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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 July 2009 (16.07.2009)

PCT

(10) International Publication Number
WO 2009/088326 A1

(51) International Patent Classification:
H04Q 7/24 (2006.01) *H04Q 7/30* (2006.01)
H04M 7/00 (2006.01)

(21) International Application Number:
PCT/SE2008/050013

(22) International Filing Date: 7 January 2008 (07.01.2008)

(25) Filing Language: English

(26) Publication Language: English

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(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, 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),

[Continued on next page]

(54) Title: IMPROVED LOCAL SWITCHING IN A CELLULAR SYSTEM

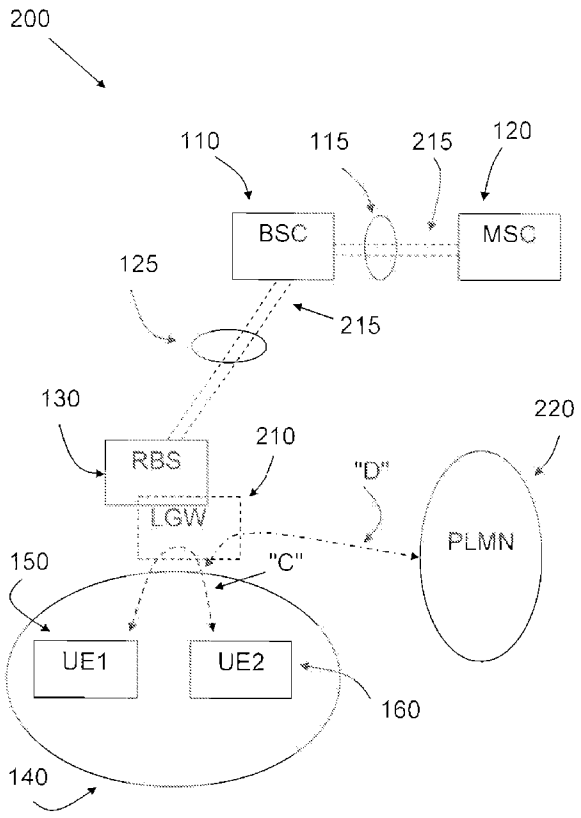

Fig 2

(57) Abstract: A method (500) for use in a cellular system (200), with a Base Station, RBS (130), which controls traffic to and from user equipments (150, 160), in a cell (140), the system (200) in addition comprising a second node(110), for the control of base stations, and a third node, a third node (120), which switches calls to and from user equipments (150, 160) in a cell (140). A call comprises payload information and control information, and the method comprises the use of a logical node or gateway (210, 410), which checks (515) if a call which is made by a UE within a cell also has a UE within the cell as its destination, in which case the LGW (210, 410) ensures (520) that the payload of the call stays within the cell. According to the method, the LGW (210, 410) of a cell is controlled (525) by the MSC of the cell.

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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).

Declarations under Rule 4.17:

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

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report*

TITLE

Improved local switching in a cellular system.

TECHNICAL FIELD

The present invention discloses a method for use in a cellular wireless communications system, in which system there can be at least a first node, a Radio Base Station, RBS, which serves to control traffic to and from user equipments, within a certain area, a cell, in the system. In addition, the system comprises a second node, a Mobile Switching Centre, MSC, which serves to switch calls to and from user equipments in a cell.

BACKGROUND

In a wireless cellular communications system such as, for example, a GSM system, the area which is served by the system is divided into so called cells. In each cell, there can be a plurality of users with user terminals, from now on referred to user equipments or UEs, such as cellular telephones, portable computers etc. Traffic to and from UEs in a cell are controlled by a so called Radio Base Station, an RBS, and the switching of calls to and from a cell is performed by a node in the system which is referred to as a Mobile Switching Centre, MSC.

Obviously, a call between two UEs which are both located within one and the same cell in the system could be handled "within the cell", i.e. routed between the UEs by the RBS of the cell, which would save so called "backhaul transportation" to and from the MSC, thus saving the operator of the system some expenditure. Such a solution is often referred to as "local switching".

However, a problem in this context is that an RBS does not know if a call which is made by a UE in the cell of the RBS has a UE in the same cell as its destination or not.

One solution by means of which "local switching" could be achieved in a cellular communication system disclosed in US patent no 6,958,983 B2, to Musikka et al.

It would be desirable in a cellular wireless communications system to find a solution for local switching which exhibits an even greater ease of implementation.

SUMMARY

Thus, as explained above, there is a need for a solution by means of which local switching in a cellular wireless communications system could be carried out in a way which offers easier implementation than previous solutions.

Such a solution is offered by the present invention in that it discloses a method for use in a cellular wireless communications system, in which system there can be at least a first node, a Radio Base Station, RBS, which serves to control traffic to and from user equipments, within a certain area, a cell, in the system.

In addition, the system in which the invention may be applied also comprises a second node, a Base Station Controller, a BSC, for the control of one or more RBSs, and a third node, a Mobile Switching Centre, MSC, which serves to switch calls to and from UEs in a cell. In the system in which the invention may be applied, a call can comprise payload information and control information.

The inventive method comprises the use of a logical node or gateway, LGW, with the following functions:

- checking if a call which originates within a cell also has a UE within the cell as its destination, i.e. if the call is an "intra-cell "call,
- ensuring, in the case of an intra-cell call, that the payload of the call stays within the cell, i.e. within the RBS and the UEs involved.

According to the inventive method, the control of an LGW of a cell is given to the MSC of the cell.

Since the LGW of a cell is controlled by the MSC of the cell, the LGW will offer ease of implementation. This and other advantages of the invention will become even more apparent from the following detailed description.

In various embodiments of the invention, the LGW of a cell may be located in one or more of the following:

- the RBS of the cell,
- the BSC of the cell,
- at the site of the RBS of the cell, but separate from the RBS.

In one embodiment, an MSC controls an LGW by means of a special control protocol which is tunnelled from the MSC to the LGW. Suitably, the LGW may comprise the following two main functions:

- a function for the call control,
- a function for payload control.

The invention also discloses a logical node or gateway, LGW, which functions essentially according to the inventive method.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail in the following, with reference to the appended drawings, in which

Fig 1 shows a block diagram of a prior art system, and
Fig 2 shows a block diagram of a system in which the invention is used, and
Fig 3 shows a block diagram of a first embodiment of a node of the invention, and

Fig 4 shows a block diagram of a second embodiment of a node of the invention, and

Fig 5 shows a flow chart of the method of the invention, and

Figs 6-8 show event diagrams in a system of the invention.

DETAILED DESCRIPTION

Fig 1 shows an overview of a prior art system 100 in which there could be a need for so called local switching. The system 100 is a wireless cellular communications system, and comprises a number of so called cells, one of which, 140, is shown by way of example. It should be pointed out that the invention can be applied in a wide variety of wireless cellular systems, but will be described below with terms used in the GSM system. However, the use of GSM terminology is merely intended to serve as an example of one of many possible systems in which the invention may be used. Thus, for example, the term Radio Base Stations or RBS should be seen as a generic reference to a node which in some other systems is known as NodeB or eNodeB. Further Base Station Controller or BSC should be seen as a generic reference to a node which in some other systems is known as Radio Network Controller or RNC. In LTE, Long Term Evolution, the RBS and BSC is combined into eNodeB.

Examples of other systems in which the invention may be used are WCDMA, Wideband Code Division Multiple Access, TD-SCDMA Time Division-Synchronous Code Division Multiple Access and LTE, Long Term Evolution, systems.

Within each cell of the system, there can be a number of users with User Equipments, UEs, such as, e.g. cellular telephones and portable computers etc which can access the system. In fig 1, a first 150 and a second 160 UE are shown by way of example.

For each cell in the system 100, there is a first node, here referred to as a Radio Base Station, an RBS, which serves to, inter alia, control the traffic to and from the UEs in the cell. The RBS of the cell 140 is shown as 130 in fig 1. The system 100 also comprises a second node, a Base Station Controller, BSC, shown as 110 in fig 1, which serves to, inter alia, carry out certain control functions for one or more RBSs in the system.

