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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 March 2009 (19.03.2009)

PCT

(10) International Publication Number
WO 2009/034098 A1

(51) International Patent Classification:
H04L 29/06 (2006.01)

(21) International Application Number:
PCT/EP2008/061975

(22) International Filing Date:
10 September 2008 (10.09.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/971,704 12 September 2007 (12.09.2007) US

(71) Applicant *(for all designated States except US)*: **TELEFONAKTIEBOLAGET LM ERICSSON (publ)** [SE/SE]; S-164 83 Stockholm (SE).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **KAMPMANN, Dirk** [DE/NL]; Jos Francotteweg 50, NL-6291 Gp Vaals (NL).

(74) Agents: **HOFFMANN EITLE** et al.; Arabellastrasse 4, 81925 München (DE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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

(54) **Title:** METHOD FOR ESTABLISHING A CALL IN A COMMUNICATION NETWORK

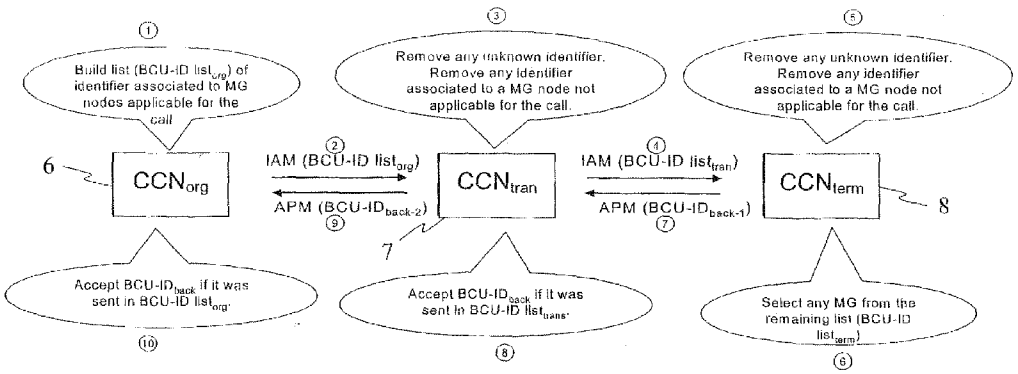

Fig. 9

(57) **Abstract:** A method for establishing a call in a communication network by selecting media gateways to be used for the call is disclosed. The media gateways are in a user plane. The method includes a negotiating procedure provided at least with steps wherein a first call control node in a control plane sends, towards a second call control node in the control plane, a message identifying a list of at least two media gateways considered eligible for the call to be established. Call control nodes and computer programs are also disclosed.

WO 2009/034098 A1

Description

[Title]

Method for establishing a call in a communication network

[Technical Field]

The present invention relates to a method for establishing a call in a communication network. It also relates to call control nodes configured to participate in establishing a call in a communication network, and to a computer program comprising instructions configured, when executed on a call control node, to cause the call control node to carry out a method for establishing a call in a communication network.

[Background]

In communication networks, such as telecommunication networks, a call often involves, on the one hand, a control plane or signalling plane and, on the other hand, a user plane. The control plane or signalling plane is in charge of establishing and managing a connection between two points on the network. The user plane is in charge of transporting the user data.

The setting up of a call on the user plane involves selecting nodes, which may be referred to as media gateways (MG or MGW), through which the data will be routed or switched. The media gateways are nodes on the user plane. The selection of the media gateways is performed by nodes, which may be

referred to as call control nodes (CCN). The call control nodes are on the control plane. The call control nodes act as media gateway controllers (MGC) since they control which media gateways to be used for the call. A media gateway is in charge of switching the user plane data and in charge of providing in-band equipment, if necessary.

An exemplary communication network including call control nodes and media gateways is a bearer independent circuit-switched (CS) core network described in 3GPP TS 23.205 V7.5.0 (2007-06), 3rd Generation Partnership Project; *Technical Specification Group Core Network and Terminals; Bearer-independent circuit-switched core network;* Stage 2 (Release 7) (available from the 3GPP, Sophia Antipolis, France), herewith referred to as "reference [1]" or "ref. [1]". The core network of reference [1] uses, on the one hand, media switching center (MSC) servers (described for instance in ref. [1], section 5.1.1.1) and gateway media switching center (GMSC) servers (described for instance in ref. [1], section 5.1.1.2), both being call control nodes, and, on the other hand, media gateways (described for instance in ref. [1], section 5.1.1.3). The GMSC server and MSC server provide the call control and mobility management functions, and the media gateway provides the bearer control and transmission resource functions. The media gateway may contain stream manipulating functions and may perform media conversion and framing protocol conversion.

Other exemplary call control nodes include a transit switching center (TSC) and a media gateway control function (MGCF). Exemplary in-band equipments (e.g. media manipulation equipment) of the media gateways include transcoder devices, echo canceller, or tone and announcement devices.

A plurality of call control nodes may be involved in setting up a call. Call setup information may be signalled between call control nodes using call control protocols such as for example ISUP (ISDN User Part or Integrated Services Digital Network User Part), BICC (Bearer Independent Call Control) or SIP (Session Initiation Protocol). In the event that a call control node selects a media gateway, call control protocols may be provided so that the call control node sends the identifier of the selected media gateway to another call control node (see for instance ref. [1], section 6.1.1.1, wherein the MGW selection may be based on a possibly received MGW-id from the succeeding node). The other call control node has then the opportunity to select the same media gateway for user plane switching. The selection of media gateways has an impact on resource utilization in the nodes and in the communication network.

It is therefore desirable to provide methods and call control nodes which solve or partially solve the above-mentioned problems of selecting media gateways such that resource utilization is optimized.

[Summary]

Such methods and call control nodes are defined in the independent claims. Advantageous embodiments are defined in the dependent claims.

In one embodiment, the method is for establishing a call in a communication network by selecting media gateways to be used for the call. The media gateways are in a user plane. The method includes a negotiating procedure provided at least

with steps wherein a first call control node in a control plane sends, towards a second call control node in the control plane, a message identifying a list of at least two media gateways considered eligible for the call to be established.

In this embodiment, the first call control node sends, to the second call control node, information pertaining to which media gateways can be successfully selected by the first call control node for establishing the call in the communication network. Rather than letting the second call control node select a media gateway amongst all the media gateways which are available for use by the second call control node for establishing the call, the second call control node receives from the first call control node a list of media gateways from which to choose from. The method adds constraints to the media gateway selection on the second call control node side. In doing so, it assists in the selection of an appropriate media gateway which may be commonly used by both the first and second call control nodes, if possible.

Such a selection of a common media gateway for a call to be established enables efficient use of the network resources, since the second call control node receives a priori information as to the capabilities of the first call control node.

A communication network may herewith be any network used for data communication, such as a core network within a mobile communication network, or a fixed telephony communication network. The media gateways constitute the nodes through which the data packets or streams are routed or switched. In one embodiment, the communication network is any one of a

circuit-switched core network, a bearer-independent circuit-switched core network, a packet-switched core network, a circuit-switched core network for ATM and/or IP transport, a circuit-switched core network in a GSM and/or UMTS environment, and a circuit-switched core network as described in reference [1].

The control plane is a protocol or set of protocols and mechanisms, and by extension the network nodes implementing these mechanisms, for setting up and managing a connection, such as for instance for providing mobility management.

The user plane is a protocol or a set of protocols and mechanisms, and by extension the network nodes implementing these mechanisms, for transporting the user data. In one embodiment, the user plane implements the bearer functionality, such as for instance for providing the bearer control and transmission resources functions.

A call is a connection between at least two parties, such as for instance a calling party and a called party. The connection may be set up to transmit voice, data, video frames, or any other type of data.

A call control node may be a server computer configured for performing functions relating to the management and setup of media gateway nodes in the user plane. The call control node may comprise a processor, a memory unit, and software arranged to be executed on the call control node so that it can perform its functionalities. In one embodiment, the first and second call control nodes are, each, any one of a media switching center server, a gateway media switching center server and a media gateway control function (MGCF).

A media gateway may be a server computer configured at least for performing the transmission of user data on the user plane. The media gateway may comprise a processing unit, a memory unit and software configured to be executed on the media gateways so that it can perform its functionalities.

In one embodiment, a media gateway is considered eligible for a call to be established by a call control node if the call control node knows the media gateway and is capable of instructing the media gateway to act in the call to be established.

In one embodiment, the message identifying the list contains an identifier of the list, wherein the list itself is stored at a location accessible by the call control nodes. In one embodiment, the message identifying the list contains the identifiers of media gateways in the list. These two embodiments are not exclusive and may be combined. In other words, the message may contain the explicit identifier of at least one media gateway and an identifier of a list stored outside the message, so that, as a result, the message identifies a list of at least two media gateways.

The method enables media gateway negotiation, i.e. the negotiation of a common media gateway, between call control nodes, for instance where a forward bearer setup is applied. A forward bearer setup is a setup wherein the bearer, on the user plane, is set up in the same direction as the call, i.e. from the calling party to the called party. The selection of a common media gateway node improves resource utilization in the network. The method may be applied to an existing

protocol, such as a standard BICC or SIP protocol, without impact thereto.

In one embodiment, the first call control node sends, towards the second call control node, the message identifying the list of at least two media gateways in the forward direction. The forward direction is the direction of establishing of the call connection.

By sending the message identifying the list in the forward direction, i.e. from the calling party to the called party, an efficient utilization of the network resources is provided when setting up a call. A message which is used in an existing protocol for setting up a connection and which is sent in the forward direction may be used for sending the list or the identifier identifying the list.

In one embodiment, the negotiating procedure is further provided with steps wherein the second call control node receives the message from the first call control node. The second call control node then removes, from the list identified by the received message, the media gateways which the second call control node cannot select for the call. The second call control node then selects, from the list, a media gateway to be used for the call to be established, and sends, towards the first call control node, a message identifying the selected media gateway.

In this embodiment, the second call control node takes into account the constraints applicable to the first call control node. It does so by taking into account the list of media gateways considered, by the first call control node, as eligible for the call to be established. The second call

control node also takes into account its own constraints. It does so by removing, from the list identified by the received message, the media gateways that the second node cannot select for the call.

After taking into account the constraints of the first call control node and its own constraints, the second call control node selects, from the list, if possible, a media gateway to be used for the call to be established. It then sends back a message identifying the selected media gateway towards the first call control node. The first call control node can then select the same media gateway for the call to be established, i.e. the media gateway which has been agreed upon by the first and second call control nodes.

This embodiment provides an efficient implementation for minimizing the number of media gateways used for a call, so as to efficiently using the network resources.

In this embodiment, the second call control node removes, from the list identified by the received message, the media gateways which the second call control node cannot select for the call, and selects, from the list, a media gateway to be used for the call to be established. The step of removing may however lead to an empty list. If so, the selection, from the list, is not possible. The procedure may however continue as follows. The second call control node selects a media gateway according to its local constraints and sends, towards the first call control node, a message identifying the selected media gateway. The first call control node identifies that the selected media gateway does not belong to the originally transmitted list, and selects a media gateway from the

originally transmitted list. This case does not lead to the use of a common media gateway by the first and second nodes.

In one embodiment, the negotiating procedure is provided with steps wherein the first call control node receives the message identifying the selected media gateway. Upon receiving said message, the first call control node completes, or attempts to complete, the call to be established using the selected media gateway identifier in the received message. This provides efficient utilization of the network resources. Using the teaching of reference [1] for instance, a skilled person would understand how to complete, or attempt to complete, a call using a media gateway identifier.

In one embodiment, the negotiating procedure is further provided with steps wherein a third call control node receives a message sent by a first call control node towards a second call control node. The third call control node is referred to herewith as an intermediary call control node. As mentioned above, the message identifies a list of at least two media gateways considered, by the first call control node, eligible for the call to be established. Upon reception of the message, the third call control node removes, from the list identified by the received message, the media gateways which it cannot select for the call. It then forwards, towards the second call control node, a message identifying the list, i.e. a message identifying the possibly modified list from which the media gateways which the third call control node cannot select for the call have been removed. The list identified in the message forwarded from the third node towards the second node is, in other words, a list of

media gateways considered, jointly by the first and third nodes, as eligible for the call to be established.

This embodiment further enables the constraints of an intermediary call control node, i.e. a third call control node, to be taken into account when selecting a media gateway for a call to be established.

