

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
8 December 2005 (08.12.2005)

PCT

(10) International Publication Number
WO 2005/117297 A1

(51) International Patent Classification⁷: **H04B 7/26**

[KR/KR]; 202, 1430-17, Sillim 5-Dong, Gwanak-Gu, Seoul 151-891 (KR).

(21) International Application Number:

PCT/KR2005/001123

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(22) International Filing Date: 19 April 2005 (19.04.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/563,869 19 April 2004 (19.04.2004) US

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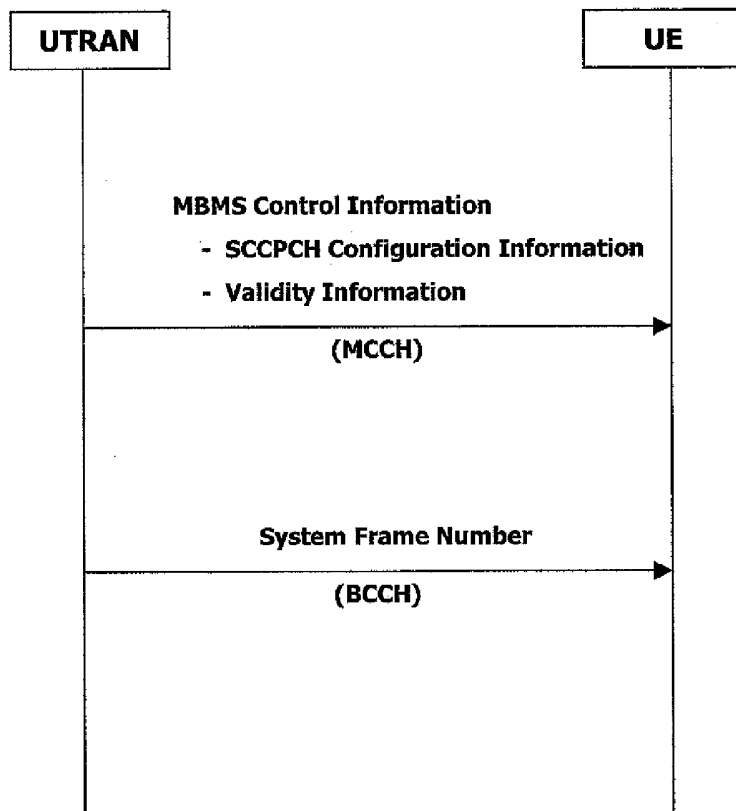
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU,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

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(54) Title: TRANSMISSION OF CONTROL INFORMATION IN WIRELESS COMMUNICATION SYSTEM



(57) Abstract: The present invention relates to a method for indicating the validity of a channel configuration. Configuration information for establishing the reception of a physical channel carrying point-to-multipoint services is sent via a point-to-multipoint control channel to a mobile terminal. Validity information is sent together with the configuration information for indicating to the mobile terminal when or how long the configuration information is valid. The configuration information may be valid during a current modification period, after a given activation time, or up to a given activation time. Thus, a mobile terminal can avoid using an invalid physical channel configuration.



FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO,
SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*

Description

TRANSMISSION OF CONTROL INFORMATION IN WIRELESS COMMUNICATION SYSTEM

Technical Field

- [1] The present invention is related to transmitting control information from a network to a mobile terminal in a wireless communication system, and more particularly, to indicating the validity of a physical channel configuration.

Background Art

- [2] Recently, mobile communication systems have developed remarkably, but for high capacity data communication services, the performance of mobile communication systems cannot match that of existing wired communication systems. Accordingly, technical developments for IMT-2000, which is a communication system allowing high capacity data communications, are being made and standardization of such technology is being actively pursued among various companies and organizations.
- [3] A universal mobile telecommunication system (UMTS) is a third generation mobile communication system that has evolved from a European standard known as Global System for Mobile communications (GSM). The UMTS aims to provide improved mobile communication service based on a GSM core network and wideband code division multiple access (W-CDMA) wireless connection technology.
- [4] In December 1998, ETSI of Europe, ARIB/TTC of Japan, T1 of the United States, and TTA of Korea formed a Third Generation Partnership Project (3GPP) for creating the detailed specifications of the UMTS technology.
- [5] Within the 3GPP, in order to achieve rapid and efficient technical development of the UMTS, five technical specification groups (TSG) have been created for performing the standardization of the UMTS by considering the independent nature of the network elements and their operations.
- [6] Each TSG develops, approves, and manages the standard specification within a related region. Among these groups, the radio access network (RAN) group (TSG-RAN) develops the standards for the functions, requirements, and interface of the UMTS terrestrial radio access network (UTRAN), which is a new radio access network for supporting W-CDMA access technology in the UMTS.
- [7] Figure 1 illustrates an exemplary basic structure of a general UMTS network. As shown in Figure 1, the UMTS is roughly divided into a terminal (or user equipment: UE) 10, a UTRAN 100, and a core network (CN) 200.
- [8] The UTRAN 100 includes one or more radio network sub-systems (RNS) 110, 120. Each RNS 110, 120 includes a radio network controller (RNC) 111, and a plurality of

base stations or Node-Bs 112, 113 managed by the RNC 111. The RNC 111 handles the assigning and managing of radio resources, and operates as an access point with respect to the core network 200.

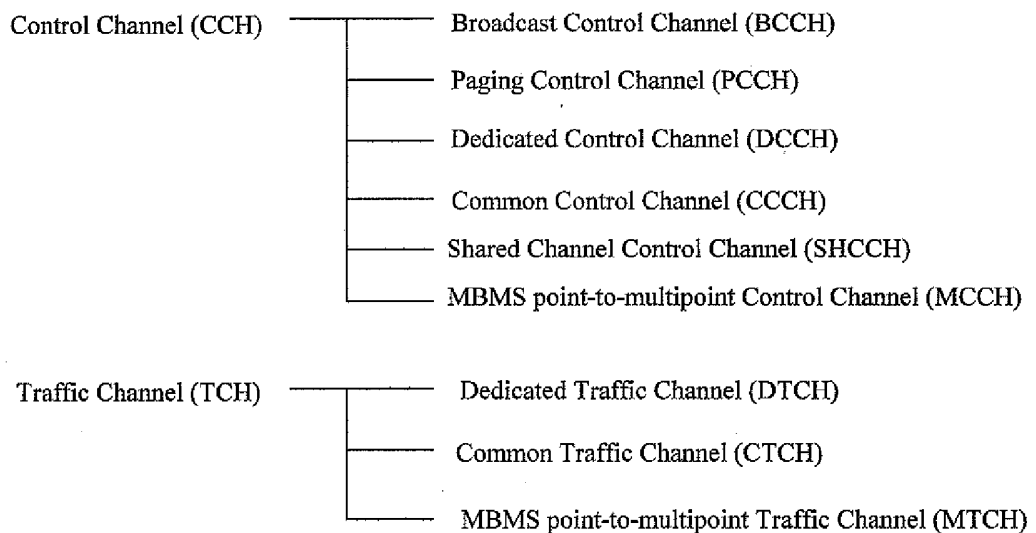
- [9] The Node-Bs 112, 113 receive information sent by the physical layer of the terminal through an uplink, and transmit data to the terminal through a downlink. The Node-Bs 112, 113, thus, operate as access points of the UTRAN 100 for the terminal.
- [10] A primary function of the UTRAN 100 is forming and maintaining a radio access bearer (RAB) to allow communication between the terminal and the core network 200. The core network 200 applies end-to-end quality of service (QoS) requirements to the RAB, and the RAB supports the QoS requirements set by the core network 200. As the UTRAN 100 forms and maintains the RAB, the QoS requirements of end-to-end are satisfied. The RAB service can be further divided into an Iu bearer service and a radio bearer service. The Iu bearer service supports a reliable transmission of user data between boundary nodes of the UTRAN 100 and the core network 200.
- [11] The core network 200 includes a mobile switching center (MSC) 210 and a gateway mobile switching center (GMSC) 220 connected together for supporting a circuit switched (CS) service, and a serving GPRS support node (SGSN) 230 and a gateway GPRS support node 240 connected together for supporting a packet switched (PS) service.
- [12] The services provided to a specific terminal are roughly divided into the circuit switched (CS) services and the packet switched (PS) services. For example, a general voice conversation service is a circuit switched service, while a Web browsing service via an Internet connection is classified as a packet switched (PS) service.
- [13] For supporting circuit switched services, the RNCs 111 are connected to the MSC 210 of the core network 200, and the MSC 210 is connected to the GMSC 220 that manages the connection with other networks.
- [14] For supporting packet switched services, the RNCs 111 are connected to the SGSN 230 and the GGSN 240 of the core network 200. The SGSN 230 supports the packet communications going toward the RNCs 111, and the GGSN 240 manages the connection with other packet switched networks, such as the Internet.
- [15] Various types of interfaces exist between network components to allow the network components to transmit and receive information to and from each other for mutual communication therebetween. An interface between the RNC 111 and the core network 200 is defined as an Iu interface. In particular, the Iu interface between the RNCs 111 and the core network 200 for packet switched systems is defined as "Iu-PS," and the Iu interface between the RNCs 111 and the core network 200 for circuit switched systems is defined as "Iu-CS."
- [16] Figure 2 illustrates a structure of a radio interface protocol between the terminal and