In addition, the system 100 also comprises a third node, a Mobile Switching Centre, shown as 120 in fig 1. One of the functions of an MSC is to switch calls to and from one or more cells in the system. Two signalling protocols are shown in fig 1, the signalling 115 used between the MSC 120 and the BSC 110, which is usually referred to as "A" signalling, e.g. BSSAP signalling, Base Station System Application Part, and the signalling 125 between the BSC 110 and the RBS 130, usually referred to as "Abis" signalling, such as, e.g. Radio Relay signalling, RR.

As indicated by means of the arrow "C" in fig 1, a call which originates in the cell 140 may also have as its destination a UE in the same cell, i.e. in this case the cell 140. It will be realized that a call which is between a calling and a called UE in one and the same cell could theoretically be handled within the cell, i.e. by the RBS of the cell, and it will also be realized that this could make the handling of such "intra-cell" calls easier and thus less expensive.

However, in present systems, one fact which will make such "local switching" impossible is that the RBSs do not know if traffic channels which are allotted to UEs within one and the same cell are/will be used by one and the same call. This information is known only by the MSC.

If the information regarding the destination and origin of the traffic channels of calls made by UEs in the cell 140 were made available to the RBS 130, and the RBS 130 could be modified to be equipped with a switching functionality, local switching could be achieved. However, if such functionality

were to be integrated in an RBS, this would make the RBS quite complex, which would negate the purpose of achieving local switching, which is to cut costs for an operator of the system.

Thus, in order to achieve local switching while keeping the costs down, the present invention proposes the use within the system 100 of a logical node or gateway, LGW, which has as its function to check if a call which originates within a cell also has a UE within the cell as its destination, in which case the LGW ensures that the payload of the call stays within the cell, i.e. within the RBS and the UEs involved. According to the method of the invention, the LGW of a cell is controlled by the MSC of the cell. Thus, since the MSC already has most of the information necessary for local switching, since the MSC knows in which cell or cells that the calling UE and the destination of a call are located, the MSC can direct the LGW to perform local switching in those cases where this is appropriate, i.e. "intra-cell calls", calls with the calling and called UEs in one and the same cell. In addition, the MSC also has switching functionality, which can be used for controlling the LGW. Thus, by means of the invention, local switching can be obtained at a low cost.

Fig 2 shows an overview of system 200 in which an LGW 210 of the invention is used. Reference numbers of components and functions which have already been shown in fig 1 have been retained in fig 2.

As shown in fig 2, the LGW 210 of the invention is preferably co-located with the RBS 130 of a cell. However, since the LGW of the invention is a logical node rather than a physical node, it can be located in a variety of places within the system. Thus, examples of other possible locations for an LGW of the invention are:

- co-located with the BSC of the cell for which it is intended,
- at the site of the RBS of the cell for which it is intended, but separate from the RBS.

The LGW 210 of the invention is controlled by the MSC 120 of the cell by which the LGW is used. The control is carried out by messages sent between the LGW and the MSC in a special so called "data tunnel", shown as 215 in fig 2. The control messages may be "tunnelled" from the MSC to the LGW using BSSAP (from the MSC to the BSC) via the "A" interface 115 and also using Abis signalling 125 from the BSC to the LGW.

In a particularly preferred embodiment of the invention, the LGW 210 comprises two main functions:

- one function for call control, and
- one function for payload control.

Fig 3 shows the LGW 210 and its two functions in this preferred embodiment, i.e. the Call Control function 211 and the Payload Control function 212. The two functions would preferably divide the total function of the LGW in the following manner:

Call control function

For downlink control information, i.e. control information from the MSC , the call control function of the LGW extracts the controlling information for a call from the Abis message. The remaining information, i.e. the information without the controlling information, is re-packed into a new LAPD frame which is forwarded by the LGW to the RBS.

For uplink control information, i.e. control information intended for the MSC, the information being comprised in an Abis message, the LGW inserts controlling information into the Abis message, and subsequently re-packs all of the information, i.e. both the original part and the inserted part, into a new LAPD frame which is sent to the BSC, from where it is forwarded to the MSC.

A main task of the call control function of the LGW is to correlate the originating & terminating "call legs" of a call. For this purpose, the call control

function will generate call identifiers (Call IDs) for the "calling leg" and the "called leg" of the call.

The Call IDs will be forwarded to the MSC by the call control function, and the MSC then forwards the Call ID of the caller and the destination of the call to the LGW.

The call control part can be realized by introducing additional parameters in BSSAP & Abis messages, such as, for example Call ID and IP address/port

If it is desired to support break-in/break-out calls (i.e. calls to/from parties outside of the RBS or the system 200, in the LGW, the call controller function will also contain the necessary information that the LGW needs to build the IPBCP (IP Bearer Control Protocol) messages, said information being information which enables the call control function of the LGW to allocate an IP address & port from an IP resource pool of the LGW, which will be used in IPBCP message.

Payload control function

For uplink messages from a UE in the cell 150, usually sent in the so called LAPD (Link Access Protocol D) frame, the payload control function of the LGW 210 performs, inter alia, the control of the payload switching as needed in order to obtain RBS local switching. This is preferably done in the following manner:

- The LGW 210 terminates & switches uplink frames for voice traffic from/to the RBS 130, said frames usually being LAPD frames,

- The LGW 210 provides an IP routing/switching function, so that so called break-in/break-out calls can be made, i.e. so that calls to/from the cell of the RBS from/to parties outside of the RBS can be routed/switched locally at the LGW. This is shown symbolically by

means of an arrow "D", which connects to the so called PLMN 220, i.e. the Public Land Mobile Network.

If a break-in/out call is made, and the function is supported by the LGW, the payload control function in the LGW is used to communicate to the receiving party that it should establish an IP bearer connection. In order to achieve this, it is proposed to re-use the existing IPBCP protocol, in order to facilitate break-in/break-out calls. The re-use of the existing IPBCP protocol may be realized by tunnelling the IPBCP messages through BSSAP & Abis messages

In a further embodiment, the LGW of the invention may comprise a so called "half-call" model. Such an LGW 410 is shown in fig 4, and as shown in fig 4, the half call version 410 of the LGW of the invention comprises two parts, both of which can be used separately, i.e. the two parts are "stand-alone" parts. A first part 411 may be used for the caller, and the second part 412 may be used for the called party. Each of the parts 411, 412, comprises essentially the complete functionality of the LGW 210 described above.

The half call version 410 of the inventive LGW is particularly useful for facilitating break-in or break-out calls, since such calls will only need to use one of the parts 411 or 412, depending on if the call is "break in" or "break out".

Fig 5 shows a rough flow chart of a method 500 of the invention. The method of the invention is intended for use in a cellular wireless communications system such as the one 200 of fig 2, in which there is at least a first node, a Radio Base Station, RBS such as the one 130 shown in figs 1 and 2, which serves to control traffic to and from user equipments within a cell in the system.

The system in which the invention is applied comprises, in addition, a second node, a Base Station Controller, a BSC such as the one 110 shown in fig 2, which controls one or more base stations in the system, and the system also comprises a third node, a Mobile Switching Centre, MSC such as the one 120 of fig 2, which serves to switch calls to and from user equipments in a cell in the system.

A call in the system comprises payload information and control information, and the method 500 of the invention comprises, as shown in step 510, the use of a logical node or gateway, LGW, shown as 210 in fig 2 and 410 in fig 4. As shown in step 515, the LGW has as one of its functions to check if a call which originates within a cell also has as its destination a UE within the cell, i.e. an intra-cell call, in which case the LGW ensures, as shown in step 520, that the payload of the call stays within the cell, i.e. within the RBS and the UEs involved.

Step 525 indicates that an LGW which is used in a cell in the system is controlled by the MSC of the cell.

As indicated in steps 530, 535, 545 an LGW which is used in a cell in the system may be located in one of the following:

- the RBS of the cell, step 530,
- the BSC of the cell, step 535,
- at the site of the RBS of the cell, but separate from the RBS, step 545.

Step 540 shows that an MSC 120 which controls an LGW 210, 410, may do so by means of a special control protocol which is tunnelled from the MSC to the LGW.