The processing by the third call control node may lead to an unmodified list, maintained as received (if all the media gateways of the list are considered eligible by the third call control node), to a modified list maintained in a modified form but not empty (if some of the media gateways are considered eligible by the third call control node and other are considered ineligible), or to an empty list (if all the media gateways are considered ineligible). If the third case (empty list obtained), the following may happen. The third call control node may create a new list and starts a new media gateway negotiation towards a succeeding call control node, such as towards the second call control node. In that case, the list identified in the message forwarded from the third node towards the second node is not a list of media gateways considered, jointly by the first and third nodes, as eligible for the call to be established, but only a list of media gateways considered eligible by the third node. Alternatively (still in the third case), the third call control node may select a media gateway according to its local constraints and send, towards the second call control node, a message identifying this selected media gateway, as a proposed common media gateway to be used by the third and second call control nodes. In yet another alternative (still in the third case), the third call control node may request the second call control node to select a media gateway

according to its local constraints and to send a message identifying this selected media gateway, as a proposed common media gateway to be used by the third and second call control nodes.

This embodiment applies to intermediary call control nodes which have the ability to control media gateways. A signalling plane node, such as a call mediation node, which does not control media gateways should not participate in the media gateway negotiation, should not interfere with the negotiation and should only forward the message without removing items from the list.

In one embodiment, the negotiating procedure is further provided with steps wherein a third call control node receives, from the second call control node, a message identifying a selected media gateway. The third call control node then selects, as a media gateway to be used for the call to be established, the media gateway identified in the received message. The third call control node then forwards, towards the first call control node, the message identifying the selected media gateway.

This embodiment enables to instruct an intermediary call control node to use the media gateway selected by the second call control node.

The invention also relates to a method performed by each one of the call control nodes in the control plane, to participate in establishing a call in a communication network by selecting media gateways to be used for the call. Namely, the invention relates to a method performed by a first call control node initially sending a message identifying a list

of at least two media gateways considered to be eligible for the call to be established. The method also relates to a method wherein a second call control node receives a message identifying a list of at least two media gateways considered eligible for the call to be established by the first call control node, selects, from the list, a media gateway to be used for the call to be established, and sends back towards the first call control node a message identifying the selected media gateway. The invention further relates to a method performed by a third call control node, i.e. an intermediary call control node, to forward in the direction of a second call control node a message identifying an above-described list, or to forward in the direction of a first call control node a message identifying a selected media gateway.

The invention further relates to the call control nodes themselves, configured to carry out in operation the above-described methods. The invention further relates to a computer program comprising instructions configured, when executed on a call control node, to cause the call control node to carry out any one of the above-described methods, or a portion thereof.

[Brief description of the drawings]

Embodiments of the present invention shall now be described, in conjunction with the appended figures, in which:

Figs. 1 and 2 schematically illustrate two exemplary call setting up scenarios to assist in understanding some problems addressed by the invention;

Figs. 3a and 3b illustrate respectively a method and a network configuration according to one embodiment of the invention, wherein a first call control node sends a message towards a second call control node in the process of establishing a call within a communication network;

Figs. 4a and 4b illustrate respectively a method and a network configuration according to one embodiment of the invention, wherein a first call control node sends a message towards a second call control node, which receives it, processes it, and sends a message back towards the first call control node;

Figs. 5a and 5b illustrate respectively a method and a network configuration according to one embodiment of the invention, wherein a first call control note sends a message to a second call control node, the second call control node receives the message, processes it, and sends a message back to the first call control node, which then receives the message and completes, or attempts to complete, a call;

Figs. 6a and 6b illustrate respectively a method and a network configuration according to one embodiment of the invention, wherein a first call control node and an intermediate call control node participate in establishing a call in a communication network;

Figs. 7a and 7b illustrate respectively a method and a network configuration according to one embodiment of the invention, wherein a first, second and third call control nodes participate in establishing a call in a communication network;

Fig. 8a and 8b illustrate respectively a method and a network configuration according to one embodiment of the invention, wherein a first, an intermediary and a second call control nodes participate in establishing a call in a communication network;

Fig. 9 illustrates three call control nodes participating in establishing a call in a communication network, according to one embodiment of the invention;

Figs. 10a, 10b, 11, 12a and 12b illustrate call control nodes according to embodiments of the invention.

[Detailed description]

The present invention shall now be described in conjunction with specific embodiments. It may be noted that these specific embodiments serve to provide the skilled person with a better understanding, but are not intended to in any way restrict the scope of the invention, which is defined by the appended claims.

Fig. 1 schematically represents an exemplary call setting up scenario to assist in understanding some problems underlying the invention.

The illustrated scenario is applicable to telephone calls (mobile or fixed), or more generally telecommunications connections, and uses a forward bearer setup procedure. Here, the bearer is established from the calling side towards the called side. On the left-hand side of the schema, an originating radio access network (RAN, e.g. GERAN which stands for GSM EDGE Radio Access Network) is illustrated

(calling side, i.e. side of the calling party). On the right-hand side of the schema, a remote radio access network (RAN, e.g. GERAN) is illustrated (called side, i.e. side of the called party).

A preceding call control node CCN-1 and a succeeding call control node CCN-2 are part of the control plane, and are each controlling one media gateway node, respectively media gateway node MG-1 and media gateway node MG-2, for user plane switching. In order to achieve forward bearer setup, the succeeding call control node CCN-2 selects a media gateway (MG) first and then sends a media gateway identifier and bearer address information backwards to the preceding call control node CCN-1. The preceding call control node CCN-1 then selects the media gateway and initiates the bearer setup procedure.

More particularly, Fig. 1 illustrates the principle behind forward bearer setup using the BICC protocol as exemplary call control protocol, to assist in understanding some problems underlying the invention. The steps leading to the setting up of a call are as follows:

(1) An initial addressing message (IAM) is sent from the preceding call control node CCN-1 to the succeeding call control node CCN-2 providing call setup information. This step is illustrated by the arrow associated with the surrounded reference 1 and the label "IAM()".

(2) The succeeding call control node CCN-2 selects a media gateway node (here, media gateway node MG-2) and seizes the media gateway resources for the connection end point. This

step is illustrated by the arrow associated with the surrounded reference 2 and the label "Select MG resources".

(3) The identifier of the media gateway MG-2, i.e. BCU-ID 2, is sent backwards from the succeeding call control node CCN-2 to the preceding call control node CCN-1. This step is illustrated by the arrow associated with the surrounded reference 3 and the label "APM (BCU-ID 2)".

(4) The preceding call control node CCN-1 selects a media gateway node MG-1 and seizes the media gateway resources for the connection end point. This step is illustrated by the arrow associated with the surrounded reference 4 and the label "Select MG resources".

(5) The preceding call control node CCN-1 triggers the start of the bearer establishment procedure by the media gateway MG-1. This step is illustrated by the arrow associated with the surrounded reference 5 and the label "Establish bearer in forward direction". When Internet Protocol (IP) is used as user plane transport protocol and BICC is used as call control protocol, the bearer setup messages are tunnelled via call control nodes CCN-1 and CCN-2 (not illustrated in Fig. 1).

In practice, it happens frequently that the succeeding call control node CCN-2 has the opportunity to select from a set of a plurality of media gateway nodes without knowing which media gateway nodes can be selected in the preceding call control node CCN-1. Consequently, there is no guarantee that the media gateway node selected in the succeeding call control node CCN-2 can be selected in the preceding call control node CCN-1 as well. If the preceding call control

node CCN-1 and the succeeding call control node CCN-2 do not select a common media gateway node MG, unnecessary long user plane routes may be obtained. This causes inefficient use of the network resources.

Fig. 2 shows one possible exemplary situation which may occur. The illustrated exemplary situation assists in understanding in more details some problems underlying the invention. In this situation, it is assumed that the succeeding call control node CCN-2 has to play an announcement (see for instance ref. [1], section 14.1.1), for example due to intelligent networking (IN) interworking, before the call can be routed to the destination network, e.g. a public switched telephone network (PSTN). At the end of the call setup, media gateways nodes MG on three sites are involved in the call.

In Fig. 2, the dashed line depicts a signalling or control plane data transmission. The plain line depicts a user plane data transmission.

The steps leading to the setting up of a call are as follows:

(1) A setup message is sent from the mobile terminal (illustrated in the radio access network RAN on the left-hand side of the schema) to a preceding call control node CCN-1 in a site 1. A site is a physical location wherein the functionalities associated with one or more nodes are gathered. This step is illustrated by the arrow associated with the surrounded reference 1 and the label "Setup()".

(2) The preceding call control node CCN-1 sends a BICC IAM message to a succeeding call control node CCN-2 in a site 2.

This step is illustrated by the arrow associated with the surrounded reference 2 and the label "IAM()".

(3) The succeeding call control node CCN-2 has to play an announcement, for example due to Intelligent Networking (IN) interworking. This step is illustrated by the word balloon containing the surrounded reference 3 and the label "CCN identifies that an announcement has to be played".

(4) The succeeding call control node CCN-2 selects a media gateway node to establish the bearer (user plane) and to play an announcement. In this example, the succeeding call control node CCN-2 selects the media gateway MG-3 in the site 3. This step is illustrated by the arrow associated with the surrounded reference 4 and the label "Select MG resources and play the announcement".

(5) The succeeding call control node CCN-2 sends the identifier of media gateway MG-3 backwards to the preceding call control node CCN-1. This step is illustrated by the arrow associated with the surrounded reference 5 and the label "APM (BCU-ID 3)".

(6) In this example, it is assumed that the preceding call control node CCN-1 cannot select media gateway node MG-3. Consequently, the preceding call control node CCN-1 selects another media gateway node, for example the media gateway node MG-1 in the site 1. This step is illustrated by the arrow associated with the surrounded reference 6 and the label "Select MG node".

(7) The bearer is established between media gateway node MG-1 in the site 1 and media gateway node MG-3 in the site 3 and

the announcement is played. This step is illustrated by the arrow associated with the surrounded reference 7 and the label "Establish bearer; MG-3 plays announcement".

(8) The succeeding call control node CCN-2 continues the call setup. It identifies that the call has to be routed to a public switched telephone network (PSTN) illustrated on the bottom right-hand corner of Fig. 2. This step is illustrated by the word balloon containing the surrounded reference 8 and the label "Continue call setup, Route call to PSTN".

(9) The succeeding call control node CCN-2 selects a media gateway node MG that can connect the user plane to public switched telephone network (PSTN). Here media gateway node MG-4 in site 4 is selected by the succeeding call control node CCN-2. This step is illustrated by the arrow associated with the surrounded reference 9 and the label "Select MG resources that interworks with PSTN".

(10) The bearer is finally established between media gateway node MG-3 and media gateway node MG-4. This step is illustrated by the arrow associated with the surrounded reference 10 and the label "Establish bearer".

It follows that the call setup involves three sites, namely site 1, wherein media gateway node MGW-1 is located, site 3, wherein media gateway node MGW-3 is located, and site 4, wherein media gateway node MGW-4 is located.

Figs. 3a and 3b illustrate respectively a method and a network configuration according to one embodiment of the invention. A first call control node (CCN) 6 starts a negotiating procedure S100. The portion S600 of the

negotiating procedure S100 performed by the call control node 6 comprises a step of sending S102 a message identifying a list of at least two media gateways 4 (not illustrated in Figs. 3a and 3b) towards a second call control node (CCN) 8 through a communication network 2.

This enables the first call control node 6 to inform the second call control node 8 as to which media gateways 4 the first call control node 6 can select for the call to be established. The second call control node 8 has then the opportunity to take into account the proposed list of media gateways 4 for the call to be established.

The embodiment illustrated in Figs. 3a and 3b notably includes a sub-embodiment wherein the second call control node 8 is not provided with capabilities enabling it to understand the message identifying the list of at least two media gateways. A smooth transition from a second call control node 8 which is not provided with capabilities enabling it to understand the message identifying the list of at least two media gateways, to a second call control node 8 which is provided with capabilities to understand such a message, is provided, without the need for modifying the first call control node 6.

Fig. 4a and 4b illustrate respectively a method and a network configuration according to one embodiment of the invention. The negotiating procedure S100 includes a portion S600 performed by the first call control node 6 and a portion S800 performed by the second call control node 8. The first call control node 6 sends S102 towards the second call control node 8 through a communication network 2 a message identifying a list of at least two media gateways 4 that the

first call control node 6 can select for the call to be established.

In the portion S800 of the negotiating procedure S100, the second call control node 8 receives S104 the message identifying the list of at least two media gateways 4 considered by the first call control node 6 eligible for the call to be established. The second call control node 8 removes S106 from the list the media gateway(s) which the node 8 cannot select for the call. The second call control node 8 then selects S108, from the possibly modified list, a media gateway 4 to be used for the call to be established. The second call control node 8 finally sends S110, towards the first call control node 6, a message identifying the selected media gateway 4.

