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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 December 2009 (03.12.2009)

PCT

(10) International Publication Number
WO 2009/145688 A1

(51) International Patent Classification:
H04W 4/06 (2009.01) *H04L 1/18* (2006.01)

(21) International Application Number:
PCT/SE2008/050639

(22) International Filing Date:
30 May 2008 (30.05.2008)

(25) Filing Language: English

(26) Publication Language: English

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

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DU, Jiuhui** [CN/CN]; Nanhu East Park, No. 707, 102 building, Chaoyang, Beijing, 100060 (CN). **XU, Bin** [CN/CN]; Nanhu East Park, No. 708, 102 building, Chaoyang, Beijing, 100102 (CN). **YAN, Ying** [CN/CN]; Nanhu East Park, No. 902, 102 building, Chaoyang District, Beijing, 100102 (CN).

(74) Agent: **NILSSON, Charlotte**; Ericsson AB, Patent Unit 3G, S-164 80 Stockholm (SE).

(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), 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

[Continued on next page]

(54) Title: UPLINK CHANNEL FOR POINT TO MULTIPOINT MULTIMEDIA BROADCAST AND MULTICAST SERVICE

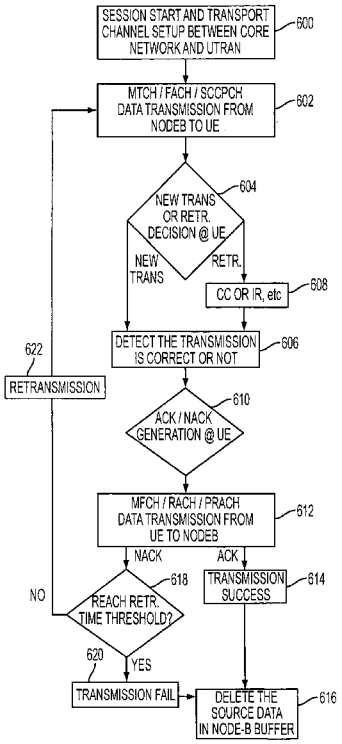

FIG. 6

(57) Abstract: A base station, user terminal, computer readable medium and method for accepting an uplink channel, for a point-to-multipoint (P-t-M) multimedia broadcast and multicast service (MBMS) transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a communication network. The method includes; setting up a downlink MBMS traffic channel (MTCH) from the base station to the multiple user terminals; transmitting first data from the base station via the MTCH channel in the P-t-M mode, wherein the P-t-M mode pushes data from the base station to the multiple user terminals; receiving from the multiple user terminals messages via an uplink MBMS Feedback Channel (MFCH), wherein the messages indicate whether the first data transmitted from the base station has been decoded successfully or not at the multiple user terminals; and deciding whether to transmit second data or retransmit the first data from the base station to the multiple user terminals based on the received messages.

WO 2009/145688 A1

(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 (Art. 21(3))*

Uplink Channel for Point to Multipoint Multimedia Broadcast and Multicast Service

TECHNICAL FIELD

[0001] The present invention generally relates to radio communication systems, devices, software and methods and, more particularly, to mechanisms and techniques for uplink channel communication for point-to-multipoint (P-t-M) multimedia broadcast and multicast service (MBMS) in a telecommunication network.

BACKGROUND

[0002] During the past years, the interest in radio access technologies for providing services for voice, video and data has increased. There are various telecom technologies used in cellular communications. The most widespread radio access technology for mobile communication is digital cellular. Increased interest is shown in 3G (third generation) systems. One such 3G system is based on Time-Division – Synchronous Code Division Multiple Access (TD-SCDMA) and this system may be one standard to be used in China.

[0003] TD-SCDMA was adopted by the International Communication Union (ITU) as one time division duplex (TDD) option for International Mobile Telecommunications-2000 (IMT-2000). TD-SCDMA is considered as a major TDD version accompanying 3GPP's Wideband Code Division Multiple Access – Frequency Division Duplex (WCDMA-FDD). One advantage of using TDD is that there is no need to use symmetric uplink/downlink spectrum and thus this system supports more flexibility for spectrum utilization and allocation and has the freedom

to dynamically adjust the numbers of time slots in one radio frame in one frequency band for uplink and downlink, and thus to support the asymmetric nature of network uplink and downlink.

[0004] The TD-SCDMA system design is expected to employ advantages of the following technologies (1) smart antenna technology, i.e., antenna beam may be formed to follow each user like spatial division multiple access (SDMA), and thus to enhance link budget, and (2) TDD and code division multiple access (CDMA), allowing the system to combine time division multiple access (TDMA) and CDMA so that the number of users in each time slot may be kept small to facilitate joint detection, which may reduce multiple-access-interference (MAI) and may alleviate the problem of enhancing the system capacity. TD-SCDMA is also a synchronous system among base stations and mobile stations, especially in the uplink. Consequently, it may alleviate MAI among users and may increase link budget, and thus system capacity.

[0005] The TD-SCDMA is capable of supporting High Speed Downlink Packet Access (HSDPA), which is based on a shared high speed downlink transport channel (called HS-DSCH, for high-speed downlink shared channel) for use in communicating packet data to a terminal device. The HSDPA is considered as improving throughput, latency, and spectral efficiency in the downlink (DL).

[0006] The TD-SCDMA is also capable of supporting multimedia broadcast and multicast service (MBMS) technology. This technology was introduced into Release 6 and Release 7 of 3GPP standards. It is developed based on WCDMA and WCDMA HSDPA. For WCDMA and its derivate systems, due to the radio

resource limit, MBMS is expected to be implemented in WCDMA HSDPA, High Speed Packet Access Plus (HSPA+) and LTE (Long Term Evolution). For example, WCDMA HSDPA provides a streaming type and high power bearer in order to guarantee Quality of Service (QoS) and ensure the broadcasted data arrives to the cell bearer. A Modulation Coding Scheme (MCS) may be used to match different data rates to different applications.

[0007] With MBMS, the same content may be transmitted to multiple users located in a specific area, the MBMS service area, in a unidirectional fashion. The MBMS service area may cover multiple cells. The broadcast and multicast concepts describe different, although closely related cases. In broadcast, a point-to-multipoint radio resource may be set up in each cell being part of the MBMS broadcast area and all users subscribing to the broadcast service simultaneously receive the same transmitted signal. No tracking of user's movement in the radio access network is performed and users may receive the content without notifying the network. Mobile TV is an example of a service that may be provided through MBMS broadcast.

[0008] In multicast, the user requests to join a multicast group prior to receiving any data. The user movement may be tracked and the radio resources may be configured to match the numbers of users in each cell. Each cell in the MBMS multicast area may be configured to point-to-point (P-t-P) or point-to-multipoint transmission. Thus, multicast allows the network to optimize the transmission type in each cell.