As shown in step 550, according to the inventive method, an LGW 410 may in one embodiment comprise two main control functions, i.e.:

- a first function, such as the ones 312, 312', for the control of a call's payload information shown in fig 3 , and
- a second function, such as the ones 314, 314', shown in fig 3, for the control of a call's control information.

Step 555 shows that in one embodiment, an LGW is given two separate parts, such as those shown in fig 4, i.e. 411, 412, each of which two parts comprises one of the first and second functions mentioned above, so that the first part 411 can be used for calls from UEs within a cell in which the LGW is used, and the second part 412 can be used for calls to UEs within a cell in which the LGW is used,

In order to further facilitate the reader's understanding of the invention, some examples of event diagrams will now be given, said examples also being illustrated in figs 6-8. A list of the abbreviations used in the description of these diagrams can be found at the end of this text.

Different kinds of lines are used for the arrows in figs 5-7, according to the following pattern:

Arrows shown with one of the following kinds of lines are message flows on behalf of the MS-A, i.e. the originating/calling party or entity:

———————

- - - - - - - - - - - - - - -

Arrows shown with the following kinds of lines are message flows on behalf of the MS-B, i.e. the terminating/called party or entity:

- · - · - · - · - · - · - · - · -

A message whose numeral has a "prime", i.e. 6' indicates a new parameter or an entirely new message introduced by this invention,

Messages whose lines have much larger arrowheads than other lines indicate user plane signalling. These messages are messages 14 and 15 in fig 6, messages 12 and 13 in fig 7 and message 11 in fig 8.

Fig 6 shows an event diagram in a system of the invention in the case when a call is made by a first UE ("MS-A") to a second UE ("MS-B") within one and the same cell, i.e. both MS A and MS B are served by one and the same RBS.

The following events then occur, with the numerals given below corresponding to the numerals at the arrows in fig 5:

1) MS-A originates the call; after SDCCH channel activation, RBS/BTS sends establish indicate with CM service request.

2) Upon reception of the message, LGW allocates a call control instance and generates the call ID corresponding to the call leg-A. AGW needs to allocate the IP address/port to be used for payload transmission for the originating call leg. The call control data [call ID-A + IP address/port-A] will be included in the CM Service Request as new parameters.

3) BSC further forwards the CM Service Request including the call control data encapsulated in the CL3 message to MSC.

4) MSC continues the call setup and do the paging of terminating MS-B.

5) MS-B responses the paging; after SDCCH channel activation, RBS/BTS sends establish indicate with paging response.

6) Upon reception of the message, AGW allocates a call control instance and generates the call ID corresponding to the call leg-B. AGW needs to allocate the IP address/port to be used for payload transmission for the terminating call leg. The call control data [call ID-B + IP address/port-B] will be included in the paging response as new parameters. Also, the MSC continues the call setup.

7) MSC proceeds the call setup with Assignment Request for MS-A. In the Assignment Request message, MSC shall include the call control data [call ID-A + IP address/port-B] with new parameters.

8) BSC sends down the Assignment Command containing the call control data. AGW shall extract the data from the message. Call ID-A is used to identify the call control instance for MS-A, after that it can correlate the traffic channel assigned for call leg-A with the IP address/port of call leg-B, hence get the peer/destination address for the traffic frames of MS-A on the user plane.

9) Upon reception of Assignment Complete in AGW, MS-A call control instance shall build the IPBCP “Request” message with IP address/port-A & IP address/port-B. The IPBCP “Request” message will eventually be tunnelled in Abis & BSSAP Assignment Complete message, up to MSC.

10) MSC tunnels down to BSC the IPBCP “Request” message and the call ID-B, with a new BSSAP message Tunnel Info. The message is further tunnelled from BSC to AGW in Data Request message.

11) AGW terminates the tunnel message. The Call ID-B identifies the call control instance in AGW for MS-B, after that it will process the IPBCP "Request" message, and build the IPBCP "Accept" message.

12) The IPBCP "Accept" message will be tunnelled up to BSC with new message Tunnel Info Ack encapsulated in Data Indicator message. Further, BSC sends the new BSSAP Tunnel Info Ack message up to MSC with the IPBCP "Accept" message tunnelled.

13) The IPBCP "Accept" message will be tunnelled down to AGW together with Call ID-A.

14) The Call control instance in AGW will process the IPBCP "Accept" message, and initiates the Nb UP Initialization message accordingly. The Nb UP initialization message will be sent to the destination address [IP address/port-B], which is linked to the call control instance in AGW for MS-B.

15) The call control instance in AGW for MS-B replies with Nb UP initialization ACK to [IP address/port-A] (It gets the address information from IPBCP "Request" message), thus to complete the Nb UP initialization.

16) Upon reception of Nb UP initialization ACK, the MS-A call control instance tunnels up the IPBCP "Connected" message to MSC.

17) MSC continues with Assignment Request for MS-B. The Call ID-B is included in the message.

18) AGW extracts the call ID-B from the Assignment Command, to identify call control instance for MS-B, and correlate the traffic channel assigned for MS-B to the established Nb UP connection.

19) The traffic channel is successfully assigned for MS-B, and the Assignment complete message sent to MSC.

Fig 7 details the events in the case of a "break-out call", i.e. a call from MS-A inside the cell of the RBS in question to MS-B in the PLMN. The events are as follows, as also shown in fig 6:

1) MS-A originates the call; after SDCCH channel activation, RBS/BTS sends establish indicate with CM service request.

2) Upon reception of the message, AGW allocates a call control instance and generates the call ID corresponding to the call leg-A. AGW needs to allocate the IP address/port to be used for payload transmission for the originating call leg. The call control data [call ID-A + IP address/port-A] will be included in the CM Service Request as new parameters.

3) BSC further forwards the CM Service Request including the call control data encapsulated in the CL3 message to MSC.

4) MSC continues the call setup and send BICC IAM to PLMN MSC-S and the Supported codec list shall indicate only the codecs supported by MS (PSCVL).

5) PLMN MSC-S sends BICC-APM with IP-address of B party as well as the selected codec X.

6) MSC proceeds the call setup with Assignment Request for MS-A. In the Assignment Request message, MSC shall include the call control data [call ID-A + IP address-B] with new parameters.

7) BSC sends down the Assignment Command containing the call control data. AGW shall extract the data from the message. Call ID-A is used to identify the call control instance for MS-A, after that it can correlate the traffic channel assigned for call leg-A with the IP address/port of call leg-B, hence get the peer/destination address for the traffic frames of MS-A on the user plane.

8) Upon reception of Assignment Complete in AGW, MS-A call control instance shall build the IPBCP "Request" message with IP address/port-A & IP address/port-B. The IPBCP "Request" message will eventually be tunnelled in Abis & BSSAP Assignment Complete message, up to MSC.

9) Upon reception of Assignment Complete message, MSC sends BICC-COT. It also tunnels the IPBCP "Request" message in BICC-APM message.

10) The IPBCP "Accept" message will be tunnelled back to MSC in BICC-APM message.

11) The IPBCP "Accept" message will be tunnelled down to AGW together with Call ID-A.

12) The Call control instance in AGW will process the IPBCP "Accept" message, and initiates the Nb UP Initialization message accordingly. The Nb UP initialization message will be sent to the destination address [IP address/port-B], which is linked to the call control instance in AGW for MS-B.

13) The call control instance in PLMN MGW for MS-B replies with Nb UP initialization ACK to [IP address/port-A] (It gets the address information from IPBCP "Request" message), thus to complete the Nb UP initialization.

14) Upon reception of Nb UP initialization ACK, the MS-A call control instance tunnels up the IPBCP "Connected" message to MSC.

15) MSC continues with BICC-APM message containing IPBCP "Connected".

16) MSC receives BICC-ACM from PLMN MSC-S and sends alerting message to MS.

17) MSC receives BICC-ANM from PLMN MSC-S and sends connect message to MS.

Fig 8 details the events in the case of a "break-in call", i.e. a call from a party in the PLMN to MS-B inside the cell of the RBS in question. The events are as follows, as also shown in fig 8:

1) MSC receives BICC-IAM message from PLMN MSC-S.