With respect to step S106, the expression "media gateway(s)" herewith means one media gateway or a plurality of them. However, if all media gateways of the list identified by the message are determined to be selectable for the call, no media gateway identifiers need to be removed by the call control node. Therefore, while the negotiating procedure S100 includes, i.e. provides, the step of removing S106, when the procedure S100 is actually executed, the step of removing S106 is optional and may amount to a validation step without an actual removal of identifiers when one or more conditions are met. In one embodiment, the negotiating procedure S100 includes a determining procedure (not illustrated) for determining whether each of the media gateways 4 identified by the received message are selectable for the call, and, if not, for removing those which are not selectable. This also applies to later described step S118.

Figs. 5a and 5b illustrate respectively a method and a network configuration according to one embodiment of the invention. Compared to Figs. 4a and 4b, the method and configuration of Figs. 5a and 5b additionally illustrate a step of receiving S112, by the first call control node 6, the message identifying the selected media gateway and a step of completing S114, or attempting to complete, a call to be established using the selected media gateway identified in the received message. Figs. 5a and 5b illustrate a negotiating procedure S100 including a two-way control plane exchange of information from a first call control node 6 to a second call control node 8 and then back from the second node 8 to the first node 6.

Figs. 6a and 6b illustrate respectively a method and a network configuration according to one embodiment of the invention. In particular, a negotiating procedure S100 comprises a portion S600 performed by a first call control node 6 and a portion S700 performed by a third call control node 7, or intermediate call control node, for participating in establishing a call.

The first call control node 6 sends S102 towards a second call control node 8, through a first portion 2a of a communication network 2, a message identifying a list of at least two media gateways 4 considered by the first node 6 as eligible for the call to be established. While the message is sent towards the second call control node 8, the message is transmitted via a third call control node 7, which receives S116 the message. The third call control node 7 then removes S118, from the list, the media gateway(s) 4 which it cannot select for the call. If all media gateways 4 of the list are eligible for the call to be established by the third node 7,

no media gateway 4 is removed from the list. The step of removing S118 is therefore a validation step. The third node 7 then forwards S120 the message identifying the list, which may have been modified, towards the second call control node 8, through a second portion 2b of the communication network 2.

As explained similarly with reference to Figs. 3a and 3b, the embodiment illustrated in Figs. 6a and 6b notably includes a sub-embodiment wherein the second call control node 8 is not provided with capabilities enabling it to understand the message identifying the list of at least two media gateways. A smooth transition from a non-enabled second call control node 8 to an enabled node 8, is provided, without the need for modifying the first call control node 6 nor the third call control node 7, which are both ready for the negotiation procedure S100.

Figs. 7a and 7b illustrate respectively a method and a network configuration according to one embodiment of the invention. In this embodiment, the negotiating procedure S100 comprises a portion S600 performed by the first call control node 6, a portion S700 performed by the third call control node 7, and a portion S800 performed by a second call control node 8.

Namely, the first call control node 6 sends a message towards a second call control node 8 via the third call control node 7, in the manner illustrated notably with reference to Fig. 6a and 6b. The transition in the forward direction through the third call control node 7 is not illustrated in Fig. 7a for clarity, and is only represented by three dots: "...". As explained above, the message identifies a list of at least

two media gateways 4 considered eligible jointly by the first node 6 and the third node 7 for the call to be established. The second call control node 8 receives S104 and processes S106, S108 the list before sending S110 a message identifying a selected media gateway 4 back towards the first call control node 6. While the message identifying the selected media gateway 4 is sent towards the first node 6 by the second node 8, the message is transmitted via the third call control node 7. The third node 7 receives S122 the message identifying the selected media gateway 4. The third call control node selects S124 as the media gateway 4 to be used for the call to be established the media gateway 4 identified by the message sent from the second node 8. The message is then forwarded S126 towards the first call control node 6.

Figs. 8a and 8b illustrate respectively a method and a network configuration according to one embodiment of the invention. Fig. 8b notably illustrates a series of exemplary media gateways 4.

The method includes a negotiating procedure S100 including a portion S600 performed by a first call control node 6, a portion S700 performed by a third call control node 7, and a portion S800 performed by the second call control node 8. Each call control node, namely the first call control node 6, the second call control node 8 and the third call control node 7, participates in establishing the call by performing their respective portion S600, S700 and S800 of the negotiating procedure S100.

In more details, the first call control node 6 sends S102 a message identifying a list of at least two media gateways 4 considered eligible for the call to be established. The

message is sent S102, by the first node 6, on a portion 2a of the communication network 2. The message sent from the first node 6 towards the second call control node 8 is received S116 by the third call control node 7. The third node 7 removes S118, from the list identified by the received message, the media gateway(s) 4 which it cannot select for the call (as explained above, if all media gateways can be selected, no media gateway is removed). It then forwards S120, towards the second call control node 8, a message identifying the list, which has been possibly modified. The message is sent S120, by the third node 7, on a portion 2b of the communication network 2.

The second call control node 8 receives S104 the message from the first call control node 6 via the third call control node 7. The second node 8 removes S106, from the list identified by the received message, the media gateway(s) 4 which it cannot select for the call (as explained above, also at this stage if all media gateways can be selected, no media gateway is removed). It then selects S108, from the list, a media gateway 4 to be used for the call to be established. The second call control node 8 then sends S110, towards the first call control node 6, a message identifying the selected media gateway 4. The message is sent S110, by the second node 8, on the portion 2b of the communication network 2.

While the message identifying the selected media gateway 4 is sent by the second call control node 8 towards the first call control node 6, the message is first received by the third call control node 7. The third node 7 receives S122 the message identifying the selected media gateway 4, and selects S124, as media gateway to be used for the call to be established, the media gateway 4 identified in the received

message. It then forwards S126, towards the first call control node 6, the message identifying the selected media gateway 4. The message is sent on the portion 2a of the communication network 2.

The first call control node 6 receives S112 the message identifying the selected media gateway 4 and completes S114, or attempts to complete, the call to be established using the selected media gateway 4 identified in the received message.

The call can therefore be established by taking into account the constraints of the first, second and third call control nodes 6, 8, 7. While Figs. 8a and 8b illustrate an embodiment wherein one intermediary call control node 7 is used, more than one intermediary call control nodes may participate in establishing a call. A first intermediary call control node (where no intermediary call control node exists on a path between a first and a second call control nodes 6, 8) or an additional intermediary call control node (where one or more intermediary call control nodes already exist on a path between a first and a second call control nodes 6, 8) may be added at any time within the communication network 2, without the need to modify the first or second call control nodes (or any already existing intermediary call control node, if any).

When used herewith, the word "towards" in expressions such as "sending a message towards a destination node" or the like does not exclude one or more transitions of the message through intermediary nodes before reaching the destination node. Cases where the message does not reach the destination node for any reasons (e.g. communication failure), while sent towards it, are neither excluded. Likewise, the word "from" in expressions such as "receiving a message from a source

node" or the like does not exclude one or more transitions of the message through intermediary nodes between the transmission of the message by the source node and the step of receiving the message.

Fig. 9 illustrates a method according to one embodiment of the invention.

This embodiment of the invention provides a procedure to negotiate between call control nodes the media gateway nodes that can be used in a call. This negotiation procedure S100 provides the opportunity for one or more subsequent call control nodes to agree on a common media gateway node. Such a selection improves the usage of resources in the network.

A call control node 6 that sends a call setup message (e.g. IAM in BICC) in forward direction adds, to this message, a list of at least two media gateway nodes 4 which are eligible for the call.

Any subsequent call control node 7, 8 removes, from the list, the media gateway nodes 4 which the call control node 7, 8 cannot select for the call. No media gateway node 4 is removed if they can all be selected. A call control node that does not control any media gateway (e.g. a call mediation node) transparently transfers the list as well.

A call control node that has to establish the user plane, for example because an announcement has to be played, selects a media gateway node from the negotiated list of media gateway nodes. The identifier of the selected media gateway node 4 is sent in backward direction giving the preceding call control

node 6, 7 the opportunity to select the same media gateway node 4.

More specifically, Fig. 9 illustrates the media gateway node selection or negotiation.

Instead of sending a list of media gateway node identifiers, it is possible to send as well an identifier for a group of media gateway nodes 4. In case an intermediate node 7 wants to remove an identifier BCU-ID from this list, which is in fact in this case an identifier for a group of media gateway nodes 4, it has to select a new identifier representing this modified list of identifiers BCU-IDs.

In one embodiment, the method of the invention is applicable when a media gateway node 4 is selected by a succeeding call control node 4 first, for example in BICC using forward bearer setup procedure. For the following discussion with reference to Fig. 9, it is assumed that a forward bearer setup is used.

The naming of the nodes 4, lists and other items is taken from Fig. 1.

A call control node CCN_{org} 6, herewith referred to as originating call control node CCN_{org} 6 (which corresponds to the first call control node 6, as previously described), starts the media gateway node negotiation or selection and is configured to perform the following steps:

Step (1): The originating call control node CCN_{org} 6 builds a list of identifiers of media gateway (MG) nodes that can be used to establish the call. The list is herewith referred to

as BCU-ID $list_{org}$. This is illustrated by the word balloon associated with the surrounded reference 1 and the label "Build list (BCU-ID $list_{org}$) of identifiers associated to MG nodes applicable to the call". The list is added to the call setup message, which is sent to the next call control node (CCN). This is illustrated by the arrow associated with the surrounded reference 2 and the label "IAM (BCU-ID $list_{org}$)". The next call control node is either an intermediate call control node CCN_{tran} or a terminating call control node CCN_{term}.

Step (2): When the originating call control node CCN_{org} 6 receives a backward message, as illustrated by the arrow associated with the surrounded reference 9 and the label "APM (BCU-ID_{back-2})", then

Step (2.1): If the message includes a media gateway node identifier BCU-ID_{back-2}, the originating call control node CCN_{org} 6 validates if the identifier is specified in the original list BCU-ID $list_{org}$.

Step (2.1.1): If the received identifier is specified in the original list, the originating call control node CCN_{org} 6 selects this media gateway node 4 for call establishment. This is illustrated by the word balloon associated with the surrounded reference 10 and the label "Accept BCU-ID_{back} if it was sent in BCU-ID $list_{org}$".

Step (2.1.2): Otherwise, the originating call control node CCN_{org} 6 selects for call establishment any media gateway node 4 from the original list BCU-ID $list_{org}$.

Step (2.2): If the message does not include a media gateway node identifier, the originating call control node CCN_{org} 6 selects, for call establishment, any one of the media gateway nodes 4 from the original list BCU-ID $list_{org}$. In one embodiment, receiving a backward message without a media gateway identifier is not allowed and may lead to a setup failure.

For example, if the BICC protocol is used as call control protocol, the list BCU-ID $list_{org}$ is added to the initial addressing message (IAM) message. The received identifier $BCU\text{-}ID_{back}$ is received in an acknowledge path message (APM) message.

In one embodiment, a call control node (call mediation node, not illustrated) that does not control media gateway nodes transparently transfers the list of media gateway node identifiers.

A call control node that transfers the call setup message but has to select a media gateway node for the call is referred to as an intermediary call control node CCN_{trans} (which corresponds to the third call control node 7, as previously described). Such call control node 7 performs the following steps:

Step (1): The intermediary call control node CCN_{trans} 7 receives a call setup message (e.g. initial addressing message (IAM) message in BICC). This is illustrated by the arrow associated with the surrounded reference 2 and the label "IAM (BCU-ID $list_{org}$)".

Step (1.1): If this message includes a list of media gateway node identifiers BCU-ID $list_{org}$, the intermediary call control node CCN_{trans} 7 performs the following steps:

Step (1.1.1): The intermediary call control node CCN_{trans} 7 removes from the list any unknown identifier BCU-ID. If all media gateway node identifiers BCU-ID are known, no identifier is removed.

Step (1.1.2): The intermediary call control node CCN_{trans} 7 removes from the list any identifier BCU-ID that is associated to a media gateway node 4 that cannot be used for the call by the intermediary call control node CCN_{trans} 7. If all media gateway node identifiers BCU-ID can be used, no identifier is removed.

Steps (1.1.1) and (1.1.2) are illustrated by word balloon associated with the surrounded reference 3 and the label "Remove any unknown identifier. Remove any identifier associated to a MG node not applicable for the call".