[0009] There are two types of air-interface mechanism for MBMS services, i.e., P-t-P and P-t-M. In the P-t-P interface, a dedicated pair of channels, uplink (UL)

and downlink (DL), are used to connect between each MBMS user to the base station. In the P-t-M interface, only a DL channel is used to push/broadcast multimedia service from the base station to the MBMS receiver (or MS receiver), irrespective of how many MBMS receivers are present. Even if no MBMS receiver is present, the P-t-M interface sends multimedia service on the DL channel. Therefore, because the P-t-P interface may guarantee/handle the QoS for MBMS transmission, the P-t-M interface may not achieve the same level of service/performance as the P-t-P interface.

[0010] In addition, the P-t-M interface does not support beam forming because there is no angle of arrival (AoA) measurement report feedback in UL, which is one of the desired features of the TD-SCDMA. Thus, the MBMS system faces many challenges when implemented in TD-SCDMA, such as network coverage balance with legacy standards such as 3GPP R4 (TD-SCDMA) and R5 (TD-SCDMA HSDPA), time slot change, power allocation and optimization, channelization code number, as well as some TD-SCDMA specific characteristics, e.g, N-carrier technique. In any implementation of the MBMS system in TD-SCDMA, it would be desirable to take into account the above advanced features.

[0011] Chinese Communication Standard Association (CCSA) has released the first version of TD-SCDMA MBMS specification, in which the Union Timeslot Networking (UTN) and broadcast are fixed. However, this is a release that is expected to be improved to include, for example, MBMS with Single Frequency Networking (MBSFN) and multicast.

[0012] Accordingly, it would be desirable to provide devices, systems and

methods for speech and video communications that avoid the afore-described problems and drawbacks.

SUMMARY

[0013] According to an exemplary embodiment, there is method for accepting an uplink channel, for a point-to-multipoint (P-t-M) multimedia broadcast and multicast service (MBMS) transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a communication network. The method includes setting up a downlink MBMS traffic channel (MTCH) from the base station to the multiple user terminals; transmitting first data from the base station via the MTCH channel in the P-t-M mode, wherein the P-t-M mode pushes data from the base station to the multiple user terminals; receiving from the multiple user terminals messages via an uplink MBMS Feedback Channel (MFCH), wherein the messages indicate whether the first data transmitted from the base station has been decoded successfully or not at the multiple user terminals; and deciding whether to transmit second data or retransmit the first data from the base station to the multiple user terminals based on the received messages.

[0014] According to another exemplary embodiment, there is a computer readable medium including computer executable instructions, wherein the instructions, when executed by a processor of the base station, cause the base station to accept an uplink channel, for a point-to-multipoint (P-t-M) multimedia broadcast and multicast service (MBMS) transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a

communication network. The instructions include setting up a downlink MBMS traffic channel (MTCH) from the base station to the multiple user terminals; transmitting first data from the base station via the MTCH channel in the P-t-M mode, wherein the P-t-M mode pushes data from the base station to the multiple user terminals; receiving from the multiple user terminals messages via an uplink MBMS Feedback Channel (MFCH), wherein the messages indicate whether the first data transmitted from the base station has been decoded successfully or not at the multiple user terminals; and deciding whether to transmit second data or retransmitting the first data from the base station to the multiple user terminals based on the received messages.

[0015] According to still another exemplary embodiment, there is a base station configured to accept an uplink channel, for a point-to-multipoint (P-t-M) multimedia broadcast and multicast service (MBMS) transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a communication network. The base station includes a processor configured to set up a downlink MBMS traffic channel (MTCH) from the base station to the multiple user terminals; a transceiver connected to the processor and configured to transmit first data via the MTCH channel in the P-t-M mode, wherein the P-t-M mode pushes data from the base station to the multiple user terminals, to receive from the multiple user terminals messages via a MBMS Feedback Channel (MFCH), wherein the messages indicate whether the transmitted data from the base station has been decoded successfully or not at the multiple user terminals; and the processor being further configured to instruct the transceiver to transmit second data

or retransmit the first data to the multiple user terminals based on the received messages.

[0016] According to yet another exemplary embodiment, there is a method for providing an uplink channel from a user terminal among multiple user terminals to a base station, for a multimedia broadcast and multicast service (MBMS) transmission mode, the base station serving the multiple user terminals in a communication network. The method includes receiving at the user terminal data on a downlink MBMS traffic channel (MTCH) from the base station, in the P-t-M mode, wherein the P-t-M mode pushes the data from the base station to the multiple user terminals; determining at the user terminal whether the data has been decoded successfully or not; and sending a message from the user terminal to the base station via an uplink MBMS Feedback Channel (MFCH), wherein the message indicates whether the data transmitted from the base station has been decoded successfully or not.

[0017] According to another exemplary embodiment, there is a computer readable medium including computer executable instructions, wherein the instructions, when executed by a processor of a user terminal of multiple user terminals, cause the user terminal to establish an uplink channel from the user terminal to a base station, for a multimedia broadcast and multicast service (MBMS) transmission mode, the base station serving the multiple user terminals in a communication network. The instructions include receiving at the user terminal data on a downlink MBMS traffic channel (MTCH) from the base station, in the P-t-M mode, wherein the P-t-M mode pushes the data from the base station to the multiple user terminals; determining at the user terminal whether the data has been decoded

successfully or not; and sending a message from the user terminal to the base station via an uplink MBMS Feedback Channel (MFCH), wherein the message indicates whether the data transmitted from the base station has been decoded successfully or not.

[0018] According to another exemplary embodiment, there is a user terminal among multiple user terminals, configured to establish an uplink channel from the user terminal to a base station, for a multimedia broadcast and multicast service (MBMS) transmission mode, the base station serving the multiple user terminals in a communication network. The user terminal includes a transceiver configured to receive data on a downlink MBMS traffic channel (MTCH) from the base station, in the P-t-M mode, wherein the P-t-M mode pushes the data from the base station to the multiple user terminals; a processor connected to the transceiver and configured to detect whether the data has been decoded successfully or not; and the processor being further configured to instruct the transceiver to send a message to the base station via an uplink MBMS Feedback Channel (MFCH), wherein the message indicates whether the data transmitted from the base station has been decoded successfully or not at the user terminal.