2) MSC continues the call setup and do the paging of terminating MS-B.

3) MS-B responses the paging; after SDCCH channel activation, RBS/BTS sends establish indicate with paging response.

4) Upon reception of the message, AGW allocates a call control instance and generates the call ID corresponding to the call leg-B. AGW needs to allocate the IP address/port to be used for payload transmission for the terminating call leg. The call control data [call ID-B + IP address/port-B] will be included in the paging response as new parameters.

5) MSC continues the call setup and send BICC APM message with IP-address-B + selected codec X (one codec from PSCVL).

6) PLMN MSC-S sends BICC-APM with IPBCP "Request" message.

7) MSC tunnels down to BSC the IPBCP "Request" message and the call ID-B, with a new BSSAP message Tunnel Info. The message is further tunnelled from BSC to AGW in Data Request message.

8) AGW terminates the tunnel message. The Call ID-B identifies the call control instance in AGW for MS-B, after that it will process the IPBCP "Request" message, and build the IPBCP "Accept" message.

9) The IPBCP "Accept" message will be tunnelled up to BSC with new message Tunnel Info Ack encapsulated in Data Indicator message. Further, BSC sends the new BSSAP Tunnel Info Ack message up to MSC with the IPBCP "Accept" message tunnelled.

10) MSC proceeds the call setup with BICC-APM message containing the IPBCP "Accept" message.

11) The call control instance in PLMN MGW starts the Nb UP initialization to [IP address/port-B] (It gets the address information from IPBCP "Accept" message).

12) The call control instance in AGW replies Nb UP initialization ACK to PLMN MGW (it gets the address information from IPBCP "Request" message) thus to complete the Nb UP initialization.

13) MSC receives BICC COT and APM messages from PLMN MSC-S.

14) MSC sends Assignment Request for MS-B. In the Assignment Request message, MSC shall include the call control data [call ID-B] with new parameters.

15) BSC sends down the Assignment Command containing the call control data. AGW shall extract the data from the message. Call ID-B is used to identify the call control instance for MS-B, after that it can correlate the traffic channel assigned for call leg-B with the initialized Nb UP traffic.

16) The Assignment Complete message is sent to MSC.

17) Upon reception of Alerting message, MSC sends BICC-ACM.

18) Upon reception of Connect message, MSC sends BICC-ANM.

The invention is not limited to the examples of embodiments described above and shown in the drawings, but may be freely varied within the scope of the appended claims.

The following abbreviations and acronyms have been used in the descriptions of figs 6-8:

Abis: The interface between BSC and BTS
APM: Application transport Mechanism
BICC-ACM: Bearer Independent Call Control – Address Complete Message
BICC-ANM: Bearer Independent Call Control – Answer message
BICC-APM: Bearer Independent Call Control - Application transport Mechanism
BICC-COT: Bearer Independent Call Control – Continuity message
BICC IAM: Bearer Independent Call Control – Initial Address Message
BSC: Base Station Controller
BSSAP: Base Station Subsystem Application Part
BTS: Base Transceiver Station
CL3: Complete Layer 3
CM: Connection Management
IPBCP: IP Bearer Control Protocol
IP: Internet Protocol
LGW: Logical GateWay
MGW: Media GateWay
MS: Mobile Station
MS-B: Mobile Station B
MS-A: Mobile Station A
MS PSCVL: Mobile Station's Permitted Speech Codec Version List
MSC: Mobile Switching Center
MSC-S: MSC Server
Nb: the interface between two MGWs in a system of the invention
Nb UP: Nb User Plane
PLMN: Public Land Mobile Network
PSCVL: Permitted Speech Version List
RBS: Radio Base Station
SDCCH: Stand Alone Dedicated Control Channel

CLAIMS

1. A method (500) for use in a cellular wireless communications system (200), in which system there is at least a first node (130), which serves to control traffic to and from user equipments (150, 160), within a cell (140), in the system, the system (200) in addition comprising a second node (110), for the control of one or more first nodes, and a third node (120), which serves to switch calls to and from user equipments (150, 160) in a cell (140), in which system a call comprises payload information and control information,
the method being characterized in (510) that it comprises the use of a logical node or gateway (210, 410), with the following functions:

- checking (515) if a call which originates within a cell also has a user equipment within the cell as its destination, i.e. if the call is an "intra-cell "call,
- ensuring (520), in the case of an intra-cell call, that the payload of the call stays within the cell, i.e. within the first node and the user equipments involved,

and according to which method the control (525) of a logical node or gateway (210, 410) of a cell is given to the third node of the cell.

2. The method (500) of claim 1, according to which the logical node or gateway (210, 410) of a cell is located in one of the following:

- the first node of the cell (530),
- the second node of the cell (535),
- at the site of the first node of the cell, but separate from the first node (545).

3. The method (500, 540) of claim 1 or 2, according to which a third node (120) controls a logical node or gateway (210, 410) by means of a special control protocol which is tunnelled from the third node to the logical node or gateway.

4. The method (500) of any of the previous claims, according to which (550) the logical node or gateway (410) comprises two main control functions:

- a first function (314) for the control of a call's payload information, and
- a second function (312) for the control of a call's control information.

5. The method of claim 4, according to which the logical node or gateway (410) is given two separate parts (411, 412), each of which two parts comprises one of said first (312, 312') and second (314, 314') functions, and according to which method the first part (411) is used for calls from user equipments within a cell in which the logical node or gateway is used, and the second part is used for calls to user equipments within a cell in which the logical node or gateway is used.

6. The method of anyone of claims 1-5, according to which the first node (130) is a radio base station, RBS, or a NodeB and the second node (110) is a base station controller, BSC, or a radio network controller, RNC, and the third node (130) is a mobile switching centre, MSC, all depending on which system in use.

7. A logical node and gateway (210, 410), for use in a cell (140) in a cellular wireless communications system (100, 200), in which system there is at least a first node (130), which serves to control traffic to and from user equipments (150, 160), within a cell in the system, the system in addition comprising a second node (110), for the control of one or more first nodes, and a third node (120), which serves to switch calls to and from user equipments (150, 160) in a cell (140), in which system a call can comprise payload information and control information, the logical node or gateway (210, 410) being characterized in that it comprises a first function (312, 312') for checking if a call which originates within a cell also has a user equipment within the cell as its destination, in which case a second function (314, 314') of the logical node or gateway ensures that the payload of the call stays within the cell, i.e. within the first node and the user equipments involved, the logical node or gateway also comprising an interface towards the third node, so that the logical node or gateway can be controlled by the third node of a cell in which the logical node or gateway is used.

8. The logical node or gateway (210, 410) of claim 7, being located in one of the following:

- the first node (130) of a cell (140) in which the logical node or gateway is used,
- the second node (110) of a cell (140) in which the logical node or gateway is used,
- the site of the first node (130) a cell in which the logical node or gateway is used, but separate from the first node.

9. The logical node or gateway (210, 410) of claim 7 or 8, which is controlled by a third node (120) of a cell in which the logical node or gateway is used by means of a control protocol which is tunnelled from the third node to the logical node or gateway.

10. The logical node or gateway (410) of any of claims 7-9, having separate a first (411) and a second (412) part, each of which two parts comprise one of said first (312, 312') and second (314, 314') functions, so that the first part (411) may be used for calls from user equipments within a cell in which the logical node or gateway is used, and the second part may be used for calls to user equipments within a cell in which the logical node or gateway is used.

11. The logical node or gateway (410) of anyone of claims 7-10, according to which the first node (130) is a radio base station, RBS, or a NodeB and the second node (110) is a base station controller, BSC, or a radio network controller, RNC, and the third node (130) is a mobile switching centre, MSC, all depending on which system in use.