Step (1.1.3): The intermediary call control node CCN_{trans} 7 processes the remaining list BCU-ID $list_{trans}$ as follows:

Step (1.1.3.1): If there is at least one element left in the list, the intermediary call control node CCN_{trans} 7 forwards the list BCU-ID $list_{trans}$ in the call setup message IAM sent to the succeeding call control node. This is

illustrated by the arrow associated with the surrounded reference 4 and the label "IAM (BCU-ID $list_{tran}$)".

Step (1.1.3.2): If the list is empty, the intermediary call control node CCN_{trans} 7 starts media gateway node negotiation towards the succeeding call control node. The intermediary call control node CCN_{trans} 7 builds and sends a BCU-ID list as described for the originating call control node CCN_{org}. In other words, the intermediary call control node CCN_{trans} 7 acts as originating call control node CCN_{org} in that case.

Step (1.2): If the received call setup message does not include a list of media gateway node identifiers BCU-ID $list_{org}$, the intermediary call control node CCN_{trans} 7 starts media gateway node negotiation as described above for the originating call control node CCN_{org} 6. In other words, also in this case, the intermediary call control node CCN_{trans} 7 acts as if it was an originating call control node CCN_{org}.

Step (2): When the intermediary call control node CCN_{trans} 7 receives a backward message, as illustrated by the arrow associated with the surrounded reference 7 and the label "APM (BCU-ID_{back-1})", it performs the following steps:

Step (2.1): If the message includes a media gateway node identifier BCU-ID_{back-1}, the intermediary call control node CCN_{trans} 7 validates if the identifier is specified in the previously forwarded list (BCU-ID $list_{trans}$).

Step (2.1.1): If the received identifier is specified in the forwarded list BCU-ID $list_{trans}$, the intermediary call control node CCN_{trans} 7 selects the media gateway node 4 for call establishment. This is illustrated by the word balloon associated with the surrounded reference 8 and the label "Accept $BCU\text{-}ID_{back}$ if it was sent in BCU-ID $list_{trans}$".

Step (2.1.2): Otherwise, the intermediary call control node CCN_{trans} 7 selects for call establishment any one of the media gateway nodes 4 that are listed in the list of media gateways BCU-ID $list_{trans}$, which was previously sent. In one embodiment, this also applies to the case where the returned media gateway was an element in the list BCU-ID list-tran and step 2.1.1 was executed, but for some reasons it was not possible to select this media gateway (i.e. there was an error during media gateway seizure).

Step (2.2): If the backward message does not include a media gateway node identifier,

Step (2.2.1): The intermediary call control node CCN_{trans} 7 selects for the call establishment any media gateway node 4 that is listed in the list BCU-ID $list_{trans}$, which was previously sent.

In one embodiment, the call setup fails (i.e. is not successfully completed) if the backward message does not identify a media gateway.

Step (2.3): The BCU-ID of the selected media gateway node is passed in backward direction, as illustrated by the arrow associated with the surrounded reference 9 and the label "APM ($BCU\text{-}ID_{back\text{-}2}$)".

A call control node that terminates media gateway node negotiation is referred to as terminating call control node CCN_{term} 8 (which corresponds to the second call control node 8, as previously described). It performs the following steps:

Step (1): The terminating call control node CCN_{term} 8 receives a call setup message (e.g. initial addressing message (IAM) message in BICC). This is illustrated by the arrow associated with the surrounded reference 4 and the label "IAM (BCU-ID $list_{tran}$)".

Step (1.1): If this message includes a list of media gateway node identifiers, the terminating call control node CCN_{term} 8 performs the following steps:

Step (1.1.1): The terminating call control node CCN_{term} 8 removes any unknown media gateway node identifier BCU-ID from the list. If all media gateway node identifiers BCU-ID are known, no identifier is removed.

Step (1.1.2): The terminating call control node CCN_{term} 8 removes any media gateway node identifier BCU-ID from the list that is associated to a media gateway node 4 that cannot be used for the call. If all media gateway node identifiers BCU-ID can be used, no identifier is removed.

Steps (1.1.1) and (1.1.2) are illustrated by the word balloon associated with the surrounded reference 5 and the label "Remove any unknown identifier. Remove any identifier associated to a MG node not applicable for the call".

Step (1.1.3): The terminating call control node CCN_{term} 8 processes the remaining list BCU-ID $list_{trans}$ as follows:

Step (1.1.3.1): If there is at least one element left in the list, the terminating call control node CCN_{term} 8 selects one of them and uses the associated media gateway node 4 to establish the user plane. This is illustrated by the word balloon associated with the surrounded reference 6 and the label "Select any MG from the remaining list (BCU-ID $list_{term}$)".

Step (1.1.3.2): If the list is empty, the terminating call control node CCN_{term} 8 selects any media gateway node 4 that is applicable for the call.

Step (1.1.4): The terminating call control node CCN_{term} 8 sends backwards the BCU-ID of the selected media gateway node (BCU-ID_{back-1}). This is illustrated by the arrow associated with the surrounded reference 7 and the label "APM (BCU-ID_{back-1})"

Step (1.2): If the received call setup message does not include a list of media gateway node identifiers, the terminating call control node CCN_{term} 8 selects any media gateway node that is applicable for the call.

In one embodiment, instead of sending a list of media gateway identifiers BCU-IDs, an identifier for a set or group of media gateway nodes $BCU\text{-}ID_{MGG}$ is sent. The set or group of media gateways may be defined somewhere else. In other words, in this embodiment, the media gateway group identifier is a placeholder for a list of media gateways defined somewhere else. This may imply that

a) a definition for each media gateway shall be known in the call control node;

b) there are one or more definitions of media gateway groups, while each media gateway in a media gateway group belongs to the set of media gateways known in the call control node (defined in a)); and

c) each media gateway group has an associated group identifier.

This kind of media gateway group may be called an explicitly defined media gateway group (MGG).

As an example, let us assume that media gateways MGw-1, MGw-2, MGw-3, ... , MGw-7 are defined in a call control node. Then, the following media gateway groups may for instance be defined:

MGG-1 = {MGw-1, MGw-2, MGw-3};

MGG-2 = {MGw-1, MGw-4, MGw-5}; and

MGG-3 = {MGw-5, MGw-6}.

Such media gateway node negotiation may be introduced in BICC as follows. If BICC is used as call control protocol, an identifier BCU-ID_{MGG} is defined with the same data format as BCU-ID is defined for the BICC protocol (5 octets). This value can be passed over the standard BICC message without any modification. Any node that does not know the value has to ignore this parameter (BICC standard). In nodes that support the usage of BCU-ID_{MGG}, the value is treated as an identifier for a set of media gateway nodes and media gateway node negotiation is performed.

Fig. 10a illustrates a call control node according to an embodiment of the invention. The call control node, herewith referred to as originating or first call control node 6, is configured to participate in establishing a call in a communication network 2 and in negotiating media gateways 4 to be used for the call. The call control node 6 is configured to operate in a control plane and includes a sender 62 configured for sending, towards another call control node 8 (not illustrated in Fig. 10a) in the control plane, a message identifying a list of at least two media gateways 4 considered eligible for the call to be established.

Fig. 10b illustrates a call control node according to an embodiment of the invention. Besides comprising a sender 62 as described with reference to Fig. 10a, the call control node 6 includes a receiver 64 configured for receiving a message identifying a selected media gateway 4, and a completor 66 configured for completing, or attempting to complete, the call to be established using the selected media gateway 4 identified in the received message.

Fig. 11 illustrates a call control node according to an embodiment of the invention. The call control node is herewith referred to as terminating or second call control node 8. It is configured to participate in establishing a call in a communication network 2. The terminating call control node 8 is configured to operate in a control plane and includes a receiver 82, a remover 84, a selector 86 and a sender 88. The receiver 82 is configured for receiving, from another call control node 6 or 7 (not illustrated in Fig. 11) in the control plane, a message identifying a list of at least two media gateways 4. The remover 84 is configured for removing from the list identified by the received message, the media gateways 4 which the call control node 8 cannot select for the call. The selector 86 is configured for selecting, from the list, a media gateway to be used for the call to be established. The sender 88 is configured for sending, towards the other call control node 6 or 7, a message identifying the selected media gateway 4.

Fig. 12a illustrates a call control node according to an embodiment of the invention. The call control node is herewith referred to as intermediate or third call control node 7. The call control node 7 includes a receiver 72, a remover 73 and a forwarder 74. The receiver 72 is configured for receiving a message sent from a first other call control node 6 (not illustrated in Fig. 12a), or another intermediary call control node 7 (not illustrated in Fig. 12a), in the control plane towards a second other call control node 8 (not illustrated in Fig. 12a), or another intermediary call control node 7 (not illustrated in Fig. 12a), in the control plane, wherein the message identifies a list of at least two media gateways. The remover 73 is configured for removing, from the list identifier by the received message, the media

gateways 4 which the call control node 7 cannot select for the call. If all media gateways can be selected, no media gateway identifier is removed from the list. If only one media gateway from the list can be selected, the list is left with one element. If no media gateway from the list can be selected, the list is empty and a new list of media gateways may be created based on the constraints of the call control node 7. Finally, the forwarder 74 is configured for forwarding, towards the second other call control node 8, a message identifying the list.

Fig. 12b illustrates an intermediate call control node 7 including the functionalities of the call control node of Fig. 12a and a receiver 75, a selector 76 and a forwarder 77. The receiver 75 is configured for receiving a message sent towards a first other call control node 6 (not illustrated in Fig. 12b), or towards another intermediary call control node 7 (not illustrated in Fig. 12b), in the control plane by a second other call control node 8 (not illustrated in Fig. 12b), or by another intermediary call control node 7 (not illustrated in Fig. 12a), in the control plane. The message identifies a selected media gateway. The selector 76 is configured for selecting, as a media gateway to be used for the call to be established, the media gateway 4 identified in the received message. Finally, the forwarder 77 is configured for forwarding, towards the first other call control node 6, the message identifying the selected media gateway 4.

The physical entities according to the invention, including the call control nodes and the media gateways may comprise or store computer programs including instructions such that, when the computer programs are executed on the physical entities, steps and procedures according to one embodiment of

the invention are carried out. The invention also relates to such computer programs for carrying out methods according to the invention, and to any computer-readable medium storing the computer programs for carrying out methods according to the invention.

Where the terms "sender", "receiver", "completor", "remover", "selector", and "forwarder" are used herewith, no restriction is made regarding how distributed these elements of a call control node may be and regarding how gathered elements may be. That is, the constituent elements of a unit may be distributed in different software or hardware components or devices for bringing about the intended function. A plurality of distinct elements may also be gathered for providing the intended functionalities.

Any one of the above-referred elements of a call control node may be implemented in hardware, software, field-programmable gate array (FPGA), application-specific integrated circuit (ASICs), firmware or the like.

In further embodiments of the invention, any one of the above-mentioned and/or claimed sender, receiver, completor, remover, selector and forwarder is replaced by sending means, receiving means, completing means, removing means, selecting means or forwarding means respectively, or by a sending unit, a receiving unit, a completing unit, a removing unit, a selecting unit or a forwarding unit respectively, for performing the functions of the sender, receiver, completor, remover, selector or forwarder respectively.

In further embodiments of the invention, any one of the above-described procedures, portions of procedure and/or

steps may be implemented using computer-readable instructions, for instance in the form of computer-understandable procedures, methods or the like, in any kind of computer languages, and/or in the form of embedded software on firmware, integrated circuits or the like.

Although the present invention has been described on the basis of detailed examples, the detailed examples only serve to provide the skilled person with a better understanding, and are not intended to limit the scope of the invention. The scope of the invention is much rather defined by the appended claims.

Claims

1. Method for establishing a call in a communication network (2) by selecting media gateways (4) to be used for the call, the media gateways (4) being in a user plane, the method including a negotiating procedure (S100) provided at least with steps wherein

a first call control node (6) in a control plane sends (S102), towards a second call control node (8) in the control plane, a message identifying a list of at least two media gateways (4) considered eligible for the call to be established.

2. Method of claim 1, wherein sending (S102) the message by the first call control node (6) towards the second call control node (8) is in the forward direction, which is the direction of establishment of the call connection.

3. Method of claim 1 or 2, wherein the negotiating procedure (S100) is further provided with steps wherein the second call control node (8)

receives (S104) the message from the first call control node (6);

removes (S106), from the list identified by the received message, the media gateways (4) which the second call control node (8) cannot select for the call;

selects (S108), from the list, a media gateway (4) to be used for the call to be established; and

sends (S110), towards the first call control node (6), a message identifying the selected media gateway (4).

4. Method of claim 3, wherein the negotiating procedure (S100) is further provided with steps wherein the first call control node (6)

receives (S112) the message identifying the selected media gateway (4); and

completes (S114), or attempts to complete, the call to be established using the selected media gateway (4) identified in the received message.