the UTRAN according to the 3GPP radio access network standards.

- [17] As shown in Figure 2, the radio interface protocol has horizontal layers comprising a physical layer, a data link layer, and a network layer, and has vertical planes comprising a user plane (U-plane) for transmitting user data and a control plane (C-plane) for transmitting control information.
- [18] The user plane is a region that handles traffic information of the user, such as voice or Internet protocol (IP) packets, while the control plane is a region that handles control information for an interface of a network, maintenance and management of a call, and the like.
- [19] The protocol layers in Figure 2 can be divided into a first layer (L1), a second layer (L2), and a third layer (L3) based on three lower layers of an open system inter-connection (OSI) standard model. Each layer will be described in more detail as follows.
- [20] The first layer (L1), namely, the physical layer, provides an information transfer service to an upper layer by using various radio transmission techniques. The physical layer is connected to an upper layer called a medium access control (MAC) layer, via a transport channel. The MAC layer and the physical layer send and receive data with one another via the transport channel.
- [21] The second layer (L2) includes a MAC layer, a radio link control (RLC) layer, a broadcast/multicast control (BMC) layer, and a packet data convergence protocol (PDCP) layer.
- [22] The MAC layer provides an allocation service of the MAC parameters for allocation and re-allocation of radio resources. The MAC layer is connected to an upper layer called the radio link control (RLC) layer, via a logical channel.
- [23] Various logical channels are provided according to the kind of transmitted information. In general, when information of the control plane is transmitted, a control channel is used. When information of the user plane is transmitted, a traffic channel is used. A logical channel may be a common channel or a dedicated channel depending on whether the logical channel is shared. Logical channels include a dedicated traffic channel (DTCH), a dedicated control channel (DCCH), a common traffic channel (CTCH), a common control channel (CCCH), a broadcast control channel (BCCH) and a paging control channel (PCCH) or a Shared Channel Control Channel (SHCCH). The BCCH provides information including information utilized by a terminal to access a system. The PCCH is used by the UTRAN to access a terminal.
- [24] A Multimedia Broadcast/Multicast Service (MBMS or "MBMS service") refers to a method of providing streaming or background services to a plurality of UEs using a downlink-dedicated MBMS radio bearer that utilizes at least one of point-to-multipoint and point-to-point radio bearer. One MBMS service includes one or more sessions and

MBMS data is transmitted to the plurality of terminals through the MBMS radio bearer only while the session is ongoing.

- [25] As the name implies, an MBMS may be carried out in a broadcast mode or a multicast mode. The broadcast mode is for transmitting multimedia data to all UEs within a broadcast area, for example the domain where the broadcast is available. The multicast mode is for transmitting multimedia data to a specific UE group within a multicast area, for example the domain where the multicast service is available.
- [26] For the purposes of MBMS, additional traffic and control channels exist. For example, an MCCH (MBMS point-to-multipoint Control Channel) is used for transmitting MBMS control information while an MTCH (MBMS point-to-multipoint Traffic Channel) is used for transmitting MBMS service data.
- [27] The different logical channels that exist are listed below:



- [28] The MAC layer is connected to the physical layer by transport channels and can be divided into a MAC-b sub-layer, a MAC-d sub-layer, a MAC-c/sh sub-layer, and a MAC-hs sub-layer according to the type of transport channel to be managed.
- [29] The MAC-b sub-layer manages a BCH (Broadcast Channel), which is a transport channel handling the broadcasting of system information. The MAC-d sub-layer manages a dedicated channel (DCH), which is a dedicated transport channel for a specific terminal. Accordingly, the MAC-d sub-layer of the UTRAN is located in a serving radio network controller (SRNC) that manages a corresponding terminal, and one MAC-d sub-layer also exists within each terminal (UE).
- [30] The MAC-c/sh sub-layer manages a common transport channel, such as a forward access channel (FACH) or a downlink shared channel (DSCH), which is shared by a plurality of terminals, or in the uplink the Radio Access Channel (RACH). In the UTRAN, the MAC-c/sh sub-layer is located in a controlling radio network controller

(CRNC). As the MAC-c/sh sub-layer manages the channel being shared by all terminals within a cell region, a single MAC-c/sh sub-layer exists for each cell region. Also, one MAC-c/sh sublayer exists in each terminal (UE). Referring to Figure 3, possible mapping between the logical channels and the transport channels from a UE perspective is shown. Referring to Figure 4, possible mapping between the logical channels and the transport channels from a UTRAN perspective is shown.

- [31] The RLC layer supports reliable data transmissions, and performs a segmentation and concatenation function on a plurality of RLC service data units (RLC SDUs) delivered from an upper layer. When the RLC layer receives the RLC SDUs from the upper layer, the RLC layer adjusts the size of each RLC SDU in an appropriate manner upon considering processing capacity, and then creates certain data units with header information added thereto. The created data units are called protocol data units (PDUs), which are then transferred to the MAC layer via a logical channel. The RLC layer includes a RLC buffer for storing the RLC SDUs and/or the RLC PDUs.
- [32] The BMC layer schedules a cell broadcast message (referred to as a 'CB message', hereinafter) received from the core network, and broadcasts the CB messages to terminals located in a specific cell(s). The BMC layer of the UTRAN generates a broadcast/multicast control (BMC) message by adding information, such as a message ID (identification), a serial number, and a coding scheme to the CB message received from the upper layer, and transfers the BMC message to the RLC layer. The BMC messages are transferred from the RLC layer to the MAC layer through a logical channel, i.e., the CTCH (Common Traffic Channel). The CTCH is mapped to a transport channel, i.e., a FACH, which is mapped to a physical channel, i.e., a S-CCPCH (Secondary Common Control Physical Channel).
- [33] The PDCP (Packet Data Convergence Protocol) layer, as a higher layer of the RLC layer, allows the data transmitted through a network protocol, such as an IPv4 or IPv6, to be effectively transmitted on a radio interface with a relatively small bandwidth. To achieve this, the PDCP layer reduces unnecessary control information used in a wired network, a function called header compression.
- [34] A radio resource control (RRC) layer is located at a lowermost portion of the L3 layer. The RRC layer is defined only in the control plane, and handles the control of logical channels, transport channels, and physical channels with respect to setup, re-configuration, and release or cancellation of radio bearers (RBs). The radio bearer service refers to a service provided by the second layer (L2) for data transmission between the terminal and the UTRAN. In general, the setup of the radio bearer refers to the process of defining the characteristics of a protocol layer and a channel required for providing a specific data service, as well as respectively setting detailed parameters and operation methods.