LIST OF ABBREVIATIONS

P-t-P Point to Point

P-t-M Point to Multi-point

MBMSMulti-media Broadcast and Multicast Service

MS Multicast Service

TD MBMS TD-SCDMA MBMS

TD-SCDMA Time Division – Synchronous Code Division Multiple Access

3GPP 3rd Generation Partnership Project

AoA Angle of Arrival

UTN Union Timeslot Networking

MBSFN MBMS with Single Frequency Networking

HSDPA High Speed Downlink Packet Access

HSUPA High Speed Uplink Packet Access

HSPA High Speed Packet Access

EUL Enhanced Uplink

CCSA Chinese Communication Standard Association

QoS Quality of Service

UL Uplink

DL Downlink

LTE Long Term Evolution (of 3G systems)

RNC Radio Network Controller

MCS Modulation Coding Scheme

HoS High order Sectorization

MTCH MBMS Traffic Channel

MCCH MBMS Control Channel

MICH MBMS Indicator Channel

MFCH MBMS Feedback Channel

FDD Frequency Division Duplex

TDD Time Division Duplex

FACH Forward Access Channel

RACH Random Access Channel

SCCPCH Secondary Common Control Physical Channel

PRACH Physical Random Access Channel

RANAP Radio Access Network Application Protocol

CN Core Network

GPRS General Packet Radio Service

GSN GPRS Support Node

GGSN Gateway GPRS Support Node

SGSN Serving GPRS Support Node

RAN Radio Access Network

NBAP Node B Application Protocol

TTI Transmission Time Interval

CC Chase Combining

IR Incremental Redundancy

DoA Degree of Arrival

MIMO Multiple Input Multiple Output

HoS High order Sectorization

UTRAN Universal Terrestrial Radio Access Network

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate one or more embodiments and, together with the description, explain these embodiments. In the drawings:

[0020] Figure 1 is a schematic diagram of a telecommunication network;

[0021] Figure 2 is a schematic diagram of a base station and/or a user terminal according to an exemplary embodiment;

[0022] Figure 3 is a schematic diagram illustrating various channels used in the MBMS system;

[0023] Figure 4 is a schematic diagram illustrating a novel uplink channel in the MBMS system according to an exemplary embodiment;

[0024] Figure 5 is a schematic diagram illustrating signals exchanged between various components of the communication system according to an exemplary embodiment;

[0025] Figure 6 is a flow diagram illustrating steps performed by the communication system during an MBMS session according to an exemplary embodiment;

[0026] Figure 7 is a flow diagram illustrating steps performed by a base station during the MBMS session according to an exemplary embodiment; and

[0027] Figure 8 is a flow diagram illustrating steps performed by a user terminal during the MBMS session according to an exemplary embodiment.

DETAILED DESCRIPTION

[0028] The following description of the exemplary embodiments refers to the accompanying drawings. The same reference numbers in different drawings identify the same or similar elements. The following detailed description does not limit the invention. Instead, the scope of the invention is defined by the appended claims. The following embodiments are discussed, for simplicity, with regard to the terminology and structure of TD-SCDMA systems described above. However, the embodiments to be discussed next are not limited to these systems but may be applied to other existing telecommunications systems, e.g., WCDMA, etc. Further, although the following description uses terminology specific for TD-SCDMA systems, the terms base station, terminal device, radio control network are used in a generic sense. For example, the term "base station" may include a radio base station (RBS), Node B, an eNode B or other nodes. The term "terminal device" may include a mobile phone, a personal digital assistant, a camera, etc.

[0029] Reference throughout the specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with an embodiment is included in at least one embodiment of the present invention. Thus, the appearance of the phrases "in one embodiment" or "in an embodiment" in various places throughout the specification are not necessarily all referring to the same embodiment. Further, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

[0030] As shown in Figure 1, according to an exemplary embodiment, a general telecommunication system 10 may include a user terminal (UE) 12

connected to a NodeB 14 via a communication link 16. The NodeB 14 may be connected to a Radio Network Controller (RNC) 18 via an interface 20, for example, an S1 interface. The elements discussed above with regard to Figure 1 may form a Radio Access Network (RAN) 22. RAN 22 is connected to a communication network (CN) 24, that might include a serving GPRS support node (SGSN) 26, a Mobile Management Entity (MME) 28, and a Public Switched Telecommunication Network (PSTN) 29.

[0031] The user terminal 12 and/or the Node B 14 may have the structure shown in Figure 2. Figure 2 shows that the terminal device 12 and/or the Node B 14 may include a processor 30 that is connected to a memory 32 via a bus 34. The processor 30 may be configured to process information related to sending or receiving a package or establishing an uplink channel. The memory 32 may be configured to store various data used by the processor 30 or information to be transmitted by the device or information necessary for the functioning of the device. The terminal or base station may include an input/output unit 36 that is configured to receive commands, for example from a user, and to send commands. A transceiver 38 may be connected to bus 34 and configured to receive or send the package information. The transceiver 38 may include an array antenna. A scheduler unit 39 may be connected to bus 34 to perform scheduling functions. These functions may be also performed by the processor 30.

[0032] Next the structure of the MBMS is discussed and the novel features added to this system are explained. The structure of the MBMS system is discussed for simplicity but the novel exemplary embodiments are applicable to an MS system.

There are several physical channels used by MBMS: MTCH (MBMS Traffic CHannel), MCCH (MBMS Control CHannel), and MICH (MBMS Indicator CHannel). These channels are downlink channels as shown in Figure 3. The MCCH and MICH channels use FACH channels as the transport channels and the S-CCPCH channels as the physical channel, as the design of the MBMS reuses the existing channels.

[0033] According to an exemplary embodiment, a new channel is added as shown in Figure 4. This novel channel is named MFCH (MBMS Feedback Channel). This channel may be used by the P-t-M interface in MBMS in both FDD and TDD mode. This channel may be shared by some or all of the P-t-M MBMS users, for example in the manner of time division multiply in uplink. The MFCH channel is an uplink channel that may be used by the terminals to provide feedback to the base station that is not related to the MBMS system, in particular a P-t-M multicast system.

[0034] To better understand how this channel is integrated with the other channels, an exemplary case is considered next. According to an exemplary embodiment, there are two approaches for the users to provide feedback to the base station in a manner that avoids collisions among the users. One approach is to schedule each user with a particular time to provide feedback to the base station. For example, the schedule command may be indicated on MCCH or MICH channel. A second approach is to not schedule the users when to provide feedback to the base station but rather to allow the users to blindly feedback within a fixed or flexible period of time. The period of time may depend on the number of the receiving users. Several users may share the new channel to increase the radio resource utilization.

[0035] According to an exemplary embodiment, a third approach is to allocate one or more fixed bit/bits for feedback among the available radio resource in the MFCH (one or several codes in one uplink time slot), and then the Node B knows what feedback bits belong to each user. Another approach is to feedback in the same channel (radio resource unit/s) with scrambling a UE specific identification, in multi-cast mode. Then, the NodeB knows the UE ID in each multi-cast group, and NodeB uses a UE specific ID match filter to split the information from each user based on the received overlapped signals in one channel.