5. Method according to any one of the preceding claims, wherein the negotiating procedure (S100) is further provided with steps wherein a third call control node (7)

receives (S116) the message sent by the first call control node (6) sent towards the second call control node (8);

removes (S118), from the list identified by the received message, the media gateways (4) which the third call control node (7) cannot select for the call; and

forwards (S120), towards the second call control node (8), a message identifying the list.

6. Method, performed by a call control node (6) in a control plane, for participating in establishing a call in a communication network (2) by selecting media gateways (4) to be used for the call, the media gateways (4) being in a user plane, the method including a negotiating procedure (S600) provided at least with steps wherein

the call control node (6) sends (S102), towards another call control node (8) in the control plane, a message identifying a list of at least two media

gateways (4) considered eligible for the call to be established.

7. Method of claim 6, wherein sending (S102) the message by the call control node (6) towards the other call control node (8) is in the forward direction, which is the direction of establishment of the call connection.

8. Method of claim 6 or 7, wherein the negotiating procedure (S600) is further provided with steps wherein the call control node (6)

receives (S112) a message identifying a selected media gateway; and

completes (S114), or attempts to complete, the call to be established using the selected media gateway (4) identified in the received message.

9. Method, performed by a call control node (8) in a control plane, for participating in establishing a call in a communication network (2) by selecting media gateways (4) to be used for the call, the media gateways (4) being in a user plane, the method including a negotiating procedure (S800) provided at least with steps wherein the call control node (8)

receives (S104), from another call control node (6) in the control plane, a message identifying a list of at least two media gateways (4);

removes (S106), from the list identified by the received message, the media gateways (4) which the call control node (8) cannot select for the call;

selects (S108), from the list, a media gateway (4) to be used for the call to be established; and

sends (S110), towards the other call control node (6), a message identifying the selected media gateway (4).

10. Method, performed by a call control node (7) in a control plane, for participating in establishing a call in a communication network (2) by selecting media gateways (4) to be used for the call, the media gateways (4) being in a user plane, the method including a negotiating procedure (S710) provided at least with steps wherein the call control node (7)

receives (S116) a message sent from a first other call control node (6) in the control plane towards a second other call control node (8) in the control plane, the message identifying a list of at least two media gateways (4);

removes (S118), from the list identified by the received message, the media gateways (4) which the call control node (7) cannot select for the call; and

forwards (S120), towards the second other call control node (8), a message identifying the list.

11. Call control node (6) configured to participate in establishing a call in a communication network (2) and in negotiating media gateways (4) to be used for the call, the media gateways (4) being in a user plane, the call control node (6) being configured to operate in a control plane and including

a sender (62) configured for sending, towards another call control node (8) in the control plane, a message identifying a list of at least two media gateways (4) considered eligible for the call to be established.

12. Node (6) of claim 11, further including

a receiver (64) configured for receiving a message identifying a selected media gateway (4); and

a completor (66) configured for completing, or attempting to complete, the call to be established using the selected media gateway (4) identified in the received message.

13. Call control node (8) configured to participate in establishing a call in a communication network (2) and in negotiating media gateways (4) to be used for the call, the media gateways (4) being in a user plane, the call control node (8) being configured to operate in a control plane and including

a receiver (82) configured for receiving, from another call control node (6) in the control plane, a message identifying a list of at least two media gateways (4);

a remover (84) configured for removing, from the list identified by the received message, the media gateways (4) which the call control node (8) cannot select for the call;

a selector (86) configured for selecting, from the list, a media gateway to be used for the call to be established; and

a sender (88) configured for sending, towards the other call control node (6), a message identifying the selected media gateway (4).

14. Call control node (7) configured to participate in establishing a call in a communication network (2) and in negotiating media gateways (4) to be used for the

call, the media gateways (4) being in a user plane, the call control node (7) being configured to operate in a control plane and including

a receiver (72) configured for receiving a message sent from a first other call control node (6) in the control plane towards a second other call control node (8) in the control plane, the message identifying a list of at least two media gateways (4);

a remover (73) configured for removing, from the list identified by the received message, the media gateways (4) which the call control node (7) cannot select for the call; and

a forwarder (74) configured for forwarding, towards the second other call control node (8), a message identifying the list.

15. Computer program comprising instructions configured, when executed on a call control node (6, 7, 8), to cause the call control node (6, 7, 8) to carry out the method according to any one of claims 6 to 10.

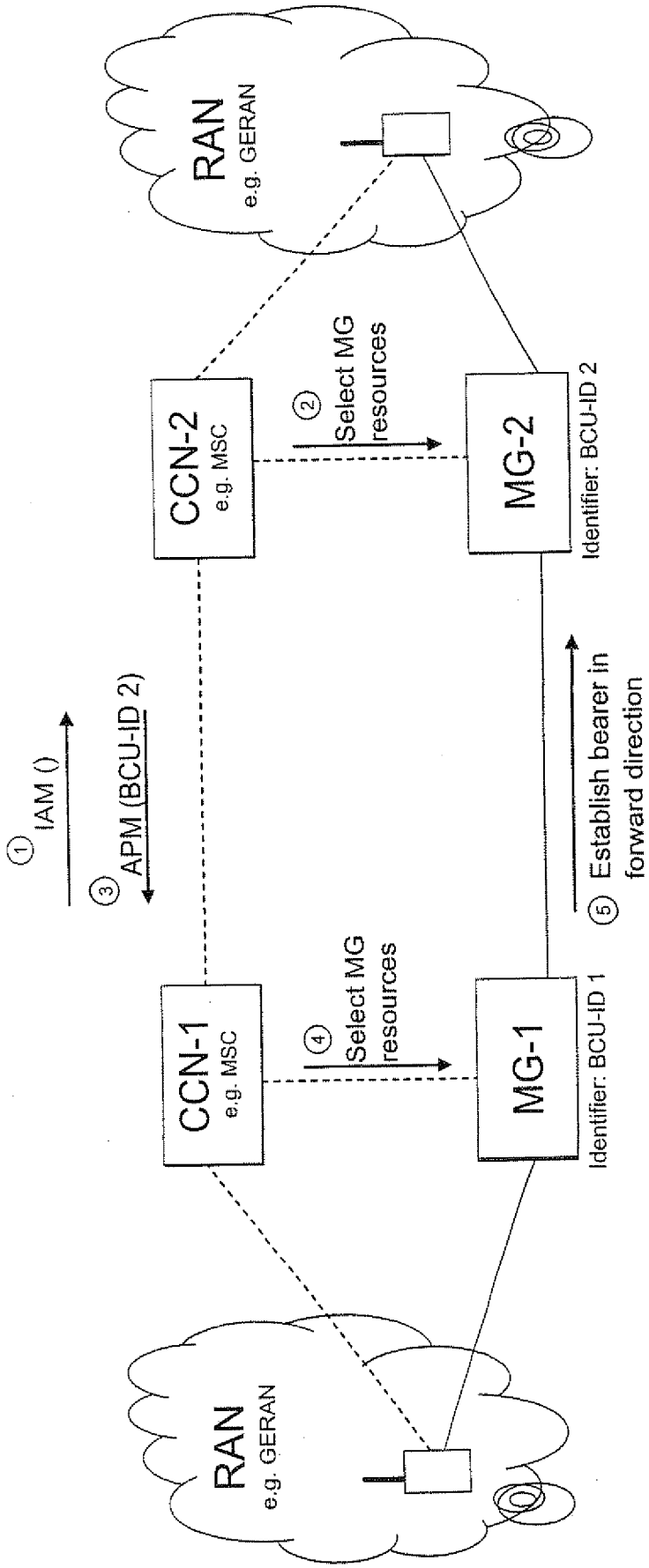
RAN
e.g. GERAN
CCN-2
e.g. MSC
② Select MG resources
MG-2
Identifier: BCU-ID 2
① IAM ()
③ APM (BCU-ID 2)
⑤ Establish bearer in forward direction
CCN-1
e.g. MSC
④ Select MG resources
MG-1
Identifier: BCU-ID 1
RAN
e.g. GERAN
Signaling Plane
User Plane

Fig. 1

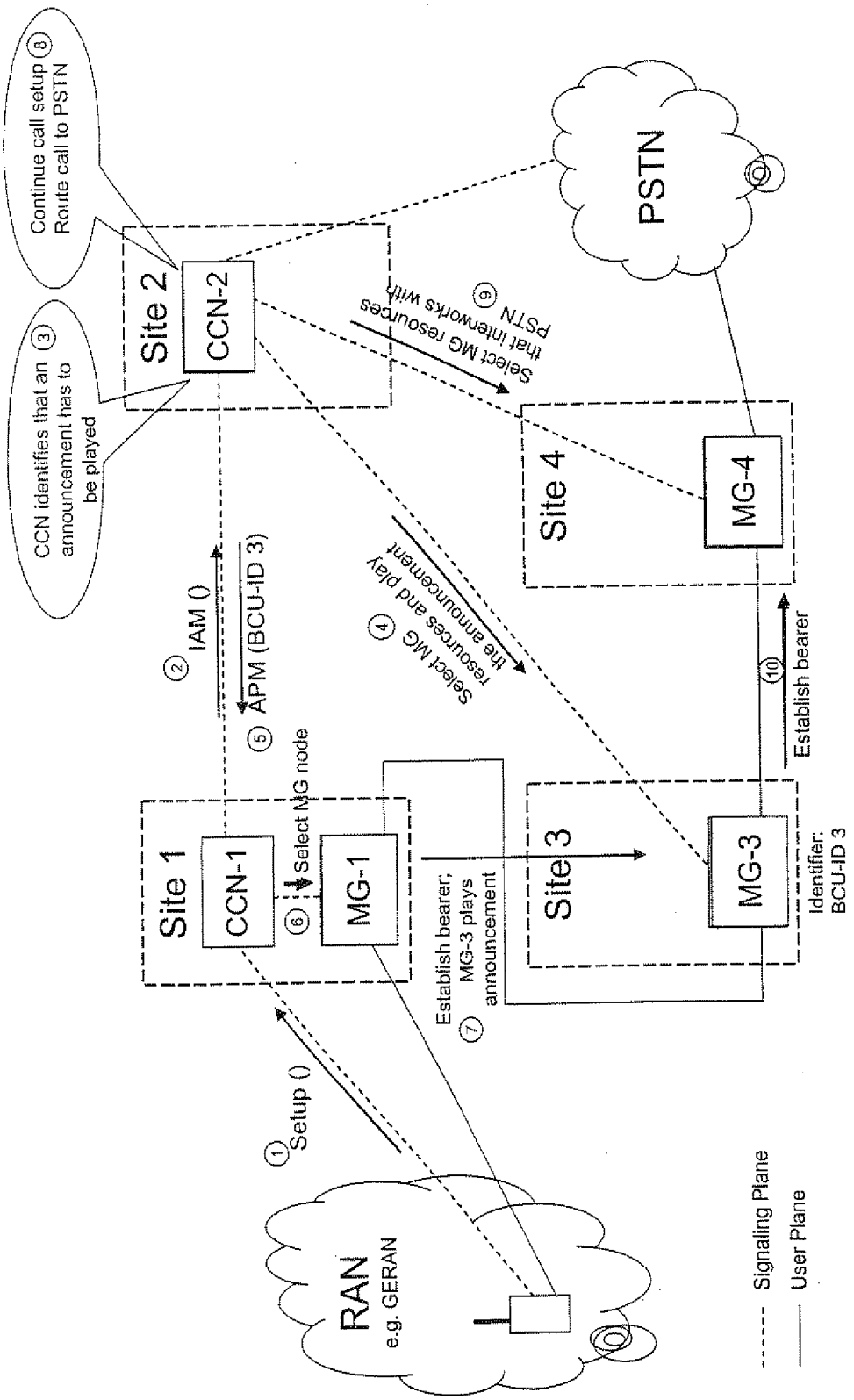
Continue call setup ⑧
Route call to PSTN
CCN identifies that an ③ announcement has to be played
Site 2
CCN-2
PSTN
⑨ Select MG resources that interworks with PSTN
Site 4
MG-4
② IAM ()
⑤ APM (BCU-ID 3)
④ Select MG resources and play the announcement
⑩ Establish bearer
Site 1
CCN-1
⑥ Select MG node
MG-1
Site 3
MG-3
Establish bearer; MG-3 plays announcement ⑦
Identifier: BCU-ID 3
① Setup ()
RAN
e.g. GERAN
Signaling Plane
User Plane