- [35] The RLC layer can belong to the user plane or to the control plane depending upon the type of layer connected at the upper layer of the RLC layer. That is, if the RLC layer receives data from the RRC layer, the RLC layer belongs to the control plane. Otherwise, the RLC layer belongs to the user plane.
- [36] The different possibilities that exist for the mapping between the radio bearers and the transport channels are not always possible. The UE/UTRAN deduces the possible mapping depending on the UE state and the procedure that the UE/UTRAN is executing. The different states and modes are explained in more detail below.
- [37] The different transport channels are mapped onto different physical channels. For example, the RACH transport channel is mapped on a given PRACH, the DCH can be mapped on the DPCH, the FACH and the PCH can be mapped on the S-CCPCH, the DSCH is mapped on the PDSCH and so on. The configuration of the physical channels is given by an RRC signaling exchange between the RNC and the UE.
- [38] Messages transmitted on the MCCH should carry all information regarding activated services, information regarding the configuration of point-to-multipoint (PTM) radio bearers on the current and neighboring cells, as well as information on available physical channels that carry them. MCCH information is periodically sent in modification periods. Meanwhile, the UE may read messages carrying the MCCH information any time during a modification period. Thus, the content of the messages, such as the configuration of the channels, without any further clarification can only be applied during the next modification period. Otherwise, it is not guaranteed that all UEs will have read the messages. Because this constrains the flexibility of the modifications to a physical channel configuration, it is necessary to have a mechanism that includes changes in a more flexible manner.

Disclosure of Invention

Technical Solution

- [39] The present invention is directed to a method for indicating the validity of an SCCPCH configuration.
- [40] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.
- [41] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the present invention is embodied in a method for indicating the validity of a physical channel carrying point-to-multipoint service data in a wireless communication system, the method comprising

generating a message comprising configuration information for a channel, including with the message validity information for indicating the validity of the configuration information, and transmitting the message to a mobile terminal.

[42] Preferably, the message is a control message transmitted through an MCCH, the configuration information is critical information and the channel is an SCCPCH.

[43] Preferably, the message is at least one of MBMS Common p-t-m rb Information, MBMS Current Cell p-t-m rb Information, MBMS General Information, MBMS Modified services Information, MBMS Neighbouring Cell p-t-m rb Information, MBMS Modification request and MBMS Unmodified services Information.

[44] Preferably, the validity information indicates that the configuration information is valid during a current modification period. Alternatively, the validity information indicates that the configuration information is valid after a given activation time. The activation time may be based on a system frame number (SFN) transmitted from a network to the mobile terminal. The system frame number (SFN) is transmitted in a system information message through a BCCH, wherein the system frame number (SFN) is the system frame number of a cell on which the configuration information is transmitted.

[45] The validity information may also indicate that the configuration information is valid up to a given activation time. The activation time may be based on a system frame number (SFN) transmitted from a network to the mobile terminal. The system frame number (SFN) is transmitted in a system information message through a BCCH, wherein the system frame number (SFN) is the system frame number of a cell on which the configuration information is transmitted.

[46] In one aspect of the present invention a method for indicating the validity of a physical channel carrying point-to-multipoint service data in a wireless communication system comprises receiving a message comprising configuration information for a channel, wherein the message includes validity information for indicating the validity of the configuration information, and receiving the channel using the configuration information according to the validity information.

[47] Preferably, the message is a control message received through an MCCH, the configuration information is critical information and the channel is an SCCPCH.

[48] Preferably, the message is at least one of MBMS Common p-t-m rb Information, MBMS Current Cell p-t-m rb Information, MBMS General Information, MBMS Modified services Information, MBMS Neighbouring Cell p-t-m rb Information, MBMS Modification request and MBMS Unmodified services Information.

[49] Preferably, the validity information indicates that the configuration information is valid during a current modification period. Alternatively, the validity information indicates that the configuration information is valid after a given activation time. The

activation time may be based on a system frame number (SFN) received from a network. The system frame number (SFN) is received in a system information message through a BCCH, wherein the system frame number (SFN) is the system frame number of a cell on which the configuration information is received.

[50] The validity information may also indicate that the configuration information is valid up to a given activation time. The activation time may be based on a system frame number (SFN) received from a network. The system frame number (SFN) is received in a system information message through a BCCH, wherein the system frame number (SFN) is the system frame number of a cell on which the configuration information is received.

[51] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

Description of Drawings

[52] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[53] Figure 1 is a block diagram of a general UMTS network architecture.

[54] Figure 2 is a block diagram of a structure of a radio interface protocol between a terminal and a network based on 3GPP radio access network standards.

[55] Figure 3 illustrates the mapping of logical channels onto transport channels in the mobile terminal.

[56] Figure 4 illustrates the mapping of logical channels onto transport channels in the network.

[57] Figure 5 illustrates possible transitions between modes and states in the UMTS network.

[58] Figure 6 illustrates a process of providing a particular MBMS service using a multicast mode.

[59] Figure 7 illustrates a process of providing broadcast services.

[60] Figure 8 illustrates a schedule for transmitting information on an MCCH.

[61] Figure 9 illustrates the transmission of control information to a mobile terminal, in accordance with one embodiment of the present invention.

Mode for Invention

[62] The present invention relates to a method for indicating the validity of a channel configuration. Preferably, the present invention indicates whether a configuration for a physical channel, such as an SCCPCH, carrying MBMS services is valid during a

current modification period or longer, after a given activation time, or up to a given activation time. Thus, the problem of a mobile terminal trying to use an invalid physical channel configuration is avoided.

- [63] An RRC mode refers to whether there exists a logical connection between the RRC of the terminal and the RRC of the UTRAN. If there is a connection, the terminal is said to be in RRC connected mode. If there is no connection, the terminal is said to be in idle mode. Because an RRC connection exists for terminals in RRC connected mode, the UTRAN can determine the existence of a particular terminal within the unit of cells, for example which cell or set of cells the RRC connected mode terminal is in, and which physical channel the UE is listening to. Thus, the terminal can be effectively controlled.
- [64] In contrast, the UTRAN cannot determine the existence of a terminal in idle mode. The existence of idle mode terminals can only be determined by the core network. Specifically, the core network can only detect the existence of idle mode terminals within a region that is larger than a cell, such as a location or a routing area. Therefore, the existence of idle mode terminals is determined within large regions. In order to receive mobile communication services such as voice or data, the idle mode terminal must move or change into the RRC connected mode. The possible transitions between modes and states are shown in Figure 5.
- [65] A UE in RRC connected mode can be in different states, such as a CELL_FACH state, a CELL_PCH state, a CELL_DCH state or a URA_PCH state. Depending on the states, the UE listens to different channels. For example a UE in CELL_DCH state will try to listen (amongst others) to DCH type of transport channels, which comprises DTCH and DCCH transport channels, and which can be mapped to a certain DPCH. The UE in CELL_FACH state will listen to several FACH transport channels which are mapped to a certain S-CCPCH physical channel. The UE in PCH state will listen to the PICH channel and to the PCH channel, which is mapped to a certain S-CCPCH physical channel.
- [66] The UE also carries out different actions depending on the state. For example, based on different conditions, a UE in CELL_FACH will start a CELL Update procedure each time the UE changes from the coverage of one cell into the coverage of another cell. The UE starts the CELL Update procedure by sending to the NodeB a Cell Update message to indicate that the UE has changed its location. The UE will then start listening to the FACH. This procedure is additionally used when the UE comes from any other state to CELL_FACH state and the UE has no C-RNTI available, such as when the UE comes from the CELL_PCH state or CELL_DCH state, or when the UE in CELL_FACH state was out of coverage.
- [67] In the CELL_DCH state, the UE is granted dedicated radio resources, and may ad-

ditionally use shared radio resources. This allows the UE to have a high data rate and efficient data exchange. However, the radio resources are limited. It is the responsibility of the UTRAN to allocate the radio resources amongst the UEs such that they are efficiently used and ensure that the different UEs obtain the quality of service required.