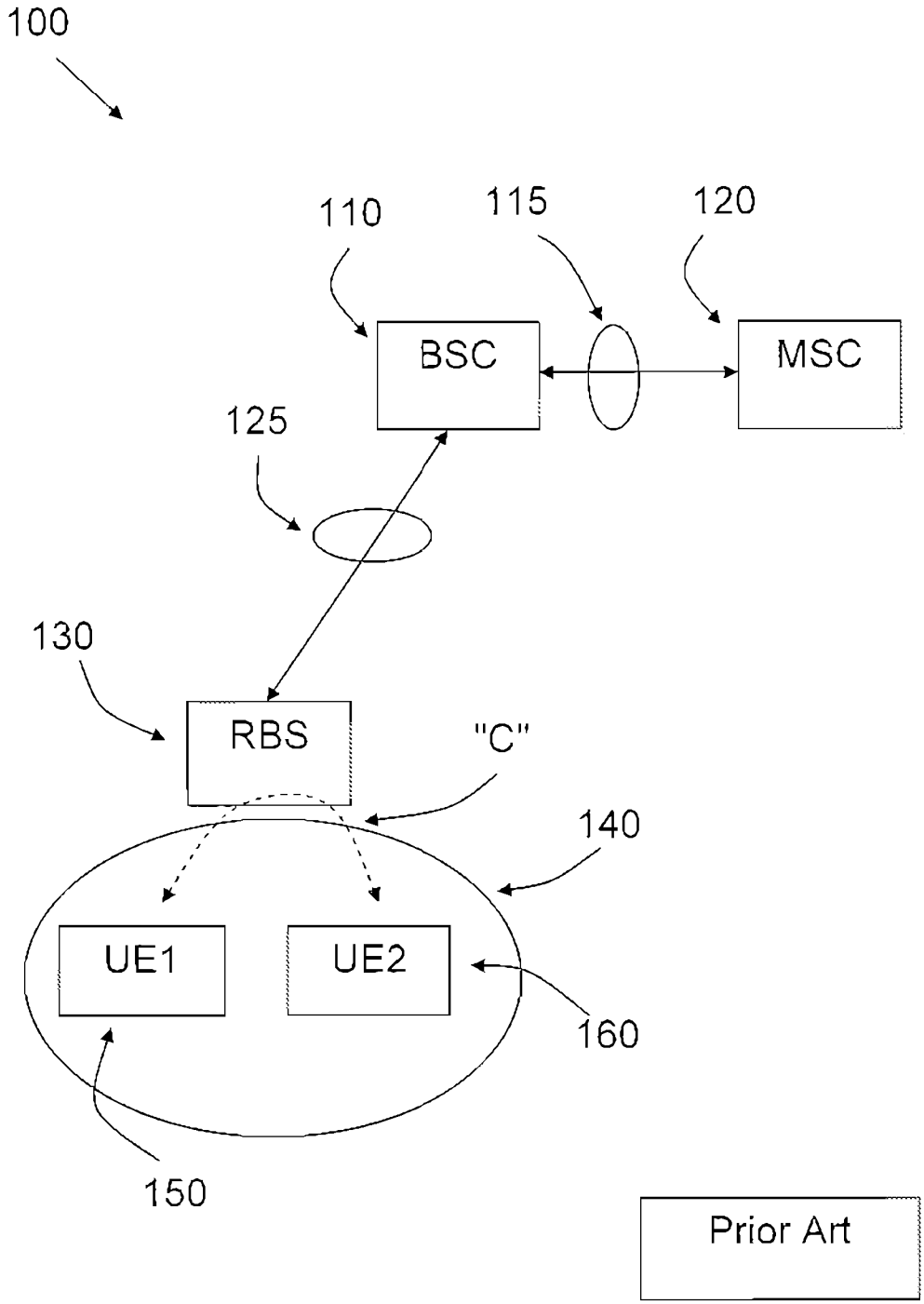

100
110
115
120
BSC
MSC
125
130
RBS
"C"
140
UE1
UE2
160
150
Prior Art

Fig 1

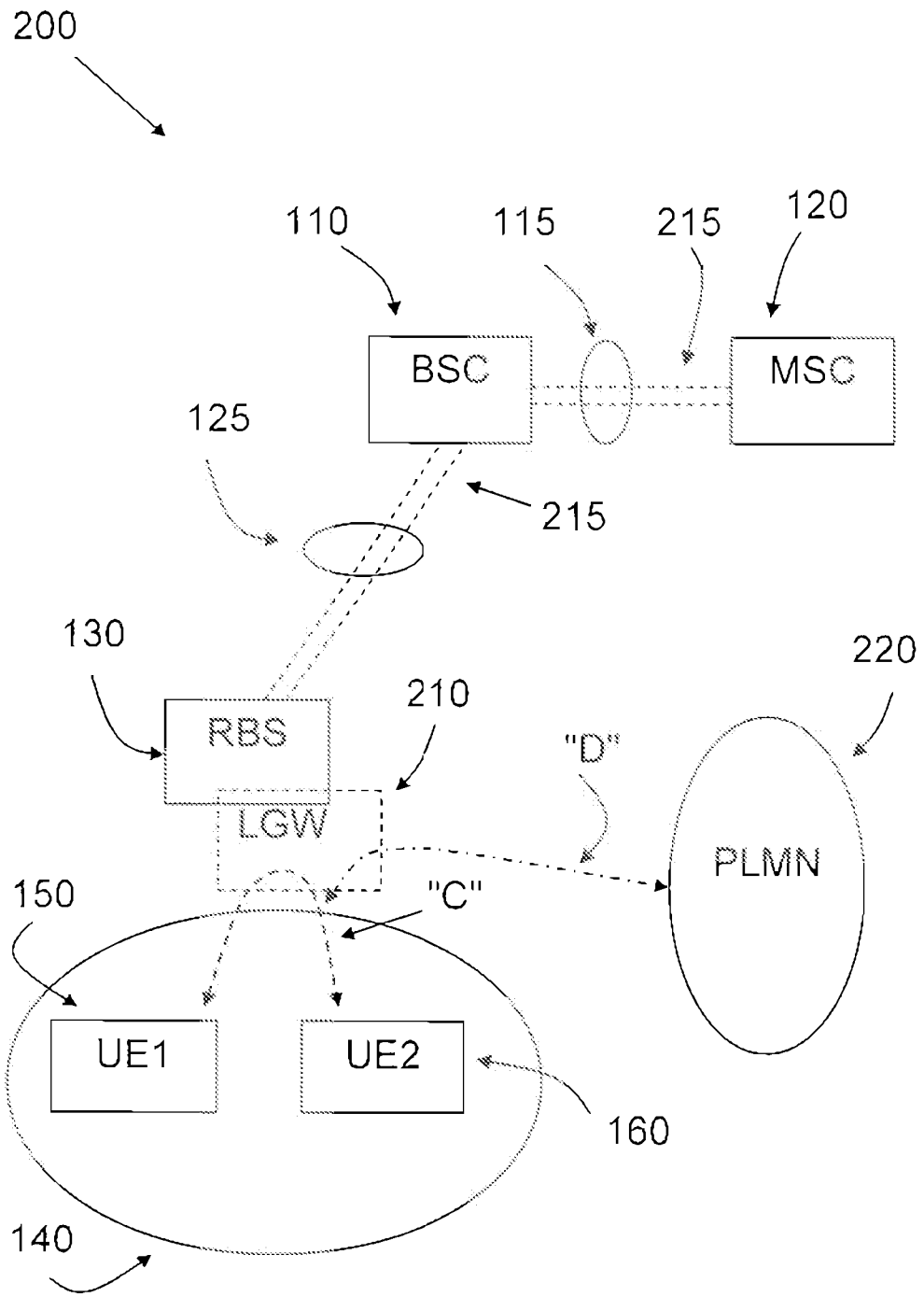

200
110
115
215
120
BSC
MSC
125
215
130
210
220
RBS
"D"
LGW
PLMN
150
"C"
UE1
UE2
160
140

Fig 2

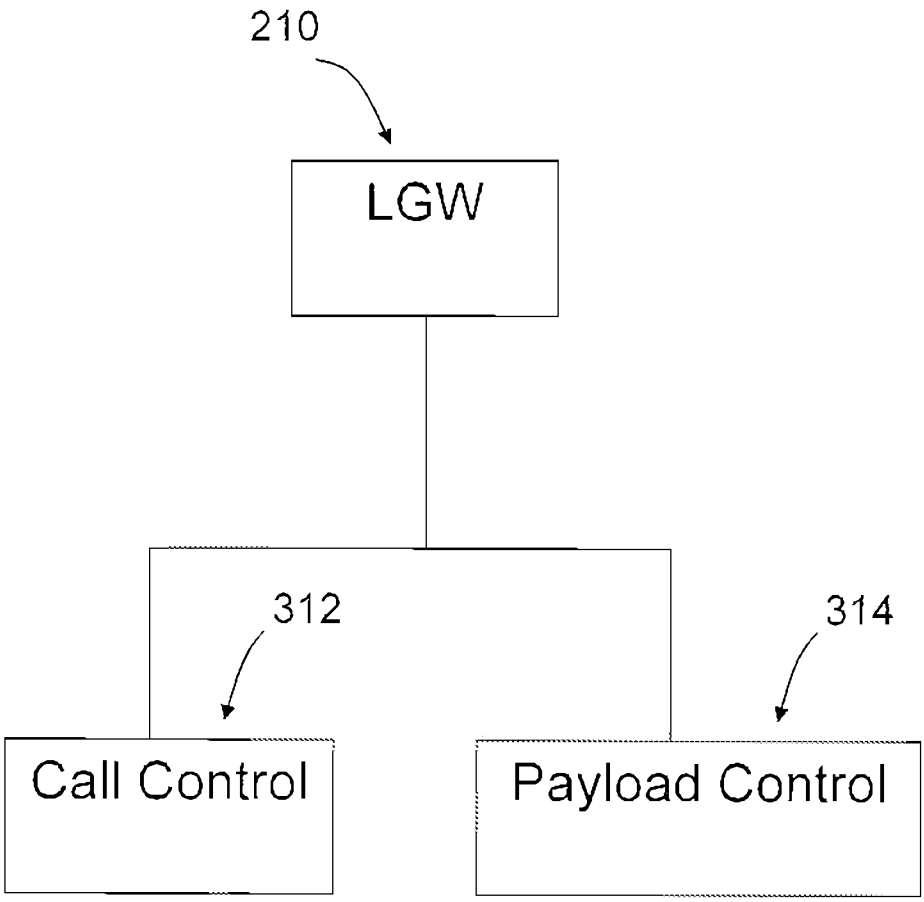


Fig 3