[0036] Specific details regarding what content is transmitted in this channel, how to share it among users, how to perform the related QoS control, and what may be an appropriate feedback time period will vary from implementation to implementation. However, one such possible implementation is discussed next. According to an exemplary embodiment, the content in MFCH may include an indication of whether the last transmission is successful or not, a parameter indicative of the current radio link quality or the Channel Quality Information (CQI), like the feedback in HSDPA, and/or may be a happy bit like the feedback in HSUPA / EUL. The sharing manner of the UL channel among the various users may be multiplied in the time domain based on the above discussed approaches. The feedback from the user terminal to the base station for indicating the QoS may be performed, for example, based on tuning the transmission block size or retransmission or up/down the transmission power, or other techniques. In one exemplary embodiment, the QoS related parameter may be the same for all of P-t-M MS users in a group, which is a unit of the P-t-M multicast. The time period for the

feedback may be fixed and the same for all P-t-M users, or variable and different for each P-t-M user.

[0037] In an exemplary embodiment, Figure 5 shows steps taking place in a MS session and the channels used to transmit signals for the MS session. In this regard, it is noted that the exemplary embodiments described here are applicable to both MS and MBMS sessions. For simplicity, the MBMS session is described next. Figure 5 shows the user terminal 12, the Node B 14, the RNC 18 and the Core Network (CN) 50. The CN 50 starts the MBMS session in step 52 by sending a signal to the RNC 18 with Re-Auth-Request (RAR) and Re-Auth-Answer (RAA). In step 54, the RNC 18 sends a corresponding MBMS start signal to Node B 14. In step 56, the RNC 18 initiates a transport channel setup for the Node B 14 and in step 58 sends the MCCH and MICH channels to initiate the MBMS session. As a result, the MBMS information is broadcasted by the logical channel MTCH in step 58. The logical channel MTCH is mapped to a transport channel FACH in step 60 to Node B 14 and mapped to a physical channel SCCPCH in step 62 to the user terminal 12. According to an exemplary embodiment, a new step 64 (which is shown with a dash line in Figure 5) is introduced to achieve the feedback from the user terminal 12 to Node B 14 and/or to the RNC 18. The feedback is performed by using the new logical channel MFCH in step 64, which is mapped to a transport channel RACH, which is further mapped in step 68 to a physical channel PRACH, in which the detailed content may be pre-defined.

[0038] According to an exemplary embodiment, the content of the PRACH channel may be an ACK/NACK bit and/or a happy bit, and/or CQI like information to

indicate whether the transmission was received correctly or not, whether the current propagation is acceptable or not, and/or some other predetermined transmission format. The content depends on the real RAN design and application services. Steps 68, 70, 72, and 74 are similar to steps 60, 62, 64, and 66 discussed above and these may occur when the steps 64 and 66 indicate that the transmission was not successful for a reason and a retransmission of the original data may be occurring.

[0039] In fact, a related algorithm or method may be pre-defined in NodeB to make the retransmission decision based on these messages. In this regard, according to an exemplary embodiment, when NodeB receives "N" feedbacks from a total of "M" P-t-M multi-cast MBMS users, where N is smaller or equal to M, NodeB may decide to retransmit the last signal. If N is small, NodeB may decide to not retransmit the signal. However, if N is large, Node B may decide to retransmit the signal. The threshold for N is determined by the network operator and may depend on the number of users and other network related parameters, or may be dynamically calculated. For example, if N is smaller than M/2, no retransmission takes place. If N is larger or equal to M/2, NodeB decides to retransmit the last signal. However, in this exemplary embodiment, the QoS related parameter setting for the group of users that receive the same signal is the same for each user of the group.

[0040] According to an exemplary embodiment, a general purpose processor may be programmed based on the steps described with regard to Figure 6 to implement the new feedback channel described in one of the above exemplary embodiments. In step 600 the MBMS session is started and the transport channel is

setup on Node B Application Part (NBAP), between the CN 50 and Universal Terrestrial Radio Access Network (UTRAN). In step 602, MBMS data is transmitted from Node B 14 to user terminal 12 along channels MTCH/FACH/SCCPCH. The MBMS data is transmitted based on the allocation and indication specified by the MCCH and MICH channels.

[0041] After the MBMS package was received by the user terminal in a sub-frame or a Transmission Time Interval (TTI), the user terminal determines in step 604 whether the transmission from the base station is a new transmission or a retransmission. If the result of the determination is that a new transmission was received, the user terminal determines in step 606 whether the new transmission may be decoded. If the result in step 604 is that a retransmission was received, the user terminal may use in step 608 an additive procedure to merge the retransmitted information with the already received package. For example, the user terminal may use the Chase Combining (CC) or Incremental Redundancy (IR) procedures as the additive procedure. After performing step 608, the method advances to step 606.

[0042] The determination in step 606 may be based on different designs, for example checking a New/Re indicator in MICH or by using an additive transmission block numbering. After determining in step 606 that the received package may be decoded, the user terminal may generate in step 610 an ACK or NACK command based on the reception result. This command as well as other information, e.g., channel status, may be feedback to the base station. This information may be sent back to the base station in step 612 via the novel MFCH channel, which is mapped to a transport channel RACH, which in turns is mapped to a physical channel

PRACH. This combination of channels is presented as an example and it is not intended to limit the invention.

[0043] When the base station receives from the user terminal the above discussed MBMS feedback package on the novel channel, the base station determines whether the command is ACK or NACK. If the received command is ACK, the base station decides in step 614 that the last transmission was successfully received by all users and the base station deletes in step 616 the source data from its buffer. However, if the received command is NACK, the base station determines in step 618 that one or more user terminals did not receive the last transmission successfully. Then, the base station decides whether to retransmit the MBMS data or not. For this situation, the base station initially determines in step 618 whether a retransmission time reached a pre-defined threshold of acceptable retransmission time. If this happened, the base station determines in step 620 that the transmission of the MBMS data failed and the method advances to step 616. Otherwise, a retransmission is planned in step 622 and the method returns to step 602. After the transmission is determined to be successful or is determined to have been failed because of a time elapsing condition, the original MBMS data saved in the buffer of Node-B may be deleted in step 616.

[0044] According to an exemplary embodiment shown in Figure 7, a processor of the base station may be programmed or configured to implement a method for accepting an uplink channel, for the P-t-M MBMS transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a communication network. The method includes, setting up in step 700 a downlink

MBMS traffic channel (MTCH) from the base station to the multiple user terminals, transmitting in step 702 first data from the base station via the MTCH channel in the P-t-M mode, where the P-t-M mode pushes data from the base station to the multiple user terminals, receiving in step 704 from the multiple user terminals messages via an uplink MBMS Feedback Channel (MFCH), wherein the messages indicate whether the first data transmitted from the base station has been decoded successfully or not at the multiple user terminals, and deciding in step 706 whether to transmit second data or retransmit the first data from the base station to the multiple user terminals based on the received messages.