[68] A UE in CELL_FACH state has no dedicated radio resources attributed, and can only communicate with the UTRAN via shared channels. Thus, the UE consumes few radio resources. However, the data rate available is very limited. Also, the UE needs to permanently monitor the shared channels. Thus, UE battery consumption is increased in the case where the UE is not transmitting.

[69] A UE in CELL_PCH/URA_PCH state only monitors the paging channel at dedicated occasions, and therefore minimizes the battery consumption. However, if the network wishes to access the UE, it must first indicate this desire on the paging occasion. The network may then access the UE, but only if the UE has replied to the paging. Furthermore, the UE can only access the network after performing a Cell Update procedure which introduces additional delays when the UE wants to send data to the UTRAN.

[70] Main system information is sent on the BCCH logical channel, which is mapped on the P-CCPCH (Primary Common Control Physical Channel). Specific system information blocks can be sent on the FACH channel. When the system information is sent on the FACH, the UE receives the configuration of the FACH either on the BCCH that is received on the P-CCPCH or on a dedicated channel. When the system information is sent on the BCCH via the P-CCPCH, then in each frame or set of two frames, a system frame number (SFN) is sent which is used to share the same timing reference between the UE and the Node B. The P-CCPCH is sent using the same scrambling code as a P-CPICH (Primary Common Pilot Channel), which is the primary scrambling code of the cell. Each channel uses a spreading code as commonly done in WCDMA (Wideband Code Division Multiple Access) systems. Each code is characterized by its spreading factor (SF) which corresponds to the length of the code. For a given spreading factor, the number of orthogonal codes is equal to the length of the code. For each spreading factor, the given set of orthogonal codes, as specified in the UMTS system, are numbered from 0 to SF-1. Each code can thus be identified by giving its length (i.e. spreading factor) and the number of the code. The spreading code that is used by the P-CCPCH is always of a fixed spreading factor 256 and the number is the number 1. The UE knows about the primary scrambling code either by information sent from the network on system information of neighboring cells that the UE has read, by messages that the UE has received on the DCCH channel, or by searching for the P-CPICH, which is sent using the fixed SF 256 and the spreading

code number 0, and which transmits a fixed pattern.

[71] The system information comprises information on neighboring cells, configuration of the RACH and FACH transport channels, and the configuration of MCCH, which is a channel dedicated for MBMS service. Each time the UE changes cells, it is camping or in idle mode. When the UE has selected the cell (in CELL_FACH, CELL_PCH or URA_PCH state), the UE verifies that it has valid system information.

[72] The system information is organized in SIBs (system information blocks), a MIB (Master information block) and scheduling blocks. The MIB is sent very frequently and provides timing information of the scheduling blocks and the different SIBs. For SIBs that are linked to a value tag, the MIB also contains information on the last version of a part of the SIBs. SIBs that are not linked to a value tag are linked to an expiration timer. The SIBs linked to an expiration timer become invalid and need to be reread if the time of the last reading of the SIB is larger than an expiration timer value. The SIBs linked to a value tag are only valid if they have the same value tag as a value tag broadcast in the MIB. Each block has an area scope of validity, such as a Cell, a PLMN (Public Land Mobile Network) or an equivalent PLMN, which signifies on which cells the SIB is valid. A SIB with the area scope "Cell" is valid only for the cell in which it has been read. A SIB with the area scope "PLMN" is valid in the whole PLMN. A SIB with the area scope "equivalent PLMN" is valid in the whole PLMN and equivalent PLMN.

[73] In general, UEs read the system information when they are in idle mode, CELL_FACH state, CELL_PCH state or in URA_PCH state of the cell that they have selected, i.e., the cell that they are camping on. In the system information, the UEs receive information on the neighboring cells on the same frequency, different frequencies and different RAT (Radio access technologies). This allows the UEs to know which cells are candidates for cell reselection.

[74] The 3GPP system provides multimedia broadcast multicast service (MBMS). The 3GPP TSG SA (Service and System Aspect) defines various network elements and their functions required for supporting MBMS services. A cell broadcast service provided by the prior art is limited to a service in which text type short messages are broadcast to a certain area. The MBMS service, however, is a more advanced service that multicasts multimedia data to terminals (UEs) that have subscribed to the corresponding service in addition to broadcasting multimedia data.

[75] The MBMS service is a downward-dedicated service that provides a streaming or background service to a plurality of terminals by using a common or dedicated downward channel. The MBMS service is divided into a broadcast mode and a multicast mode. The MBMS broadcast mode facilitates transmitting multimedia data to every user located in a broadcast area, whereas the MBMS multicast mode facilitates

transmitting multimedia data to a specific user group located in a multicast area. The broadcast area signifies a broadcast service available area and the multicast area signifies a multicast service available area.

[76] Figure 6 illustrates a process of providing a particular MBMS service, by using the multicast mode. The procedure can be split into two types of actions, those that are transparent and those that are not transparent to the UTRAN.

[77] The transparent actions are described in the following. A user desiring to receive the MBMS service, first needs to subscribe in order to be allowed to receive MBMS services, to receive information on MBMS services, and to join a certain set of MBMS services. A service announcement provides the terminal with a list of services to be provided and other related information. The user can then join these services. By joining, the user indicates that the user wants to receive information linked to services that the user has subscribed to and becomes part of a multicast service group. When a user is no longer interested in a given MBMS service, the user leaves the service, i.e., the user is no longer part of the multicast service group. These actions can be taken by using any means of communication, i.e., the actions may be done using SMS (Short Messaging Service), or by Internet access. These actions do not have to necessarily be done using the UMTS system.

[78] In order to receive a service for which the user is in a multicast group the following actions that are not transparent to the UTRAN are executed. The SGSN informs the RNC about a session start. Then the RNC notifies the UEs of the multicast group that a given service has started in order to initiate reception of the given service. After having broadcast the necessary UE actions and eventually the configuration of the PtM bearers for the given service the transmission of the data starts. When the session stops, the SGSN indicates the stopped session to the RNC. The RNC in turn initiates a session stop. The transmission of the service from the SGSN means for the RNC to provide a bearer service for conveying the data of the MBMS service.

[79] After the notification procedure, other procedures can be initiated between the UE and the RNC and the SGSN to enable data transmission, such as RRC connection establishment, connection establishment towards the PS domain, frequency layer convergence, and counting.

[80] Reception of an MBMS service may be performed in parallel to the reception of other services, such as a voice or video call on the CS domain, SMS transfer on the CS or PS domain, data transfer on the PS domain, or any signaling related to the UTRAN or PS or CS domain.

[81] Contrary to the multicast service, for broadcast services, as shown in Figure 7, only the announcement of the service must be done in a transparent manner. No subscription or joining is needed. Afterwards, the actions that are transparent to the RNC

are the same as for multicast services.