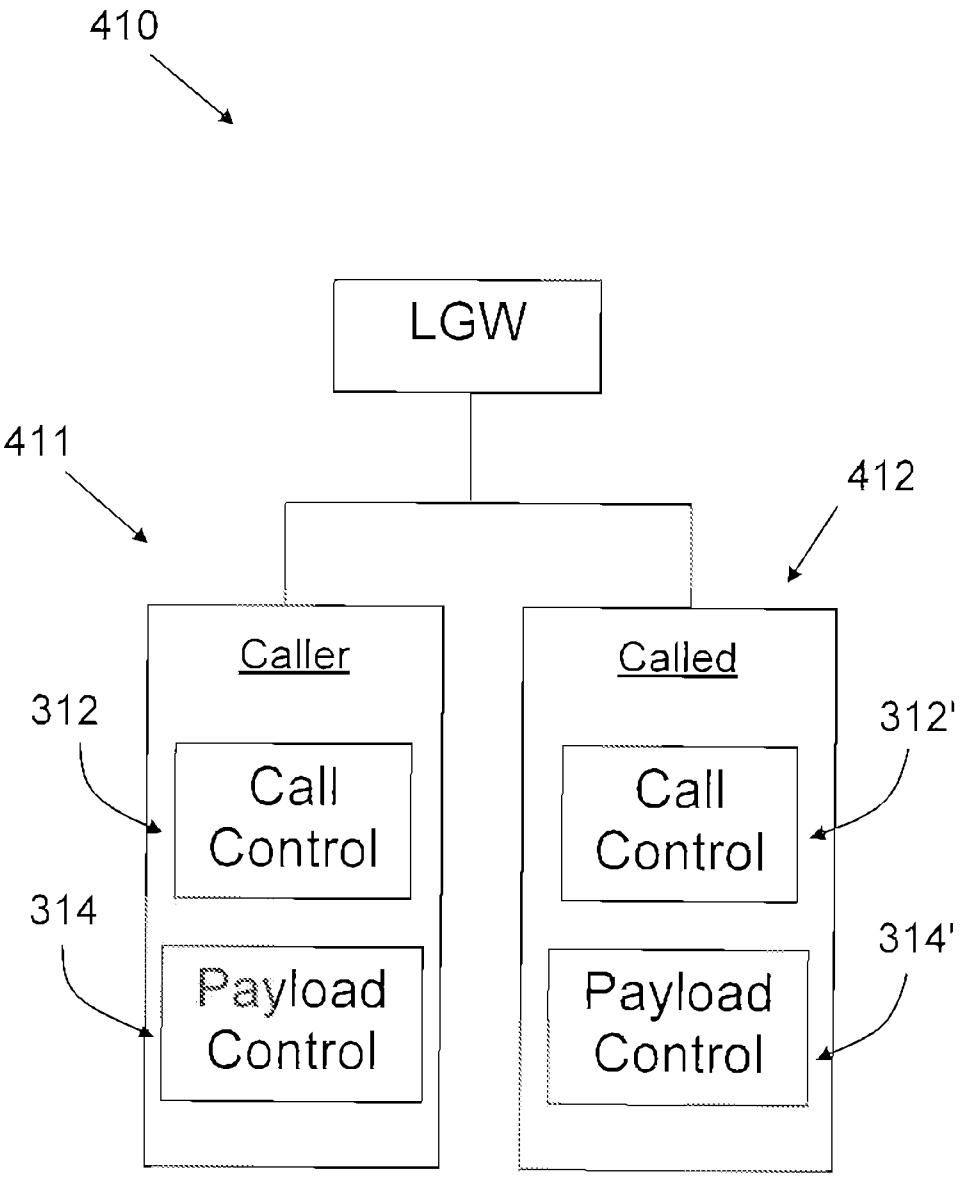

410
LGW
411
412
Caller
Called
312
312'
Call Control
Call Control
314
314'
Payload Control
Payload Control

Fig 4

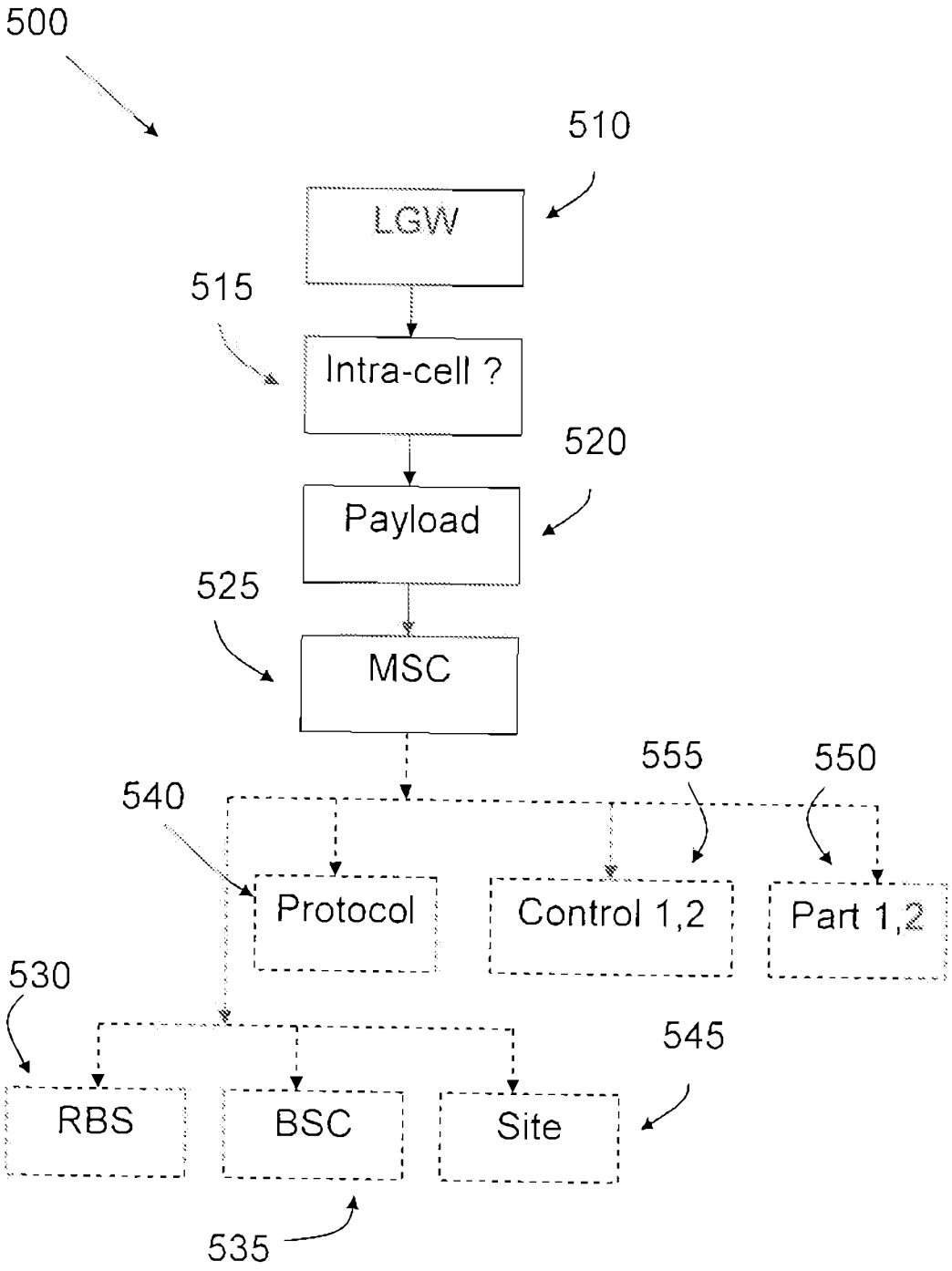

500
510
LGW
515
Intra-cell ?
520
Payload
525
MSC
555
550
540
Protocol
Control 1,2
Part 1,2
530
545
RBS
BSC
Site
535