[0045] According to an exemplary embodiment shown in Figure 8, a processor of the user terminal may be programmed or configured to implement a method for providing an uplink channel from a user terminal among multiple user terminals to a base station, for a multimedia broadcast and multicast service (MBMS) transmission mode, the base station serving the multiple user terminals in a communication network. The method includes receiving in step 800 at the user terminal data on a downlink MBMS traffic channel (MTCH) from the base station, in the P-t-M mode, where the P-t-M mode pushes the data from the base station to the multiple user terminals; determining in step 802, at the user terminal, whether the data has been decoded successfully or not; and sending in step 804 a message from the user terminal to the base station via an uplink MBMS Feedback Channel (MFCH), wherein the message indicates whether the data transmitted from the base station has been decoded successfully or not.

[0046] The above discussed methods may be used for both FDD and TDD MBMS systems and also for FDD and TDD MBMS systems with advanced antennas. In this respect, the FDD and TDD MBMS systems with advanced antennas transmit based on the 3GPP technical specification release 4 (R4) and release 5 (R5) services based on multiple input multiple output (MIMO) or beam-forming techniques, in which a gain is achieved due to the introduction of advanced antennas, but they transmit MBMS data in the broadcast manner. Thus, for these systems with advanced antennas, there is an unbalanced coverage among different services, as there is no uplink feedback for the MBMS data transmission to provide support for the MIMO or beam-forming techniques. By introducing the above discussed feedback uplink channel in the MBMS system, this channel may provide further information, which is needed by the advanced antennas to achieve the beam-forming, and thus, the advanced antennas may also work for MBMS services. Therefore, the unbalanced coverage issue may be reduced.

[0047] For TD-SCDMA, this new channel also may provide support for using the smart antenna solution of R4 and R5 in TD MBMS network. TD-SCDMA DL beam-forming needs DoA measurement in uplink and thus, the new channel may be used to provide this information. Beside beam-forming, the feedback channel may also be used to support MIMO or High order Sectorization (HoS) or other advanced antenna systems. The utilization of advanced antennas may save transmission power, and also may split all P-t-M MBMS users in a cell into different small groups. Thus, for each small group, for example, in one fixed beam, the P-t-M MBMS QoS handling may be easier.

[0048] Thus, according to at least one exemplary embodiment discussed above, a balance is achieved between P-t-P modes having QoS evaluation and broadcast modes with no QoS evaluation. The QoS of P-t-M MBMS users may be implemented and the new shared channel may save the limited radio resource utilization.

[0049] In addition, the above discussed exemplary embodiments may help to implement advanced antennas like MIMO, beam-forming, HoS in MBMS network so that the problem of unbalanced coverage between MBMS and non-MBMS network is reduced and the coverage difference may be decreased. These advantages of the exemplary embodiments may result in easier network planning and optimization, for example the management of the radio resources.

[0050] The disclosed exemplary embodiments provide a user terminal, a system, a method and a computer program product for introducing a new channel in MBMS systems. It should be understood that this description is not intended to limit the invention. On the contrary, the exemplary embodiments are intended to cover alternatives, modifications and equivalents, which are included in the spirit and scope of the invention as defined by the appended claims. Further, in the detailed description of the exemplary embodiments, numerous specific details are set forth in order to provide a comprehensive understanding of the claimed invention. However, one skilled in the art would understand that various embodiments may be practiced without such specific details.

[0051] As also will be appreciated by one skilled in the art, the exemplary embodiments may be embodied in a wireless communication device, a

telecommunication network, as a method or in a computer program product. Accordingly, the exemplary embodiments may take the form of an entirely hardware embodiment or an embodiment combining hardware and software aspects. Further, the exemplary embodiments may take the form of a computer program product stored on a computer-readable storage medium having computer-readable instructions embodied in the medium. Any suitable computer readable medium may be utilized including hard disks, CD-ROMs, digital versatile disc (DVD), optical storage devices, or magnetic storage devices such a floppy disk or magnetic tape. Other non-limiting examples of computer readable media include flash-type memories or other known memories.

[0052] The present exemplary embodiments may be implemented in a user terminal, a base station, and generally in a wireless communication network or system comprising both the user terminal and the base station. The exemplary embodiments may also be implemented in an application specific integrated circuit (ASIC), or a digital signal processor. Suitable processors include, by way of example, a general purpose processor, a special purpose processor, a conventional processor, a digital signal processor (DSP), a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits (ASICs), Field Programmable Gate Arrays (FPGAs) circuits, any other type of integrated circuit (IC), and/or a state machine. A processor in association with software may be used to implement a radio frequency transceiver for use in the user terminal, the base station or any host computer. The user terminal may be used in conjunction with modules, implemented in hardware and/or software, such as a

camera, a video camera module, a videophone, a speakerphone, a vibration device, a speaker, a microphone, a television transceiver, a hands free headset, a keyboard, a Bluetooth module, a frequency modulated (FM) radio unit, a liquid crystal display (LCD) display unit, an organic light-emitting diode (OLED) display unit, a digital music player, a media player, a video game player module, an Internet browser, and/or any wireless local area network (WLAN) module.

[0053] Although the features and elements of the present exemplary embodiments are described in the embodiments in particular combinations, each feature or element can be used alone without the other features and elements of the embodiments or in various combinations with or without other features and elements disclosed herein. The methods or flow charts provided in the present application may be implemented in a computer program, software, or firmware tangibly embodied in a computer-readable storage medium for execution by a general purpose computer or a processor.

WHAT IS CLAIMED IS:

1. A method for accepting an uplink channel, for a point-to-multipoint (P-t-M) multimedia broadcast and multicast service (MBMS) transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a communication network, the method comprising:

setting up (700) a downlink MBMS traffic channel (MTCH) from the base station to the multiple user terminals;

transmitting (702) first data from the base station via the MTCH channel in the P-t-M mode, wherein the P-t-M mode pushes data from the base station to the multiple user terminals;

characterized by:

receiving (704) from the multiple user terminals messages via an uplink MBMS Feedback Channel (MFCH), wherein the messages indicate whether the first data transmitted from the base station has been decoded successfully or not at the multiple user terminals; and

deciding (706) whether to transmit second data or retransmit the first data from the base station to the multiple user terminals based on the received messages.

2. The method of Claim 1, wherein the MTCH channel is a standard channel in MBMS and the MFCH channel is not a standard channel in MBMS.