Fig. 2

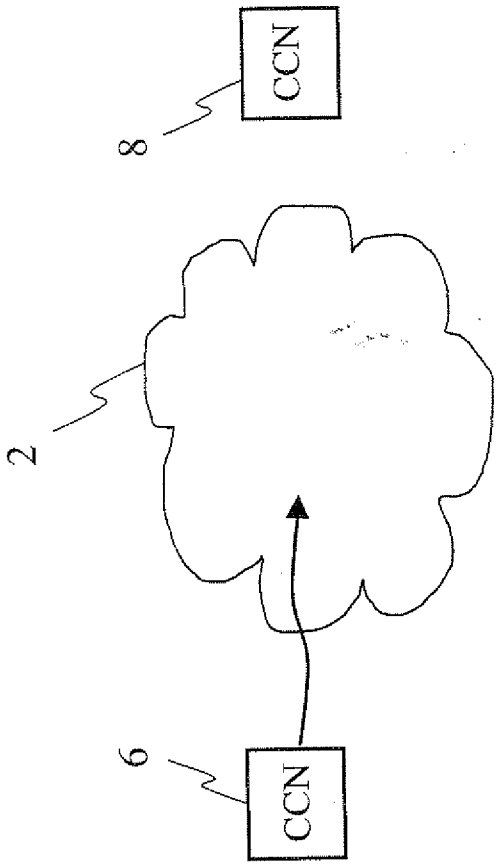
8
CCN
2
6
CCN

Fig. 3b

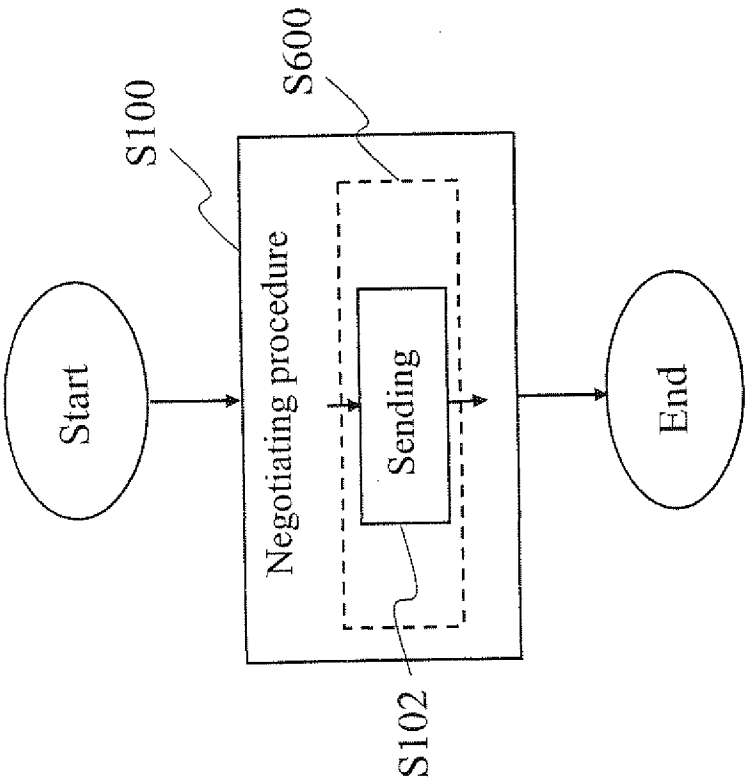
S600
S100
Start
Negotiating procedure
Sending
End
S102

Fig. 3a

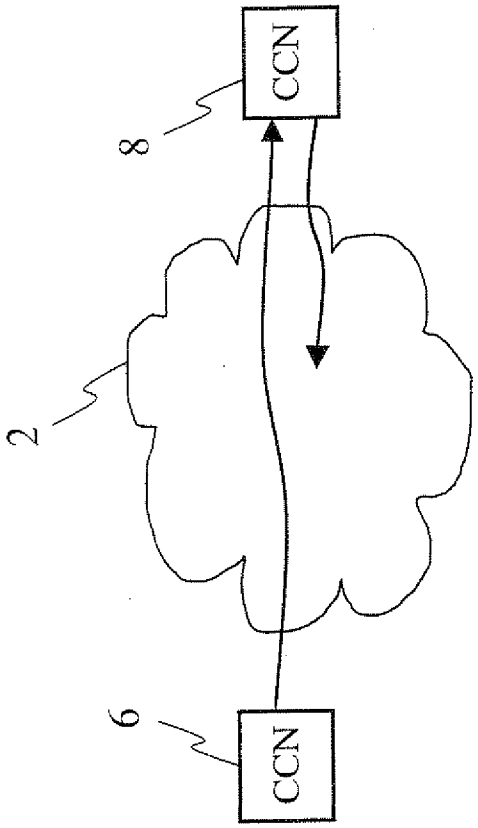
CCN
8
2
6
CCN

Fig. 4b

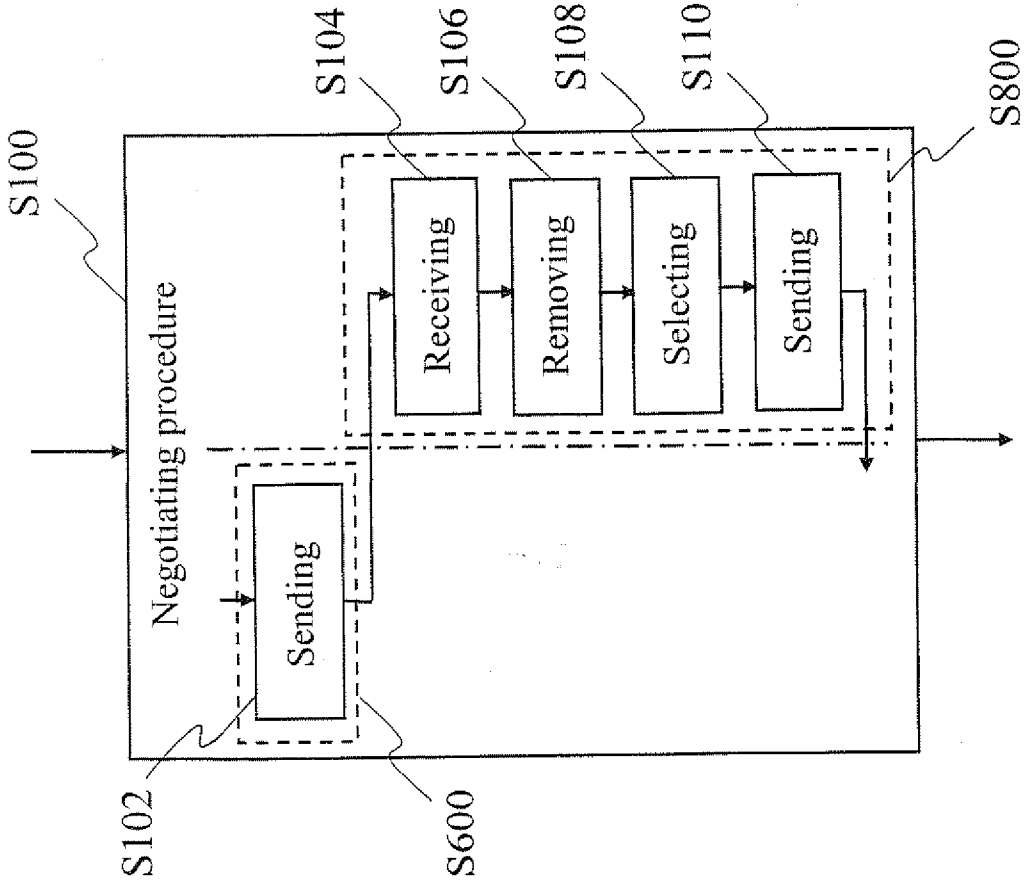
S100
S104
S106
S108
S110
S800
Receiving
Removing
Selecting
Sending
Negotiating procedure
Sending
S102
S600

Fig. 4a

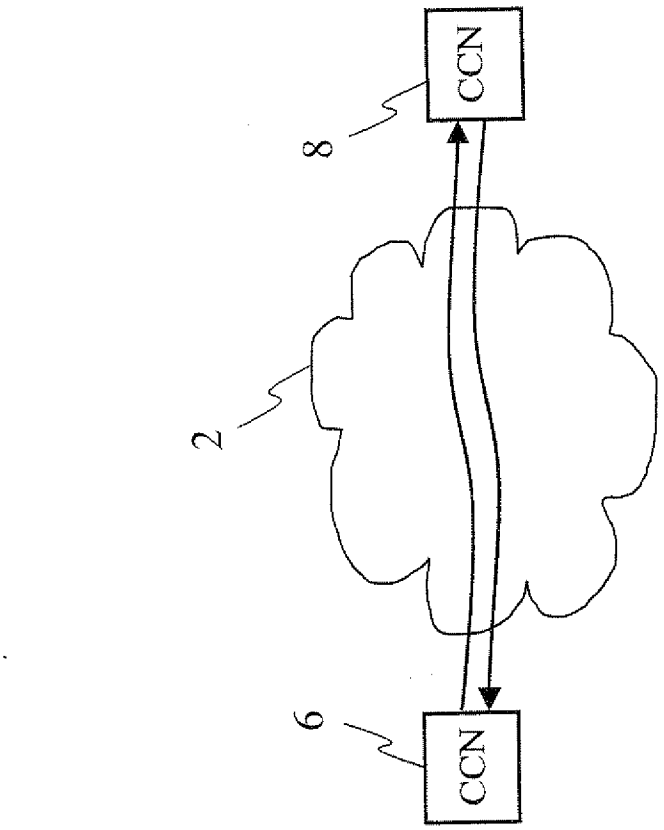
8
CCN
2
6
CCN

Fig. 5b

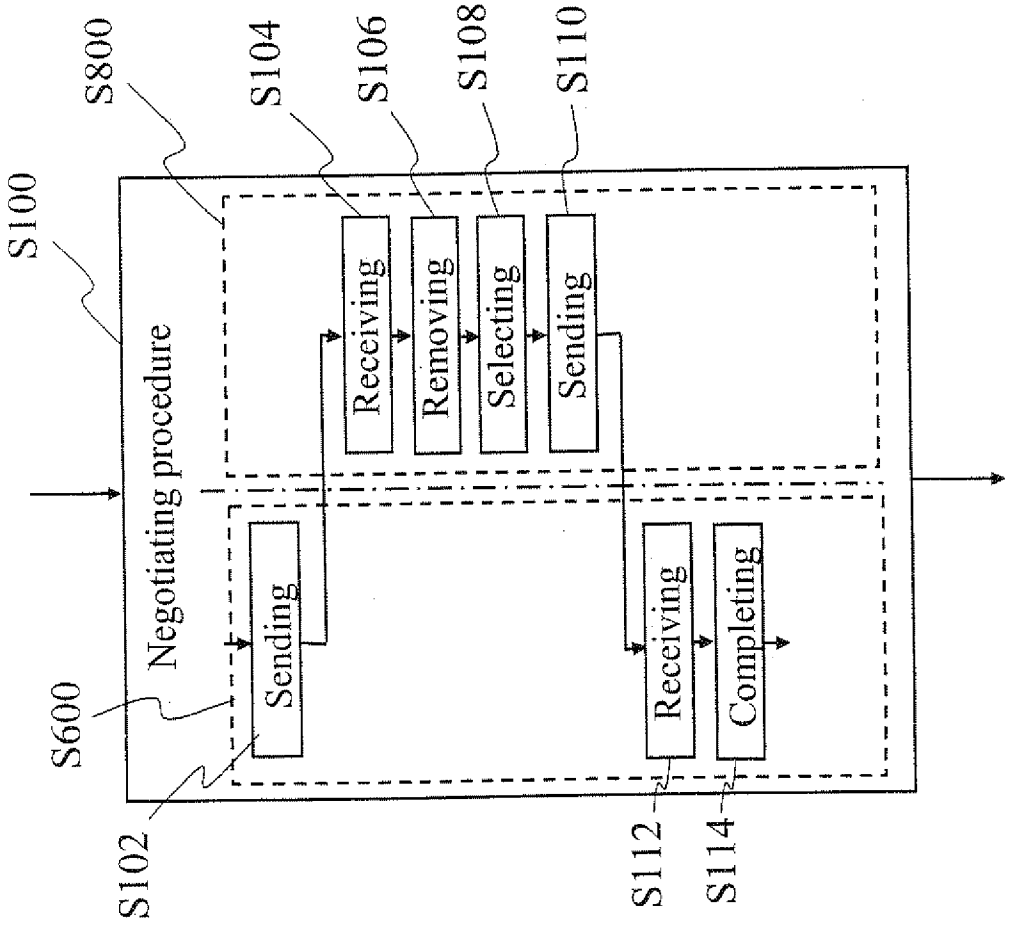
S100
S800
S104
S106
S108
S110
Negotiating procedure
Receiving
Removing
Selecting
Sending
S600
Sending
Receiving
Completing
S102
S112
S114