- [82] For MBMS, two additional control channels are introduced. They are the MCCH and the MICH (MBMS Notification Indicator Channel). The MCCH is mapped on the FACH. The MICH is a new physical channel and is used to notify users to read the MCCH channel. The MICH is designed to allow the UEs to perform a DRX (Discontinuous Reception) scheme. DRX allows the reduction of battery consumption for UEs while allowing the UEs to still be aware of any service for which a session is starting. The MICH may be used to inform the UE of a change in a frequency convergence scheme, change of a configuration of a point-to-multipoint (PtM) bearer, switch between the PtM bearer and a point-to-point (PtP) bearer, etc., which all require the MCCH to be read.
- [83] The MCCH channel periodically transmits information regarding active services, MTCH configuration, frequency convergence, etc. The UE reads the MCCH information to receive the subscribed services based on different triggers. For example, the UE may be triggered after cell selection/reselection, when the UE is notified of a given service on the MICH, or when the UE is notified via the DCCH channel. The MCCH carries different messages, such as MBMS Common p-t-m rb Information, MBMS Current Cell p-t-m rb Information, MBMS General Information, MBMS Modified services Information, MBMS Neighbouring Cell p-t-m rb Information or MBMS Unmodified services Information.
- [84] The MCCH information is transmitted based on a fixed schedule. The schedule identifies a transmission time interval (TTI) containing the beginning of the MCCH information. The transmission of the information may take a variable number of TTIs. The UTRAN transmits the MCCH information in consecutive TTIs. The mobile terminal (UE) continues to receive the SCCPCH until: 1) the UE receives all of the MCCH information; 2) the UE receives a TTI that does not include any MCCH data; or 3) the information contents indicate that further reception is not required (e.g. there is no modification to the desired service information).
- [85] Based on this behavior, the UTRAN may repeat the MCCH information following a scheduled transmission in order to improve reliability. The MCCH schedule is common for all services. The entire MCCH information is transmitted periodically based on a "repetition period". A "modification period" is defined as an integer multiple of the repetition period. The MBMS ACCESS INFORMATION may be transmitted periodically based on an "access info period". This period is an integer divider of the "repetition period".
- [86] MCCH information may be categorized as critical and non-critical information. Changes to critical information will only be applied at the first MCCH transmission of a modification period. At the beginning of each modification period, the UTRAN

transmits the MBMS Modified services Information including, amongst others, information on MBMS services whose MCCH information is modified at that modification period. MBMS Modified services Information is repeated at least once in each repetition period of that modification period. Changes to non-critical information may take place at any time. Figure 8 illustrates a schedule with which the MBMS Modified services Information and the remaining information sent on MCCH are transmitted. Different blocks indicate potentially different MCCH content.

[87] Referring to Figure 9, a method for indicating the validity of a physical channel carrying point-to-multipoint service data is shown. The UTRAN generates a message for transmitting MBMS control information to the mobile terminal. The message is sent on a logical channel MCCH (MBMS Control Channel), as shown in Figure 9. The MCCH may carry different control messages, such as MBMS Common p-t-m rb Information, MBMS Current Cell p-t-m rb Information, MBMS General Information, MBMS Modified services Information, MBMS Neighbouring Cell p-t-m rb Information and MBMS Unmodified services Information.

[88] Configuration information for receiving a physical channel SCCPCH (Secondary Common Control Physical Channel) carrying MBMS services is included in the message transmitted to the mobile terminal. Preferably, the configuration information is transmitted as critical information. Thus, any changes to the configuration information are applied during the first MCCH transmission of a modification period. Also included in the message transmitted to the mobile terminal is validity information for indicating when or how long the configuration information is valid.

[89] The mobile terminal receives the message including the configuration information and the validity information through the MCCH. Preferably, the validity information indicates to the mobile terminal that the configuration information is valid during a current modification period. Thus, when the validity information is received during the current modification period, the mobile terminal is informed that the SCCPCH configuration is currently valid and may be used upon reading the configuration information. Alternatively, the validity information may indicate to the mobile terminal that the configuration information is valid either after a given activation time or until a given activation time. Accordingly, once having read the validity information, the mobile terminal knows exactly how long to receive the SCCPCH using the corresponding configuration information. Therefore, the mobile terminal avoids attempting to receive the SCCPCH using an invalid configuration.

[90] The activation time may correspond to a start or end time of an MBMS service subscribed to by the mobile terminal or to a start or end time of an SCCPCH configuration. Preferably, the activation time is based on a system frame number (SFN). The SFN may be transmitted from the network to the mobile terminal in a system in-

formation message, wherein the system information message is transmitted through a BCCH (Broadcast Control Channel), as shown in Figure 9. When the validity information indicates that the configuration is valid after a given activation time, then it is valid after the SFN. When the validity information indicates that the configuration information is valid up to a given activation time, then it is valid up to the SFN.

- [91] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. In the claims, means-plus-function clauses are intended to cover the structure described herein as performing the recited function and not only structural equivalents but also equivalent structures.

