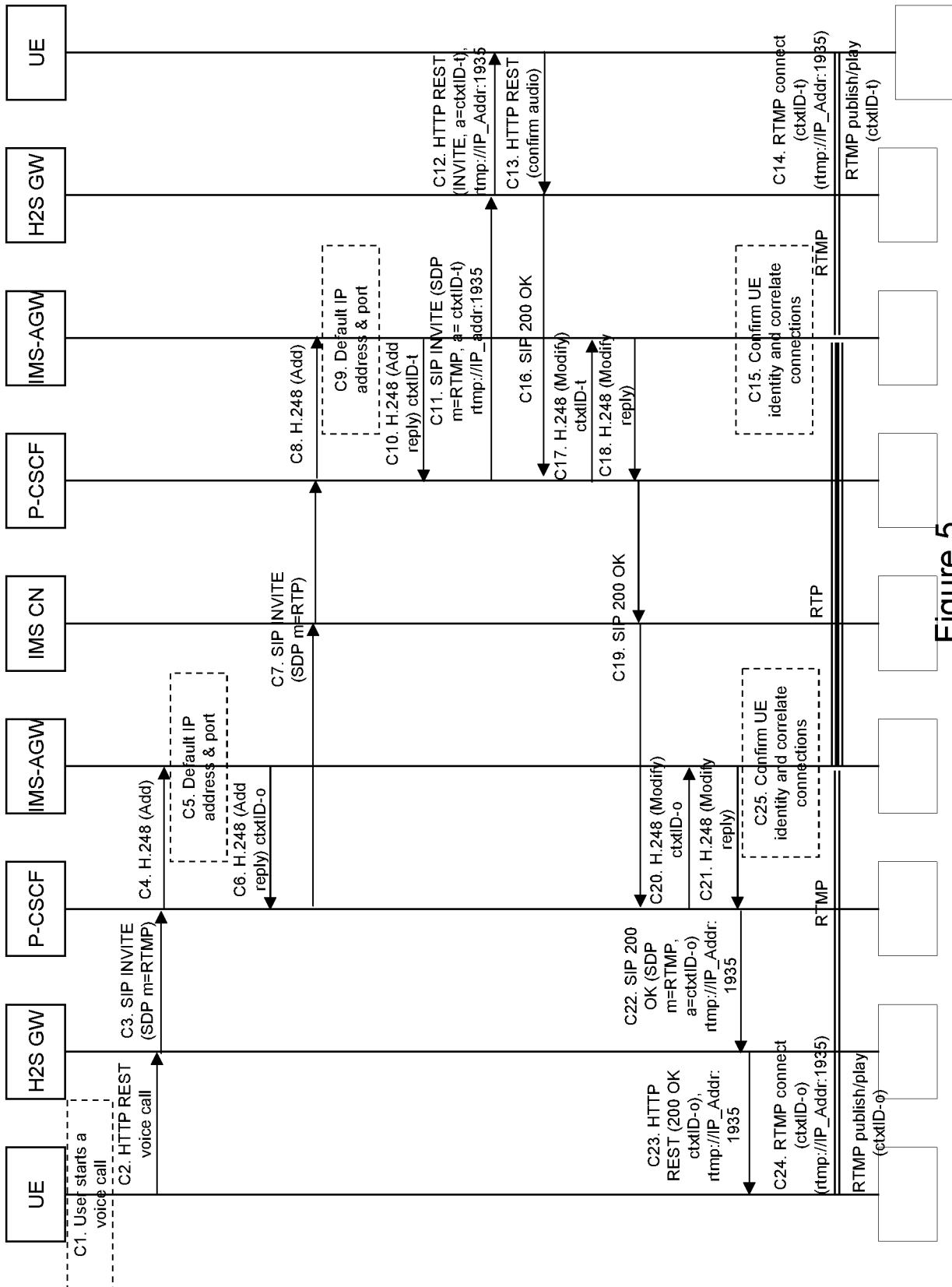


Figure 5

6/8

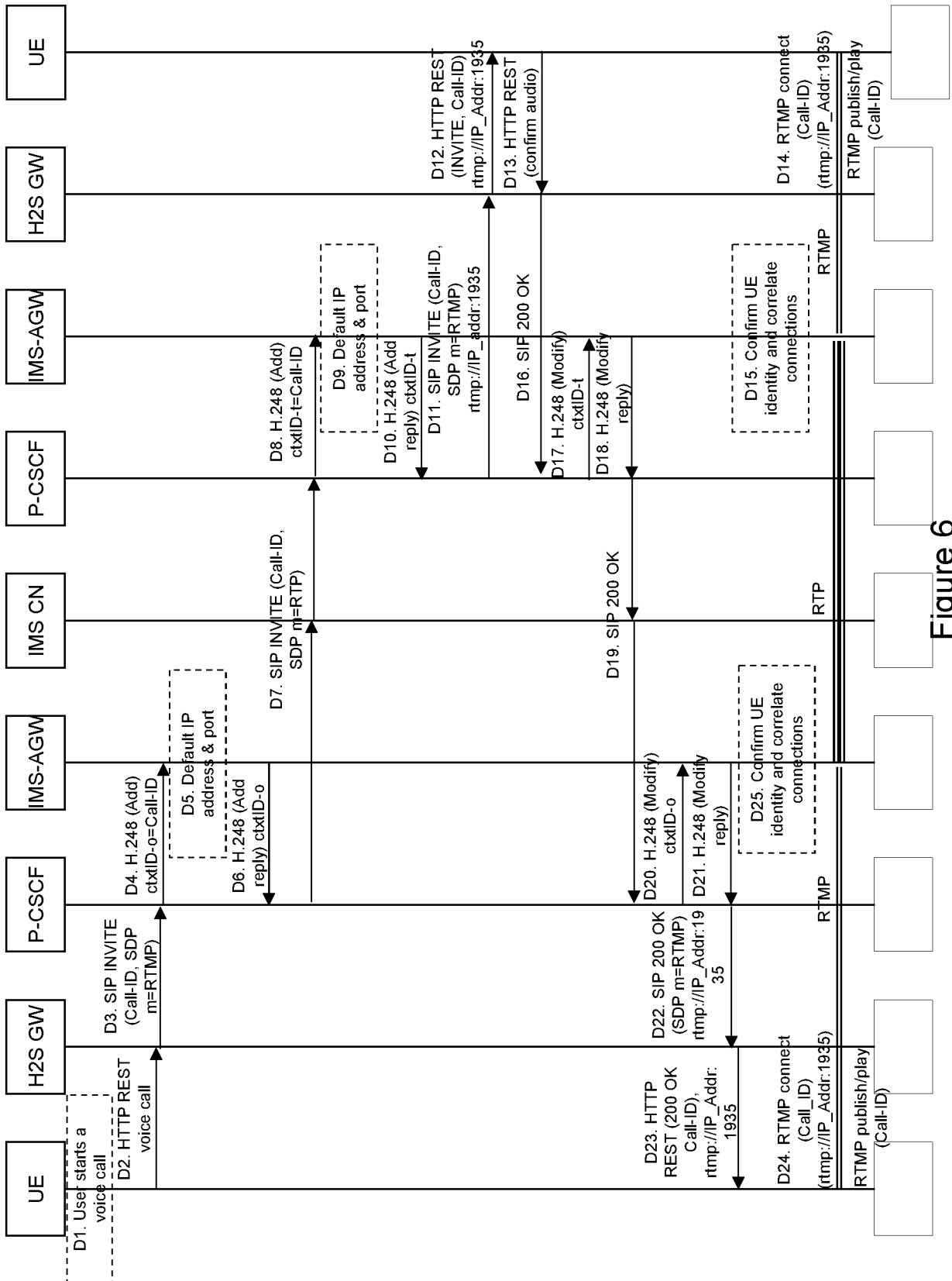


Figure 6

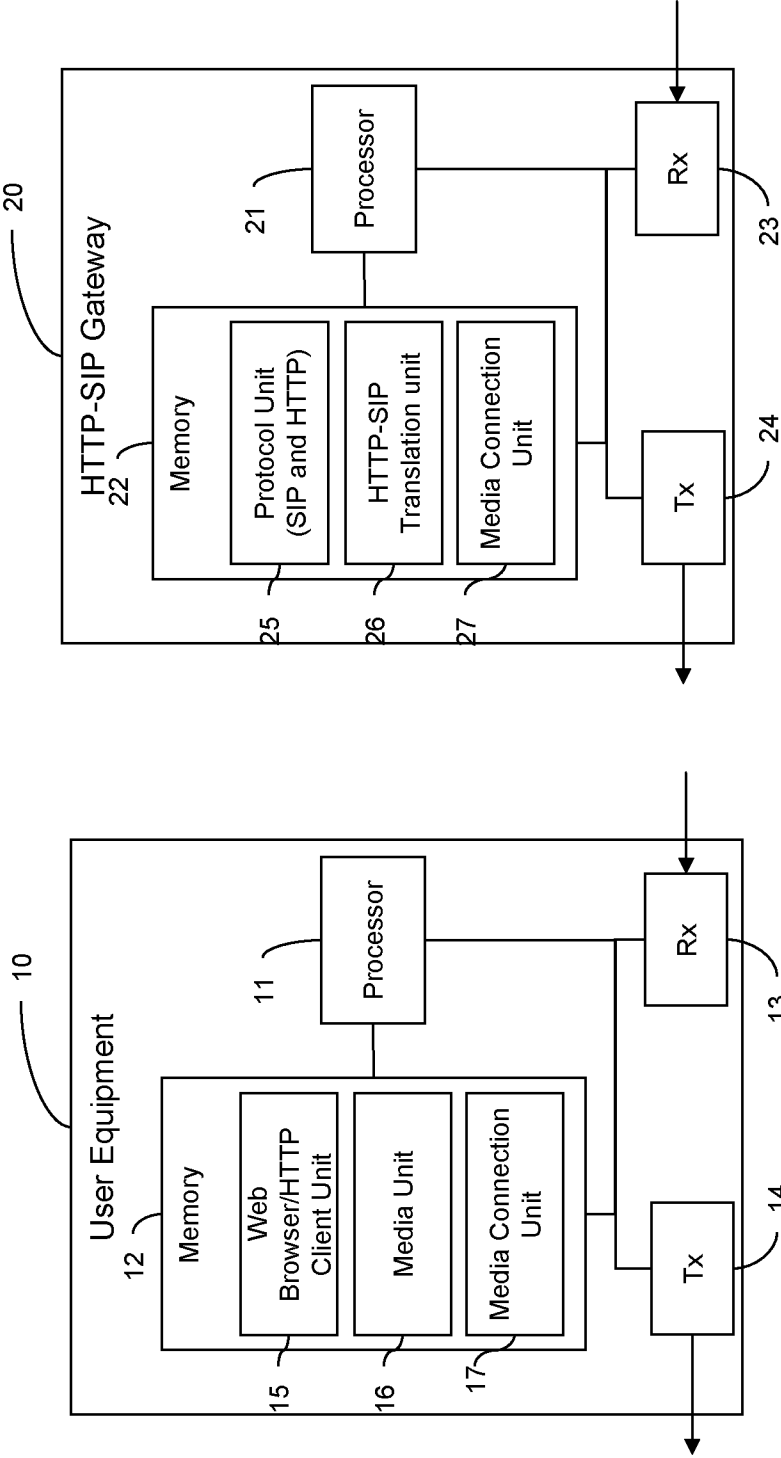


Figure 8

Figure 7

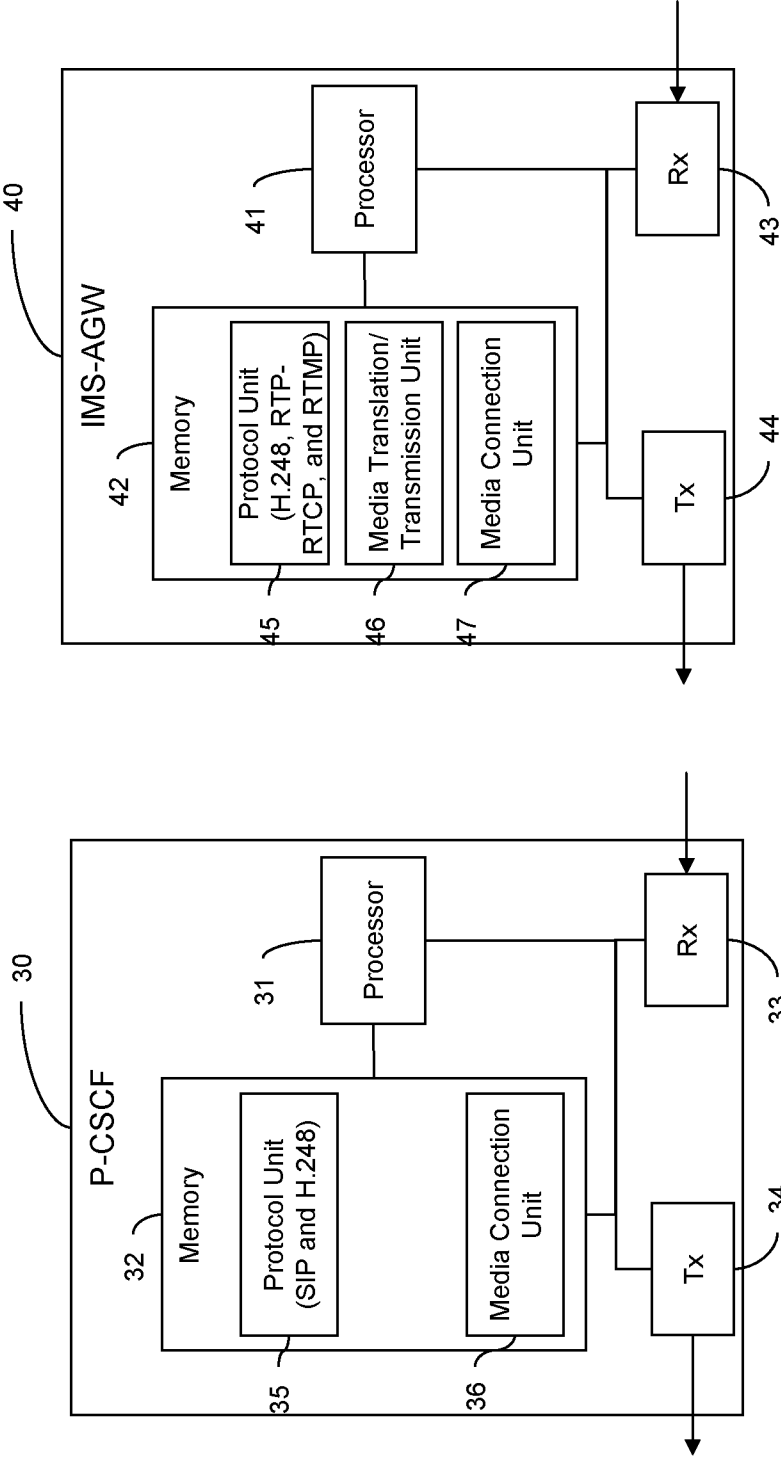


Figure 9

Figure 10

## INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2012/053679

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H04L29/06  
ADD.

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

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

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

EPO-Internal, COMPENDEX, 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 2012/023238 A1 (BOUTHEMY JEAN-LUC R [US] ET AL) 26 January 2012 (2012-01-26) figures 1-7<br>paragraph [0013] - paragraph [0063]<br>-----                                                                                                                                                                                                            | 1-38                  |
| X         | HEIDI-MARIA RISSANEN ET AL: "Design and Implementation of a RESTful IMS API", WIRELESS AND MOBILE COMMUNICATIONS (ICWMC), 2010 6TH INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 20 September 2010 (2010-09-20), pages 86-91, XP031795973, ISBN: 978-1-4244-8021-0<br>page 87, right-hand column - page 90, left-hand column<br>-----<br>-/- | 1-38                  |



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

20 November 2012

Date of mailing of the international search report

03/12/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040,  
Fax: (+31-70) 340-3016

Authorized officer

Riegler, Jörg

## INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2012/053679

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Category*                                            | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Relevant to claim No. |
| X                                                    | <p>Bailly, Marc;Menard, Philippe:<br/>"Connecting mobile IMS services With Web applications",<br/>Proceedings of the 5th International Mobile Multimedia Communications Conference, ICST<br/>7 September 2009 (2009-09-07), 9 September 2009 (2009-09-09), XP002687499,<br/>DOI: 10.4108/ICST.MOBIMEDIA2009.7504<br/>ISBN: 978-9-63-979962-2<br/>Retrieved from the Internet:<br/>URL:http://dl.acm.org/ft_gateway.cfm?id=1653605&amp;ftid=699130&amp;dwn=1&amp;CFID=205603643&amp;CFTOKEN=21790739<br/>[retrieved on 2012-11-20]<br/>page 2, right-hand column - page 5,<br/>left-hand column<br/>-----</p> | 1-38                  |

## INTERNATIONAL SEARCH REPORT

### Information on patent family members

International application No

PCT/EP2012/053679

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| US 2012023238                             | A1                  | 26-01-2012                 | NONE                |
| -----                                     |                     |                            |                     |