Fig. 5a

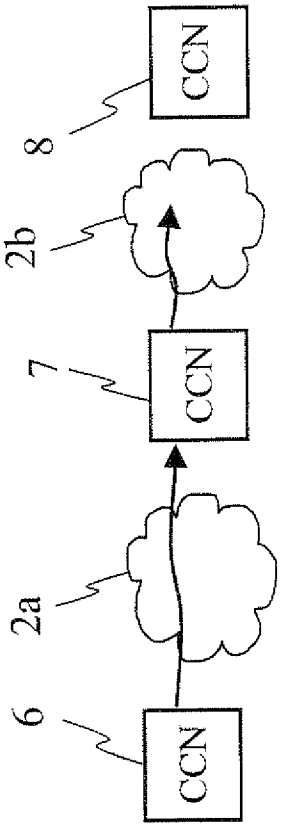
CCN
6
2a
CCN
7
2b
CCN
8

Fig. 6b

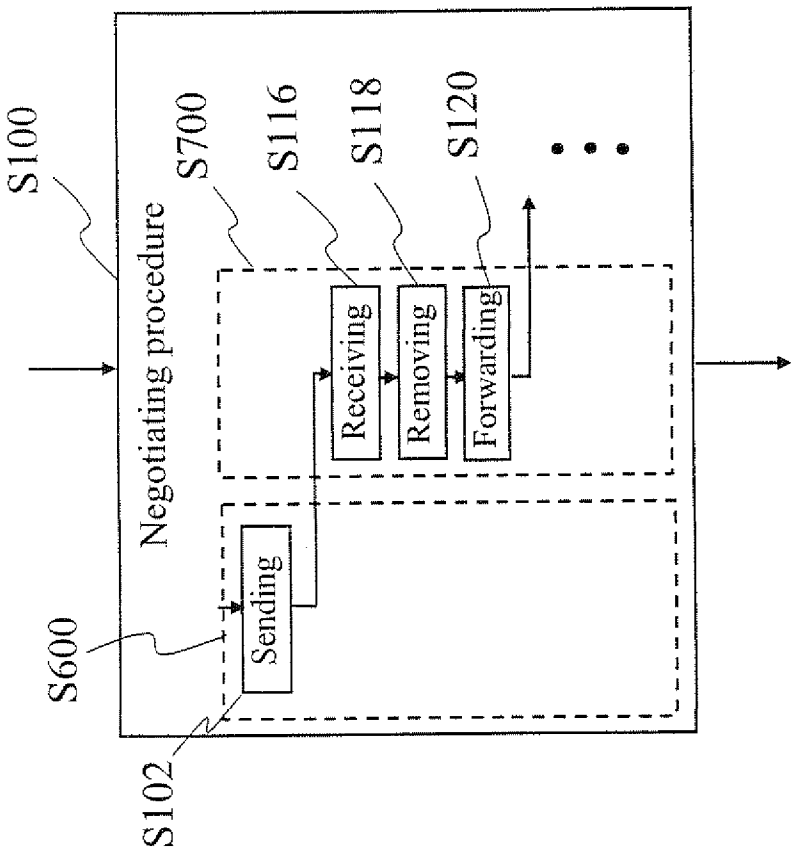
S100
Negotiating procedure
S700
S116
S118
S120
Receiving
Removing
Forwarding
Sending
S600
S102

Fig. 6a

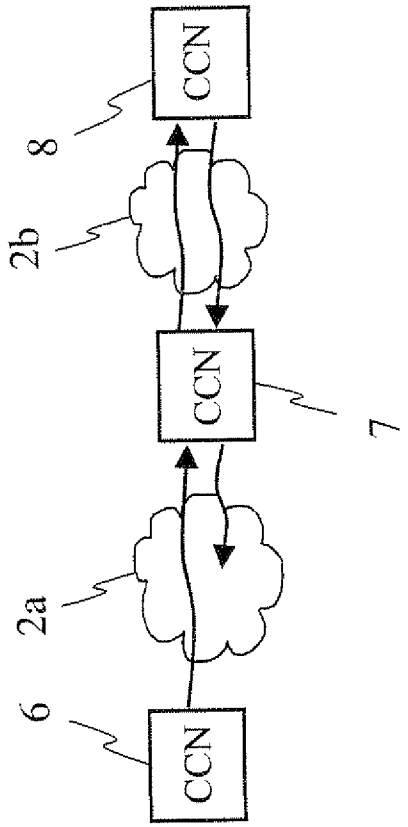
CCN
8
2b
CCN
7
2a
6
CCN

Fig. 7b

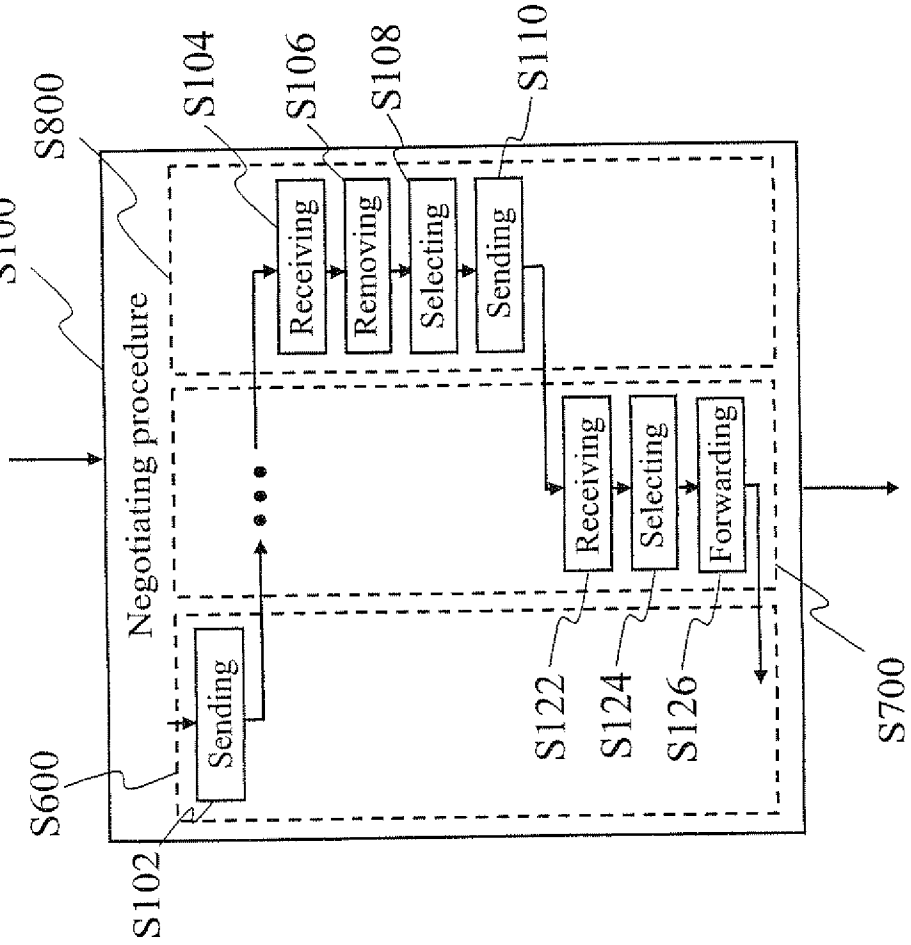
S800
S104
S106
S108
S110
S100
Receiving
Removing
Selecting
Sending
Negotiating procedure
Receiving
Selecting
Forwarding
Sending
S600
S102
S122
S124
S126
S700

Fig. 7a

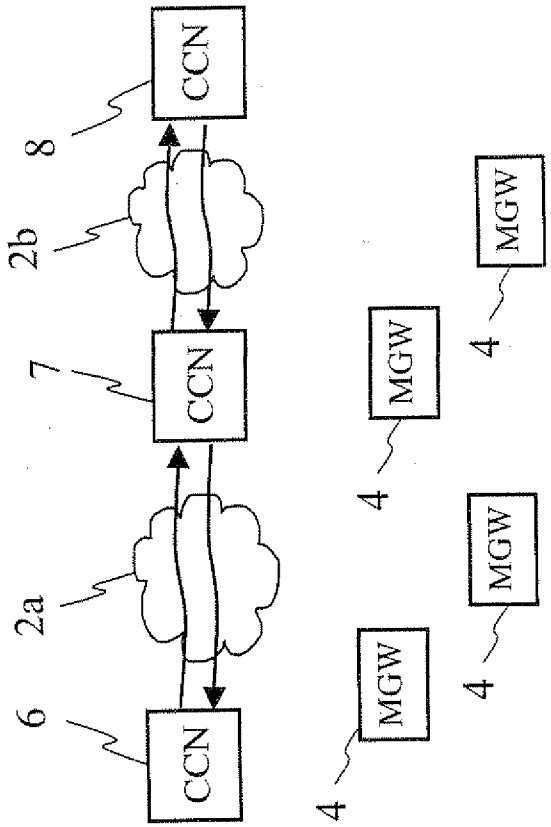
CCN
8
2b
CCN
7
2a
CCN
6
MGW
4
MGW
4
MGW
4
MGW
4

Fig. 8b

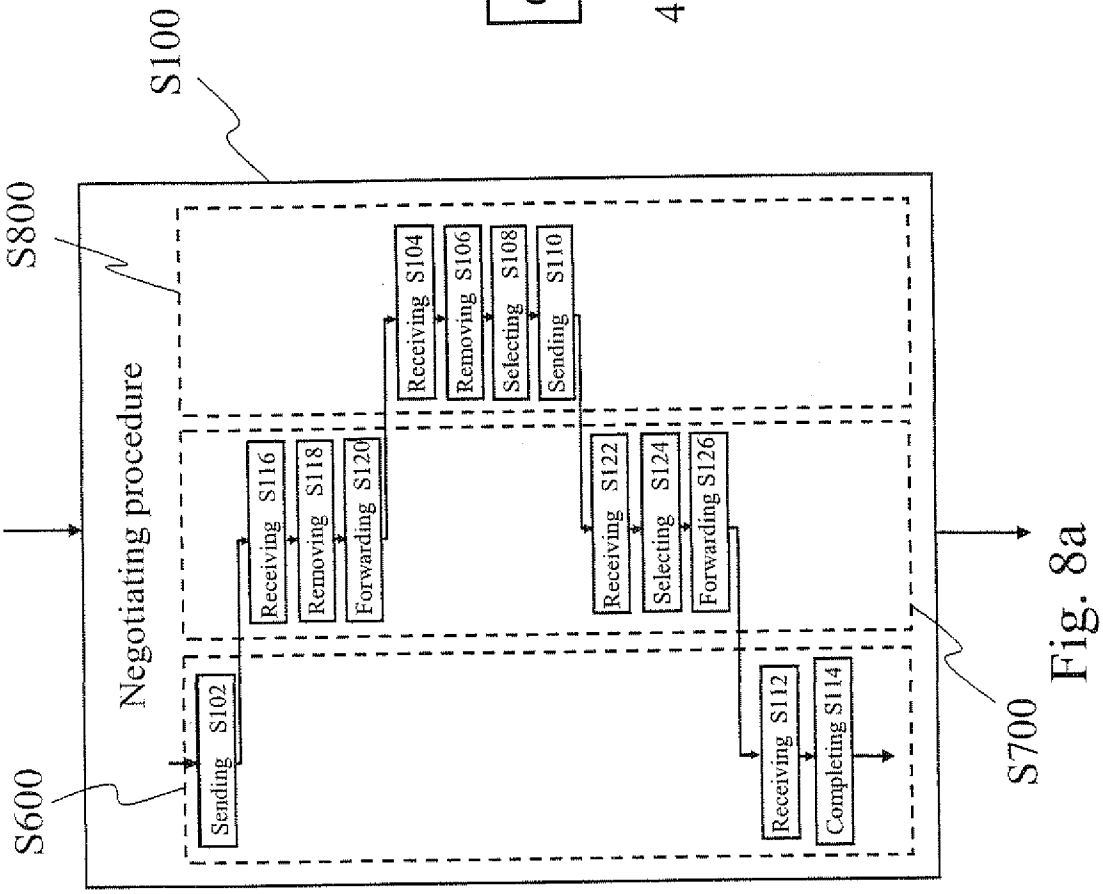
S100
S800
Negotiating procedure
S600
S700
Sending S102
Receiving S104
Removing S106
Selecting S108
Sending S110
Receiving S112
Completing S114
Receiving S116
Removing S118
Forwarding S120
Receiving S122
Selecting S124
Forwarding S126