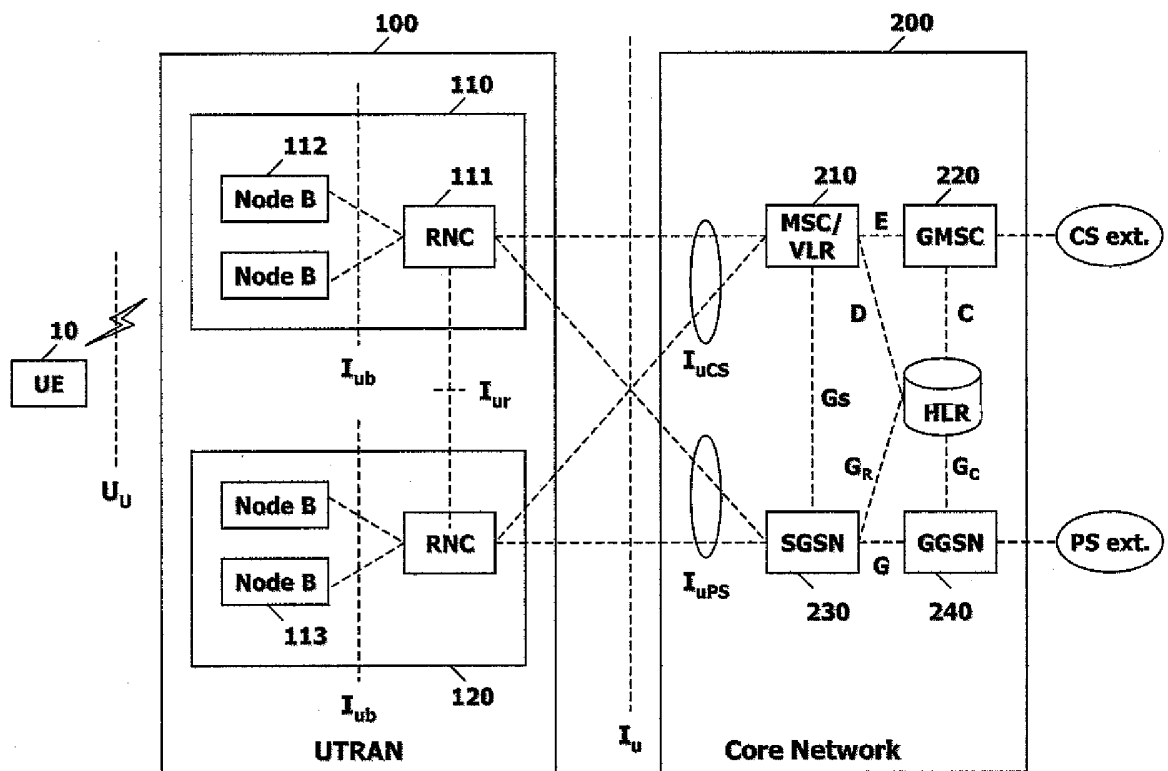
Claims

- [1] A method for indicating the validity of a physical channel carrying point-to-multipoint service data in a wireless communication system, the method comprising:
generating a message comprising configuration information for a channel;
including with the message validity information for indicating the validity of the configuration information; and
transmitting the message to a mobile terminal.
- [2] The method of claim 1, wherein the message is a control message transmitted through an MCCH.
- [3] The method of claim 2, wherein the configuration information is critical information.
- [4] The method of claim 1, wherein the channel is an SCCPCH.
- [5] The method of claim 1, wherein the message is at least one of:
MBMS Common p-t-m rb Information;
MBMS Current Cell p-t-m rb Information;
MBMS General Information;
MBMS Modified services Information;
MBMS Neighbouring Cell p-t-m rb Information; and
MBMS Unmodified services Information.
- [6] The method of claim 1, wherein the validity information indicates that the configuration information is valid during a current modification period.
- [7] The method of claim 1, wherein the validity information indicates that the configuration information is valid after a given activation time.
- [8] The method of claim 7, wherein the activation time is based on a system frame number (SFN) transmitted from a network to the mobile terminal.
- [9] The method of claim 8, wherein the system frame number (SFN) is transmitted in a system information message through a BCCH.
- [10] The method of claim 8, wherein the system frame number (SFN) is the system frame number of a cell on which the configuration information is transmitted.
- [11] The method of claim 1, wherein the validity information indicates that the configuration information is valid up to a given activation time.
- [12] The method of claim 11, wherein the activation time is based on a system frame number (SFN) transmitted from a network to the mobile terminal.
- [13] The method of claim 12, wherein the system frame number (SFN) is transmitted in a system information message through a BCCH.
- [14] The method of claim 12, wherein the system frame number (SFN) is the system

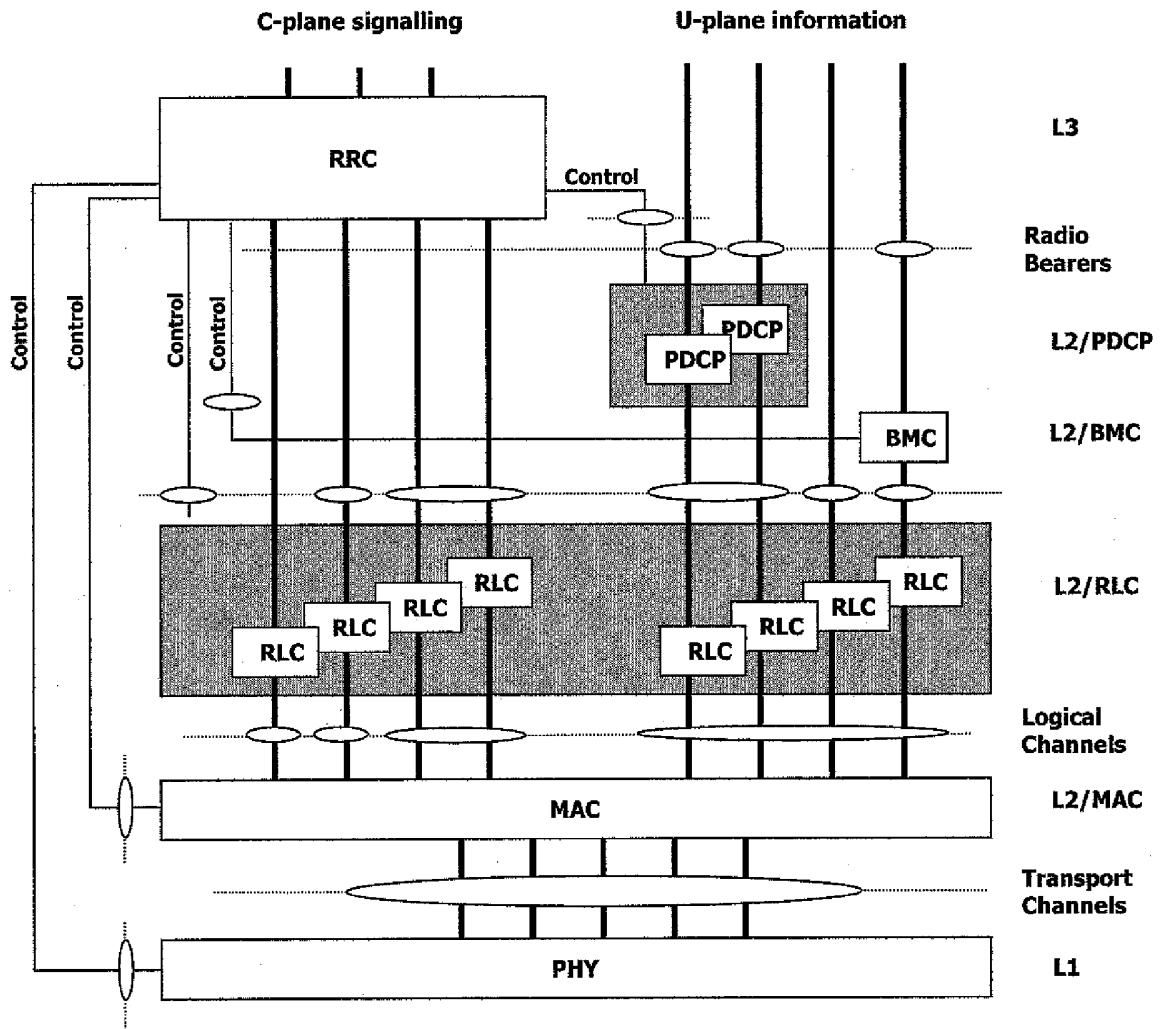
- frame number of a cell on which the configuration information is transmitted.
- [15] A method for indicating the validity of a physical channel carrying point-to-multipoint service data in a wireless communication system, the method comprising:
- receiving a message comprising configuration information for a channel, wherein the message includes validity information for indicating the validity of the configuration information; and
- receiving the channel using the configuration information according to the validity information.
- [16] The method of claim 15, wherein the message is a control message received through an MCCH.
- [17] The method of claim 16, wherein the configuration information is critical information.
- [18] The method of claim 15, wherein the channel is an SCCPCH.
- [19] The method of claim 15, wherein the message is at least one of:
- MBMS Common p-t-m rb Information;
- MBMS Current Cell p-t-m rb Information;
- MBMS General Information;
- MBMS Modified services Information;
- MBMS Neighbouring Cell p-t-m rb Information; and
- MBMS Unmodified services Information.
- [20] The method of claim 15, wherein the validity information indicates that the configuration information is valid during a current modification period.
- [21] The method of claim 15, wherein the validity information indicates that the configuration information is valid after a given activation time.
- [22] The method of claim 21, wherein the activation time is based on a system frame number (SFN) received from a network.
- [23] The method of claim 22, wherein the system frame number (SFN) is received in a system information message through a BCCH.
- [24] The method of claim 22, wherein the system frame number (SFN) is the system frame number of a cell on which the configuration information is received.
- [25] The method of claim 15, wherein the validity information indicates that the configuration information is valid up to a given activation time.
- [26] The method of claim 25, wherein the activation time is based on a system frame number (SFN) received from a network.
- [27] The method of claim 26, wherein the system frame number (SFN) is received in a system information message through a BCCH.
- [28] The method of claim 27, wherein the system frame number (SFN) is the system

frame number of a cell on which the configuration information is received.