Fig 5

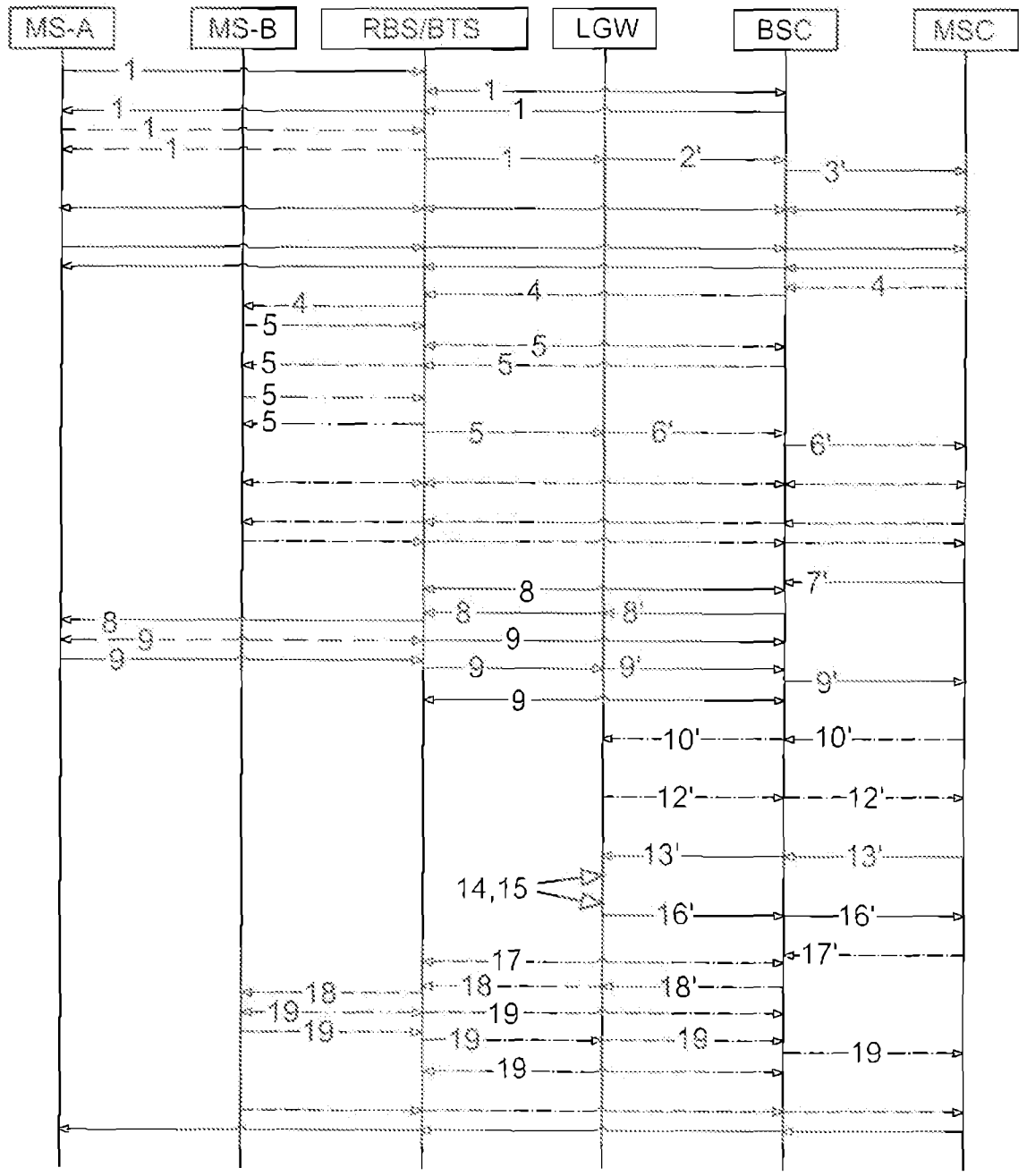

MS-A
MS-B
RBS/BTS
LGW
BSC
MSC
1
2'
3'
4
5
6'
7'
8
8'
9
9'
10'
12'
13'
14,15
16'
17
17'
18
18'
19

FIG. 6

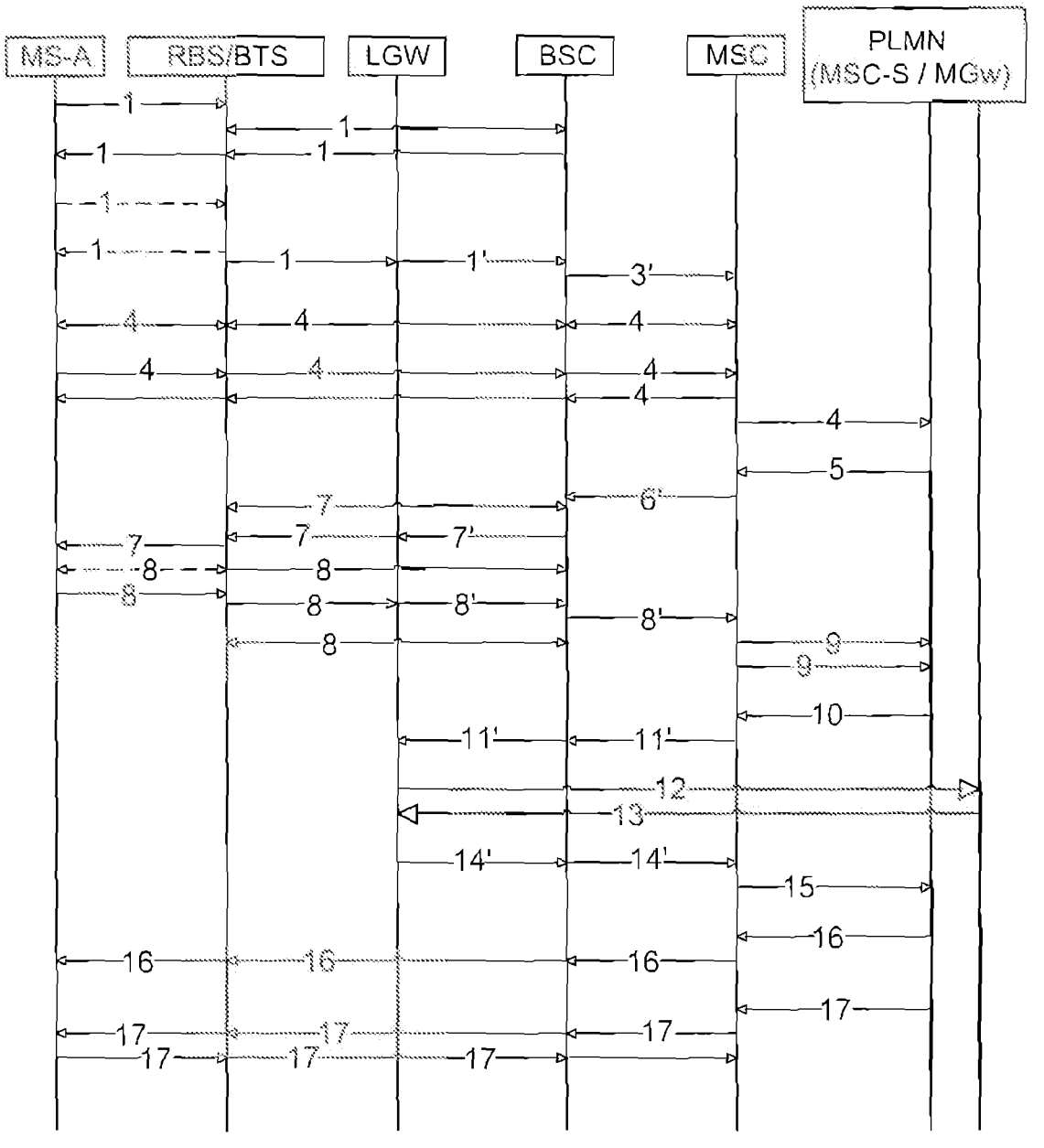
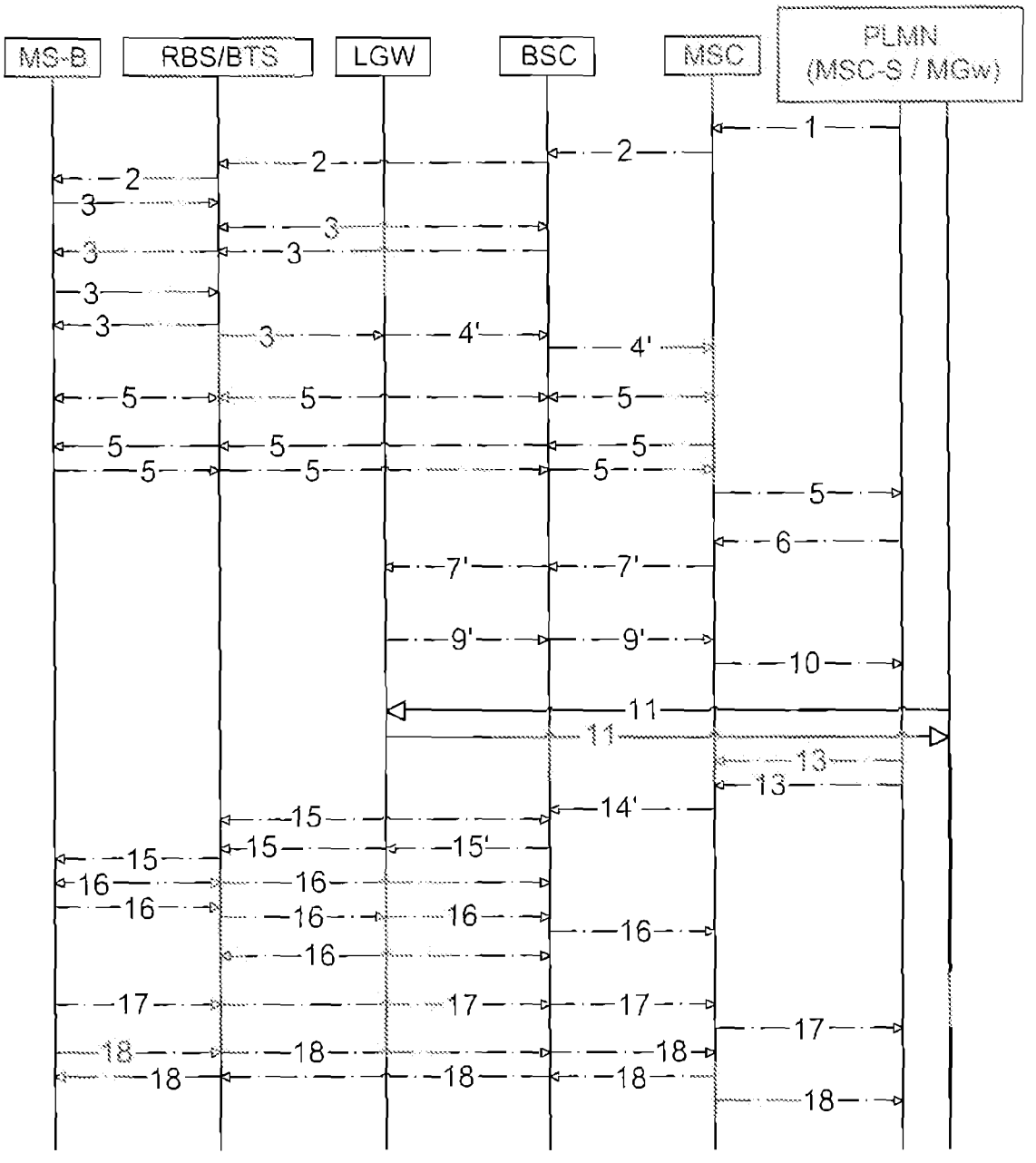


FIG. 7


MS-B
RBS/BTS
LGW
BSC
MSC
PLMN
(MSC-S / MGw)
1
2
2
2
3
3
3
3
3
3
3
4'
4'
5
5
5
5
5
5
5
5
5
6
7'
7'
9'
9'
10
11
11
13
13
14'
15
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15'
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FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2008/050013

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04Q, H04L

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006126923 A1 (TELEFONAKTIBOLAGET LM ERICSSON(PUBL)), 30 November 2006 (30.11.2006), page 8, line 24 - page 14, line 15, claims 1-20, abstract, figure 1a-d, 2-4	1,7
	--	
X	US 20030086418 A1 (MCINTOSH ET AL), 8 May 2003 (08.05.2003), page 2, line 20 - page 4, line 30; page 5, line 15 - page 8, line 8, abstract	1,7
A		2-6,8-11
	--	
X	US 20060251008 A1 (WU ET AL), 9 November 2006 (09.11.2006), claims 1-3, abstract	1,7
A		2-6,8-11
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"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
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"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
22 October 2008	28-10-2008
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Per Karlsson/PR Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2008/050013

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20020141358 A1 (REQUENA), 3 October 2002 (03.10.2002), abstract --	1-11
A	EP 0797319 A2 (TRW INC.), 24 Sept 1997 (24.09.1997), abstract -- --------	1-11

International patent classification (IPC)
H04Q 7/24 (2006.01)
H04M 7/00 (2006.01)
H04Q 7/30 (2006.01)

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Use the application number as username.
The password is **VFTLSRLJPX**.

Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

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				EP	1884090	A	06/02/2008
US	20030086418	A1	08/05/2003	AU	2002340425	A	19/05/2003
				WO	03041426	A	15/05/2003
US	20060251008	A1	09/11/2006	US	7385947	B	10/06/2008
				WO	2006117652	A	09/11/2006
US	20020141358	A1	03/10/2002	AU	2393502	A	11/06/2002
				EP	1338152	A	27/08/2003
				US	6904035	B	07/06/2005
				WO	0245440	A	06/06/2002
EP	0797319	A2	24/09/1997	DE	69730548	D,T	18/08/2005
				US	5930708	A	27/07/1999