3. The method of Claim 1, wherein the transmitting first data comprises:

transmitting the first data to each of the multiple user terminals in a same timeslot.

4. The method of Claim 1, wherein the receiving comprises:

receiving from each of the multiple user terminals a corresponding feedback message.

5. The method of Claim 1, wherein the messages include, besides one of an ACK or NACK indication, information for supporting beam-forming at the base station, wherein beam-forming is related to focusing a transmitted wave to a desired physical location of a user terminal, or information about a current radio link quality of each of the multiple user terminals.

6. The method of Claim 1, wherein deciding to transmit second data comprises:

evaluating a number N of the users that indicate unsuccessful decoding of the transmitted first data; and

deciding to transmit the second data when N is smaller then a predetermined threshold.

7. A computer readable medium including computer executable instructions, wherein the instructions, when executed by a processor of the base station, cause the base station to accept an uplink channel, for a point-to-multipoint (P-t-M)

multimedia broadcast and multicast service (MBMS) transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a communication network, the instructions comprising:

setting up (700) a downlink MBMS traffic channel (MTCH) from the base station to the multiple user terminals;

transmitting (702) first data from the base station via the MTCH channel in the P-t-M mode, wherein the P-t-M mode pushes data from the base station to the multiple user terminals;

characterized by:

receiving (704) from the multiple user terminals messages via an uplink MBMS Feedback Channel (MFCH), wherein the messages indicate whether the first data transmitted from the base station has been decoded successfully or not at the multiple user terminals; and

deciding (706) whether to transmit second data or retransmitting the first data from the base station to the multiple user terminals based on the received messages.

8. The medium of Claim 7, wherein the MTCH channel is a standard channel in MBMS and the MFCH channel is not a standard channel in MBMS.

9. The medium of Claim 7, wherein the transmitting first data comprises:

transmitting the first data to each of the multiple user terminals in a same timeslot.

10. The medium of Claim 7, wherein the receiving comprises:

receiving from each of the multiple user terminals a corresponding feedback message.

11. The medium of Claim 7, wherein the messages include, besides one of an ACK or NACK indication, information for supporting beam-forming at the base station, wherein beam-forming is related to focusing a transmitted wave to a desired physical location of a user terminal, or information about a current radio link quality of each of the multiple user terminals.

12. The medium of Claim 7, wherein deciding to transmit second data comprises:

evaluating a number N of the users that indicate unsuccessful decoding of the transmitted first data; and

deciding to transmit the second data when N is smaller then a predetermined threshold.

13. A base station configured to accept an uplink channel, for a point-to-multipoint (P-t-M) multimedia broadcast and multicast service (MBMS) transmission mode, from multiple user terminals to a base station, the base station serving the multiple user terminals in a communication network, the base station comprising:

a processor (30) configured to set up a downlink MBMS traffic channel (MTCH) from the base station to the multiple user terminals;

a transceiver (38) connected to the processor (30) and configured to transmit first data via the MTCH channel in the P-t-M mode, wherein the P-t-M mode pushes data from the base station to the multiple user terminals, and characterized by receiving from the multiple user terminals messages via a MBMS Feedback Channel (MFCH), wherein the messages indicate whether the transmitted data from the base station has been decoded successfully or not at the multiple user terminals; and

the processor (30) being further configured to instruct the transceiver (38) to transmit second data or retransmit the first data to the multiple user terminals based on the received messages.

14. The base station of Claim 13, wherein the MTCH channel is a standard channel in MBMS and the MFCH channel is not a standard channel in MBMS.

15. The base station of Claim 13, wherein the processor is further configured to instruct the transceiver to transmit the first data to each of the multiple user terminals in a same timeslot.

16. A method for providing an uplink channel from a user terminal among multiple user terminals to a base station, for a multimedia broadcast and multicast service (MBMS) transmission mode, the base station serving the multiple user terminals in a communication network, the method comprising:

receiving (800) at the user terminal data on a downlink MBMS traffic channel (MTCH) from the base station, in the P-t-M mode, wherein the P-t-M mode pushes the data from the base station to the multiple user terminals;

determining (802) at the user terminal whether the data has been decoded successfully or not; and

characterized by:

sending (804) a message from the user terminal to the base station via an uplink MBMS Feedback Channel (MFCH), wherein the message indicates whether the data transmitted from the base station has been decoded successfully or not.

17. The method of Claim 16, wherein the MTCH channel is a standard channel in MBMS and the MFCH channel is not a standard channel in MBMS.

18. The method of Claim 16, wherein the message includes, besides one of an ACK or NACK indication, information for supporting beam-forming at the base station, wherein beam-forming is related to focusing a transmitted wave to a desired physical location of the user terminal, or information about a current radio link quality of the user terminal.

19. The method of Claim 16, further comprising:

determining at the user terminal whether the received data is a new transmission or a retransmission of previous data.

20. The method of Claim 16, further comprising:

applying an additive procedure, when the received data is a retransmission of the previous data, to add the received data to the previous data.

21. A computer readable medium including computer executable instructions, wherein the instructions, when executed by a processor of a user terminal of multiple user terminals, cause the user terminal to establish an uplink channel from the user terminal to a base station, for a multimedia broadcast and multicast service (MBMS) transmission mode, the base station serving the multiple user terminals in a communication network, the instructions comprising:

receiving (800) at the user terminal data on a downlink MBMS traffic channel (MTCH) from the base station, in the P-t-M mode, wherein the P-t-M mode pushes the data from the base station to the multiple user terminals;

determining (802) at the user terminal whether the data has been decoded successfully or not; and

characterized by:

sending (804) a message from the user terminal to the base station via an uplink MBMS Feedback Channel (MFCH), wherein the message indicates whether the data transmitted from the base station has been decoded successfully or not.

22. The medium of Claim 21, wherein the MTCH channel is a standard channel in MBMS and the MFCH channel is not a standard channel in MBMS.

23. The medium of Claim 21, wherein the message includes, besides one of an ACK or NACK indication, information for supporting beam-forming at the base station, wherein beam-forming is related to focusing a transmitted wave to a desired physical location of the user terminal, or information about a current radio link quality of the user terminal.

24. The medium of Claim 21, further comprising:

determining at the user terminal whether the received data is a new transmission or a retransmission of previous data.

25. The medium of Claim 21, further comprising:

applying an additive procedure, when the received data is a retransmission of the previous data, to add the received data to the previous data.