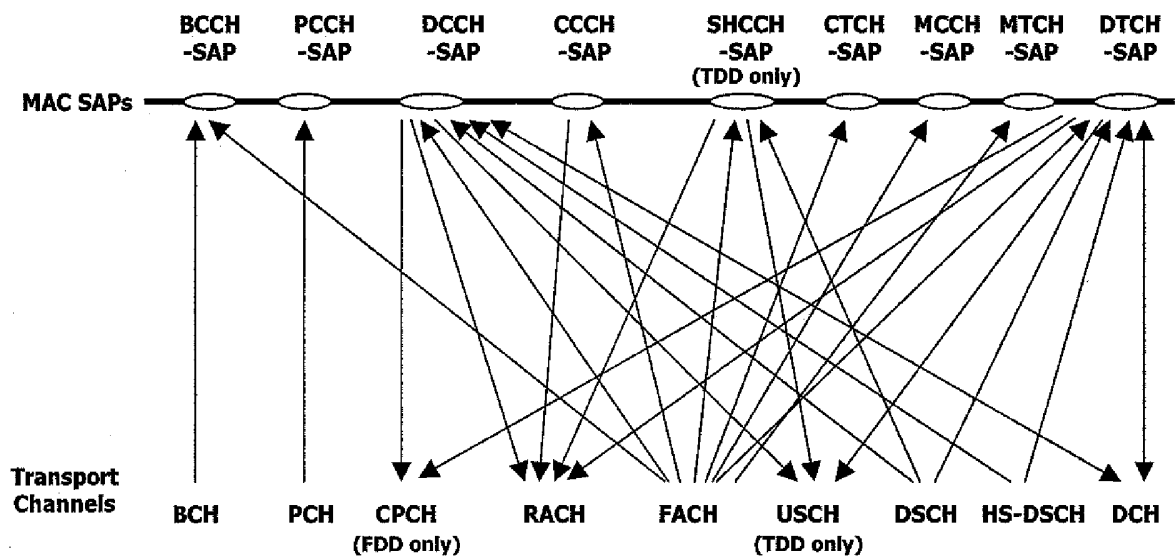
[Fig. 1]



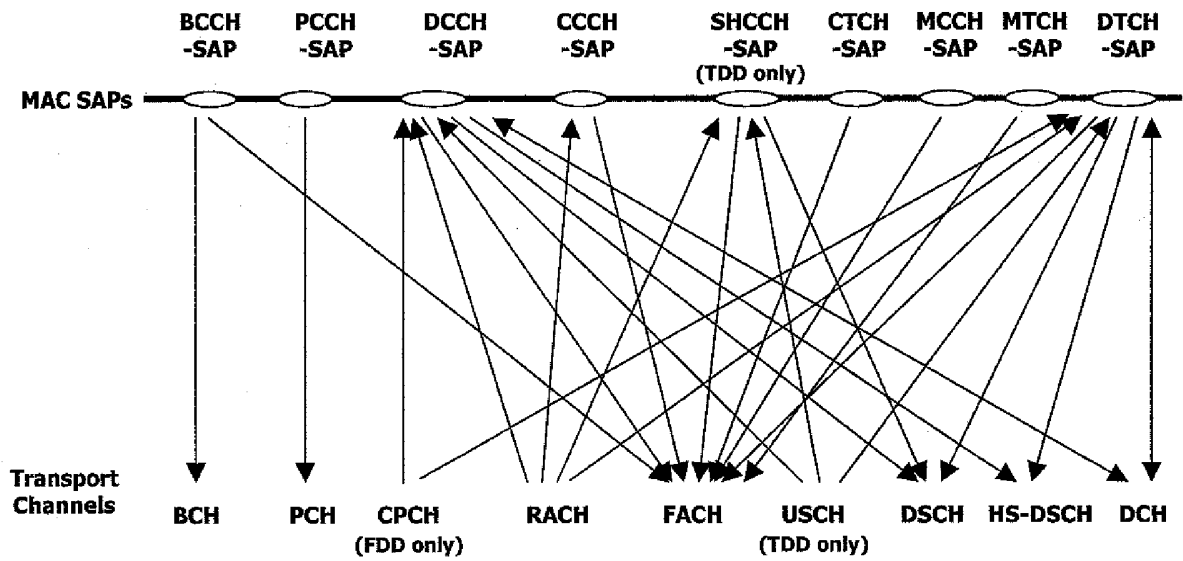
[Fig. 2]



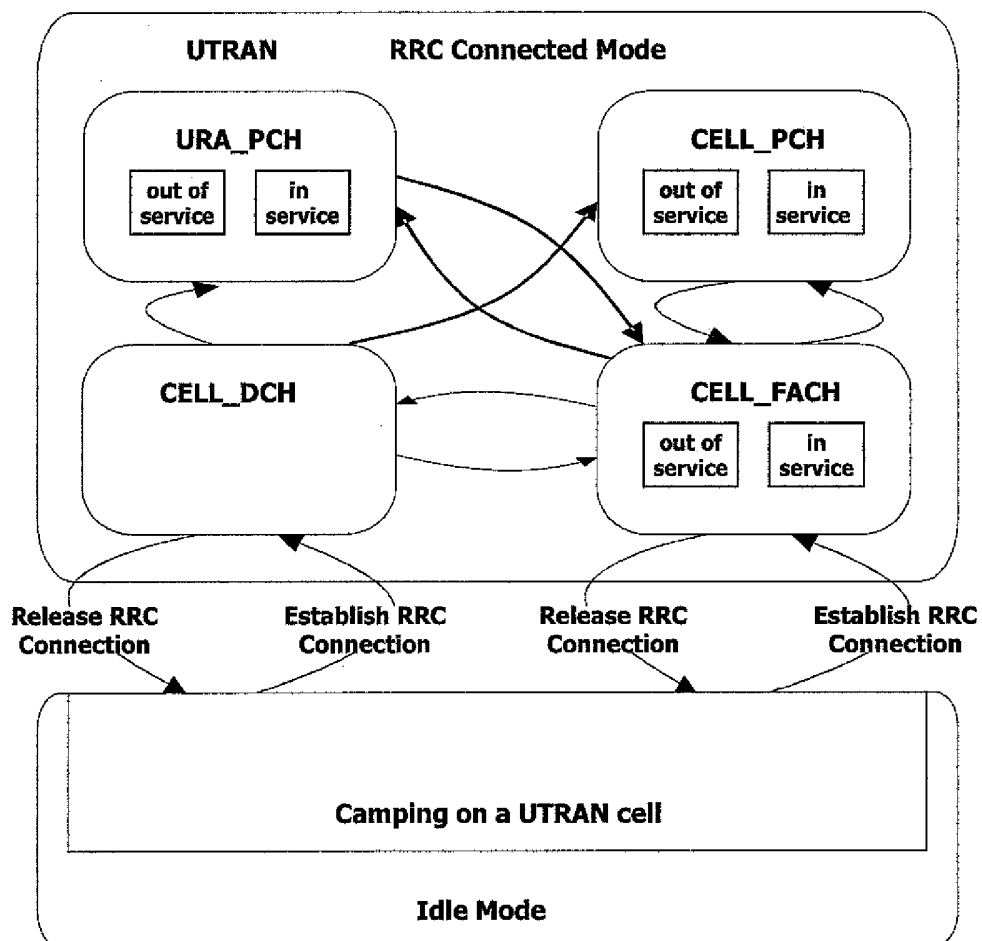
[Fig. 3]