Fig. 8a

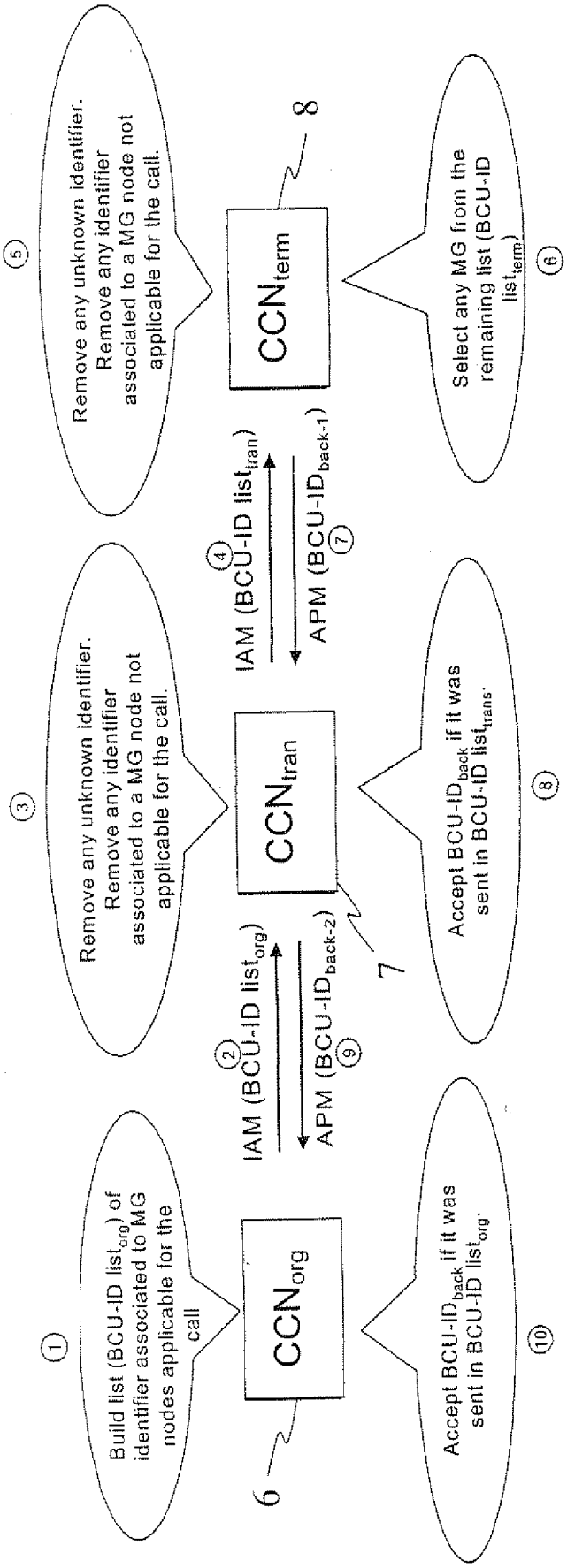
Build list (BCU-ID list$_{org}$) of identifier associated to MG nodes applicable for the call
①
CCN$_{org}$
6
IAM (BCU-ID list$_{org}$)
②
APM (BCU-ID$_{back-2}$)
⑨
Remove any unknown identifier. Remove any identifier associated to a MG node not applicable for the call.
③
CCN$_{tran}$
7
IAM (BCU-ID list$_{tran}$)
④
APM (BCU-ID$_{back-1}$)
⑦
Remove any unknown identifier. Remove any identifier associated to a MG node not applicable for the call.
⑤
CCN$_{term}$
8
Select any MG from the remaining list (BCU-ID list$_{term}$)
⑥
Accept BCU-ID$_{back}$ if it was sent in BCU-ID list$_{trans}$.
⑧
Accept BCU-ID$_{back}$ if it was sent in BCU-ID list$_{org}$.
⑩

Fig. 9

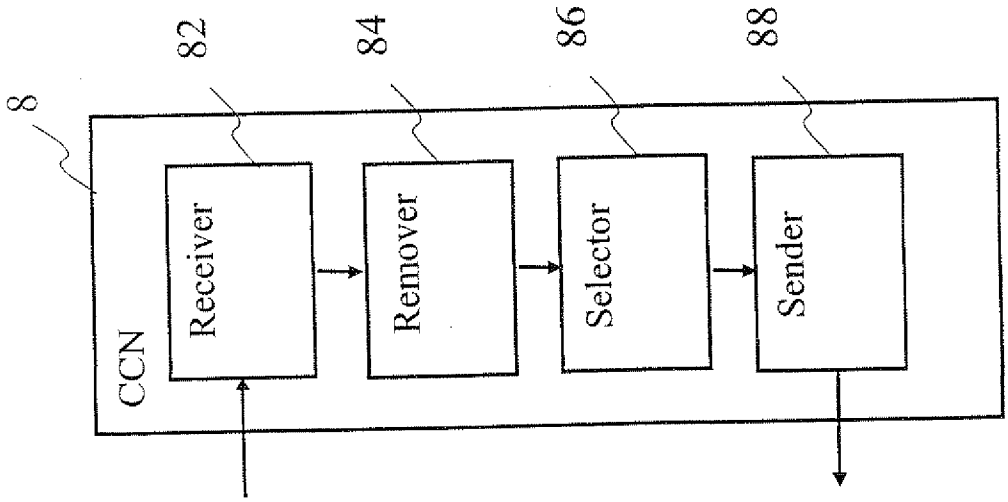

Fig. 11

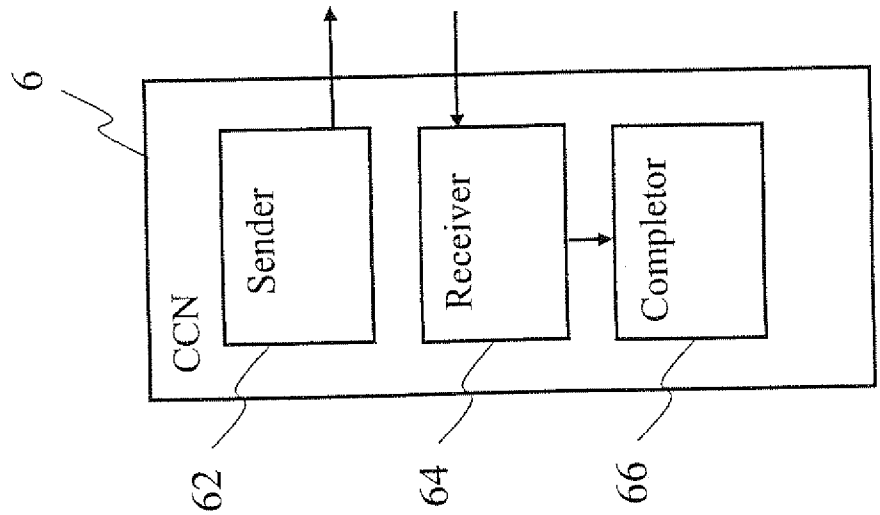

Fig. 10b

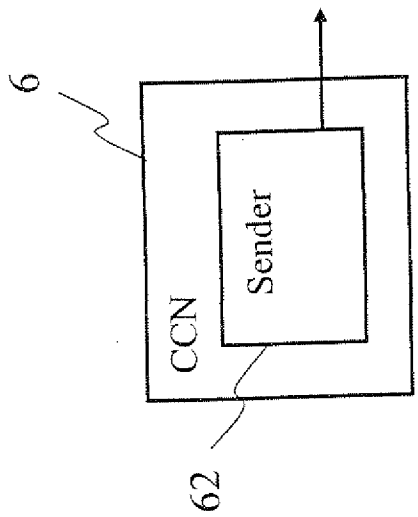

Fig. 10a

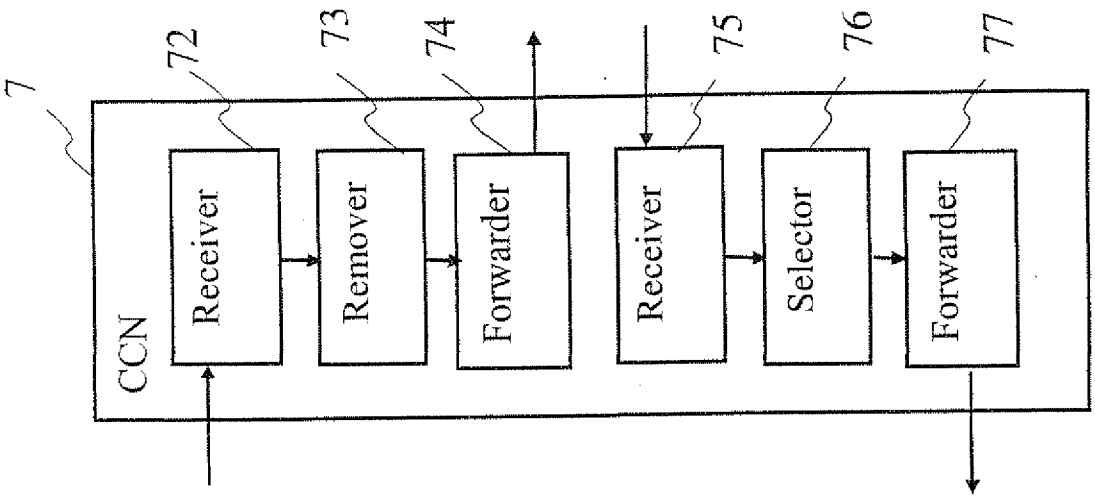

Fig. 12b

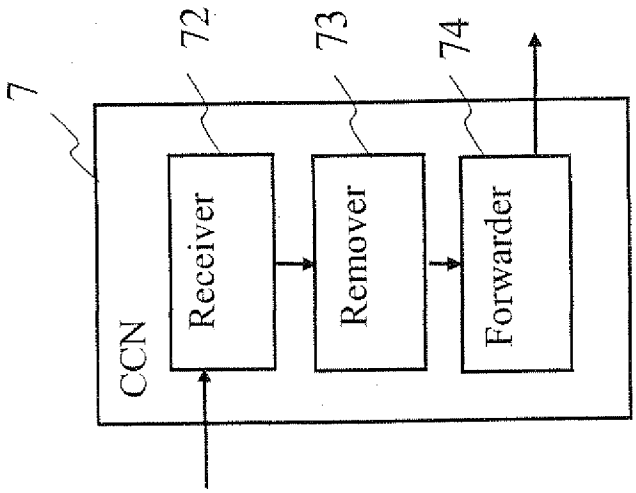

Fig. 12a

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/061975

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06

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

B. FIELDS SEARCHED

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 947 747 B1 (STUEMPERT MARTIN [DE]) 20 September 2005 (2005-09-20) abstract column 2, line 47 - column 3, line 67	1-25
A	US 2002/044547 A1 (DALTON JAMES P G [US] ET AL DALTON JR JAMES P G [US] ET AL) 18 April 2002 (2002-04-18) abstract paragraph [0012] - paragraph [0016] paragraph [0068] - paragraph [0073]	1-25
A	US 2007/053343 A1 (SUOTULA JANNE [FI] ET AL) 8 March 2007 (2007-03-08) paragraph [0011] - paragraph [0018] paragraph [0060] - paragraph [0063]	1-25

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 February 2009	10/02/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Stergiou, Christos

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2008/061975

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6947747 B1	20-09-2005	AT 250838 T	15-10-2003
		AU 6275500 A	13-03-2001
		BR 0013363 A	30-04-2002
		CA 2381622 A1	22-02-2001
		CN 1379961 A	13-11-2002
		DE 60005532 D1	30-10-2003
		DE 60005532 T2	05-08-2004
		WO 0113657 A1	22-02-2001
		EP 1205082 A1	15-05-2002
		JP 2003507945 T	25-02-2003
		MX PA02001535 A	02-07-2002
US 2002044547 A1	18-04-2002	NONE	
US 2007053343 A1	08-03-2007	AT 380428 T	15-12-2007
		CN 1810007 A	26-07-2006
		DE 602004010516 T2	27-11-2008
		EP 1639784 A2	29-03-2006
		WO 2004112415 A2	23-12-2004
		JP 2006527940 T	07-12-2006