26. A user terminal among multiple user terminals, configured to establish an uplink channel from the user terminal to a base station, for a multimedia broadcast and multicast service (MBMS) transmission mode, the base station serving the multiple user terminals in a communication network, the user terminal comprising:

a transceiver (38) configured to receive data on a downlink MBMS traffic channel (MTCH) from the base station, in the P-t-M mode, wherein the P-t-M mode pushes the data from the base station to the multiple user terminals;

a processor (30) connected to the transceiver (38) and configured to detect whether the data has been decoded successfully or not; and

characterized in that the processor (30) being further configured to instruct the transceiver (38) to send a message to the base station via an uplink MBMS Feedback Channel (MFCH), wherein the message indicates whether the data transmitted from the base station has been decoded successfully or not at the user terminal.

27. The user terminal of Claim 26, wherein the MTCH channel is a standard channel in MBMS and the MFCH channel is not a standard channel in MBMS.

28. The user terminal of Claim 26, wherein the message includes, besides one of an ACK or NACK indication, information for supporting beam-forming at the base station, wherein beam-forming is related to focusing a transmitted wave to a desired physical location of the user terminal, or information about a current radio link quality of the user terminal.

29. The user terminal of Claim 26, wherein the processor is further configured to determine whether the received data is a new transmission or a retransmission of previous data.

30. The user terminal of Claim 26, wherein the processor is further configured to apply an additive procedure when the received data is a retransmission of the previous data, to add the received data to the previous data.

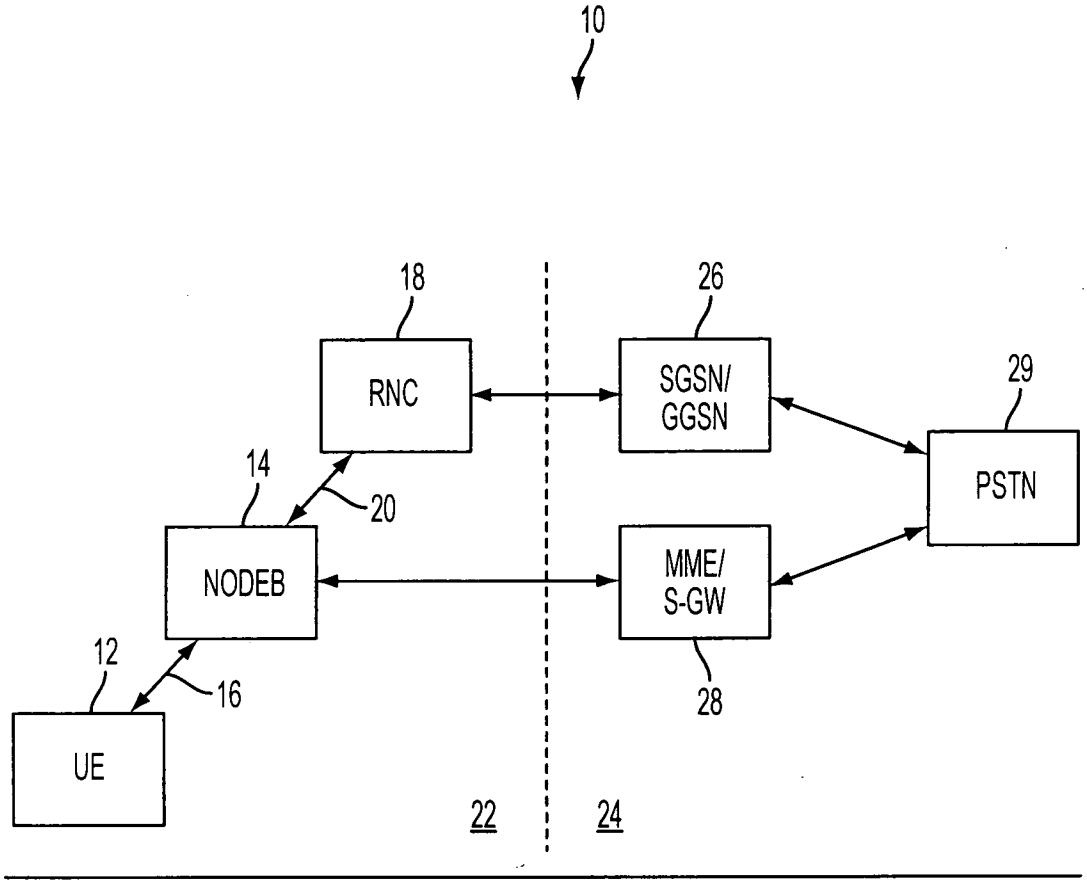
10
18
26
RNC
SGSN/
GGSN
29
PSTN
14
20
NODEB
MME/
S-GW
12
16
28
UE
22
24

FIG. 1

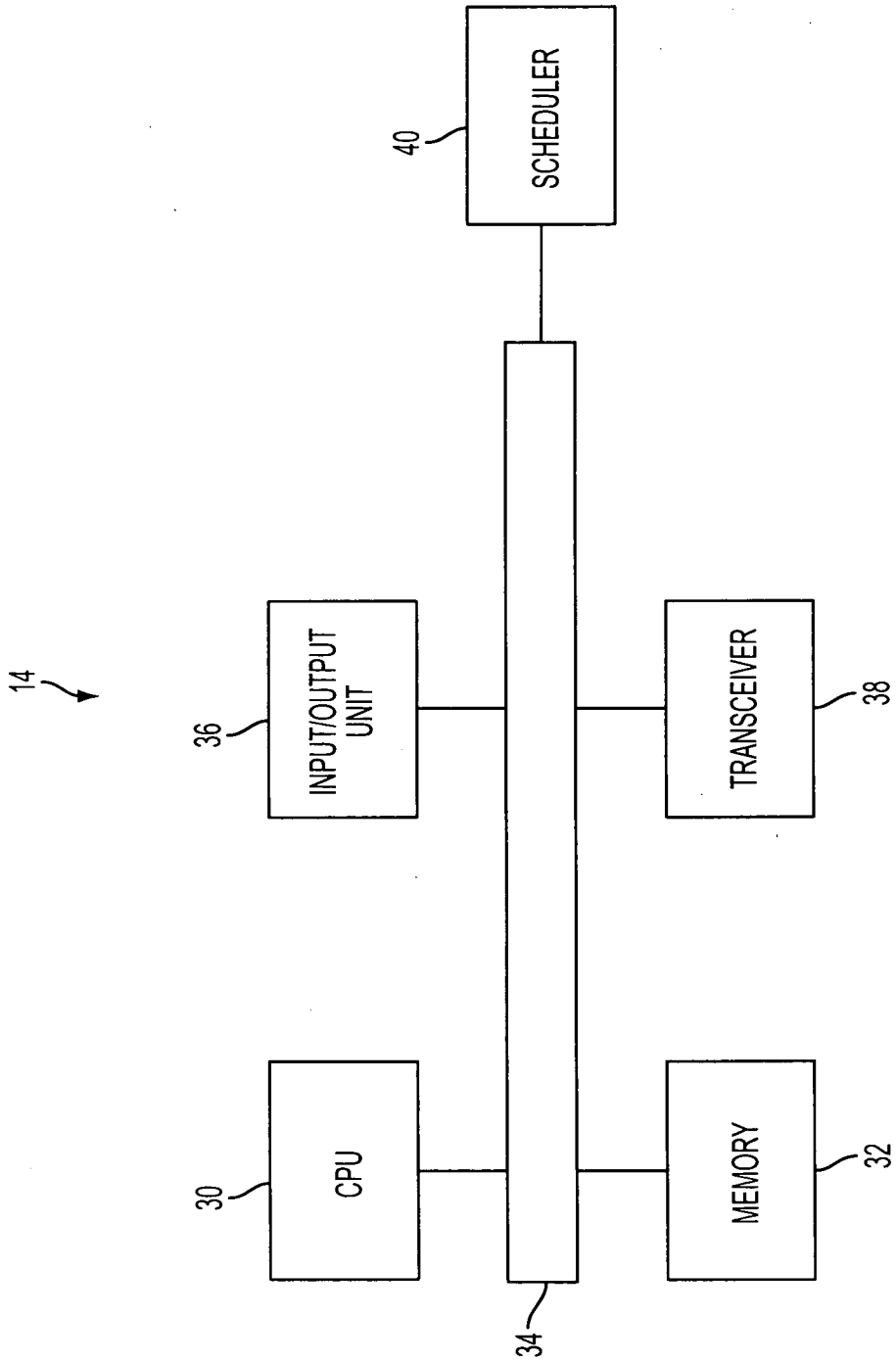
14
SCHEDULER
40
INPUT/OUTPUT UNIT
36
TRANSCEIVER
38
CPU
30
MEMORY
32
34