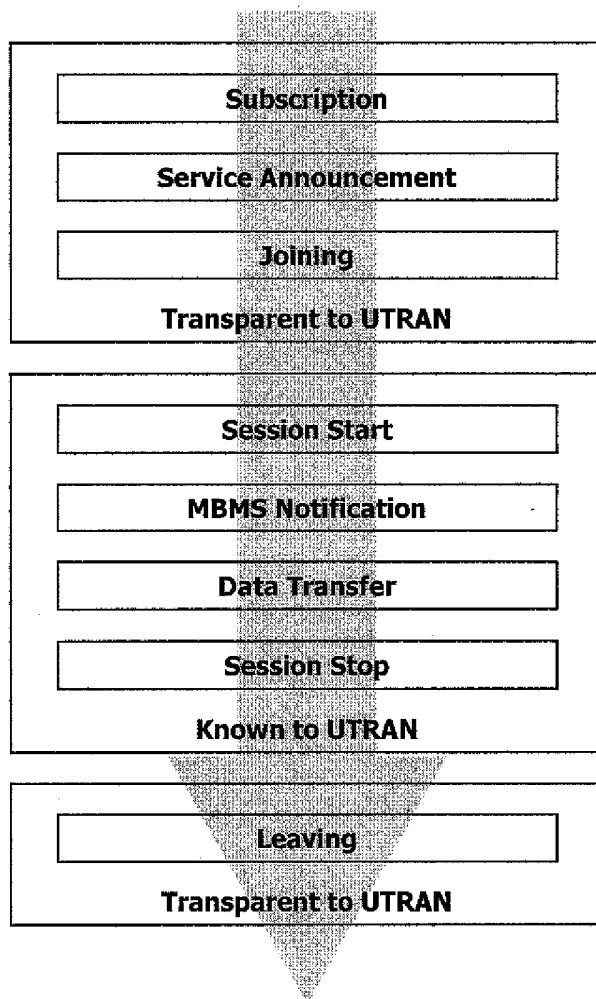
[Fig. 4]



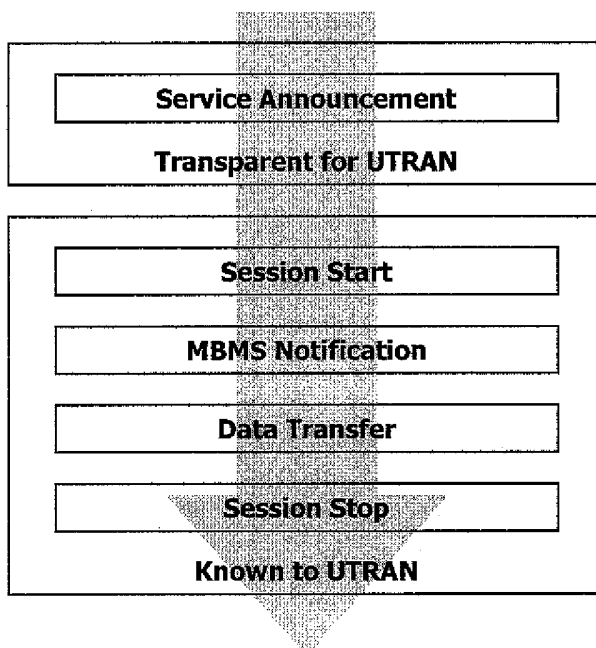
[Fig. 5]



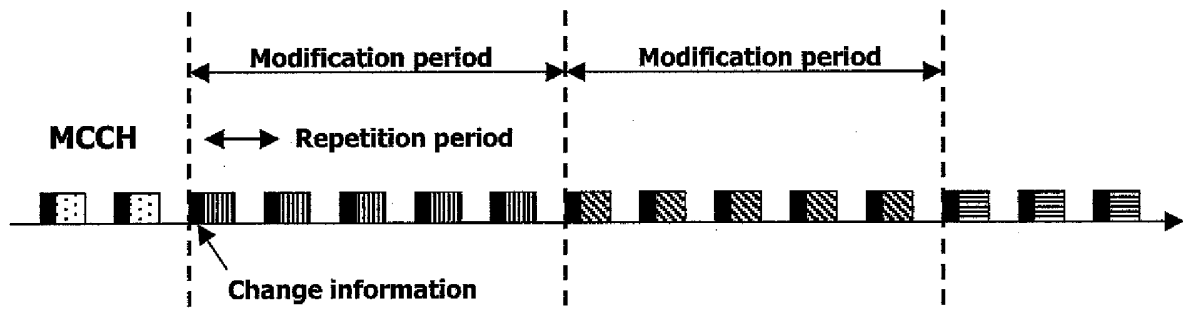
[Fig. 6]



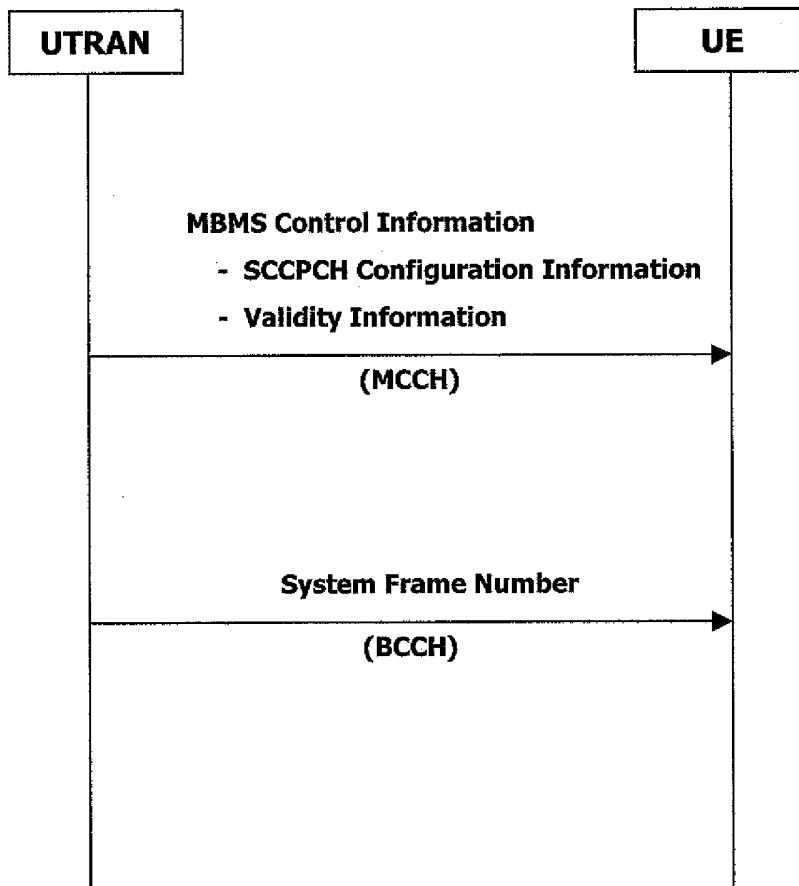
[Fig. 7]



[Fig. 8]



[Fig. 9]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2005/001123

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 H04B 7/26**

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)

IPC7 H04B 1/707, H04B 7/26, H04Q 7/00

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

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

search terms : cdma, multimedia broadcast multicast service(MBMS), universal mobile telecommunications service(UMTS), UMTS terrestrial radio access network(UTRAN), validity information, configuration, medium access control(MAC)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PA	US 20040192267 A1 30 Sep. 2004 (NOKIA CORPORATION) claims 1, 5, 9, 13, 17	1, 15
A	US 6449488 B1 10 Sep. 2002 (LUCENT TECHNOLOGIES INC.) claim 1	1, 15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of 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

25 JULY 2005 (25.07.2005)

Date of mailing of the international search report

25 JULY 2005 (25.07.2005)

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Telephone No. 82-42-481-5718



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2005/001123

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 20040192267 A1	30 Sep. 2004	WO 04/052040 A3	17 June 2004
US 6449488 B1	10 Sep. 2002	EP 1079642 A1	28 Feb. 2001
		JP 2001-119340 A	27 Apr. 2001
		KR 2001-0050185 A	15 June 2001