FIG. 2

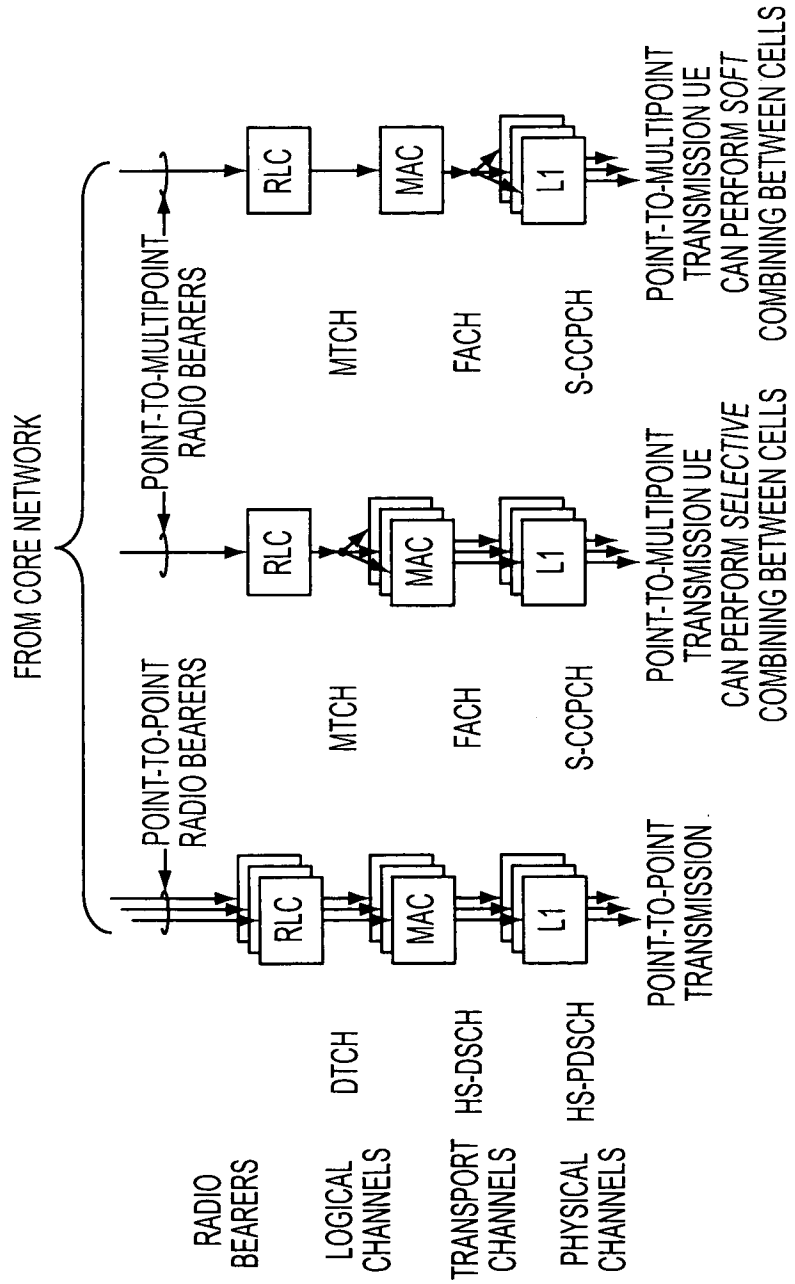
FROM CORE NETWORK
POINT-TO-POINT RADIO BEARERS
POINT-TO-MULTIPOINT RADIO BEARERS
RLC
MAC
L1
MTCH
FACH
S-CCPCH
DTCH
HS-DSCH
HS-PDSCH
POINT-TO-POINT TRANSMISSION
POINT-TO-MULTIPOINT TRANSMISSION UE CAN PERFORM SELECTIVE COMBINING BETWEEN CELLS
POINT-TO-MULTIPOINT TRANSMISSION UE CAN PERFORM SOFT COMBINING BETWEEN CELLS
RADIO BEARERS
LOGICAL CHANNELS
TRANSPORT CHANNELS
PHYSICAL CHANNELS

FIG. 3

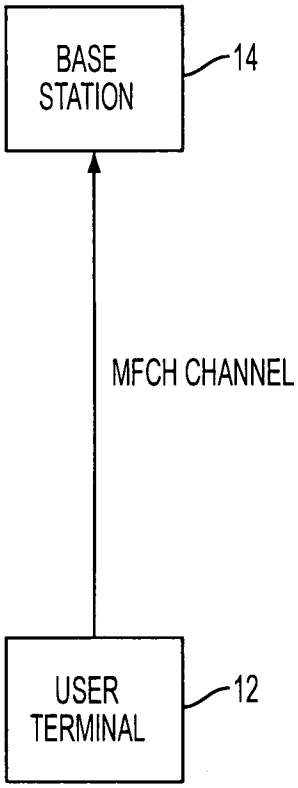

FIG. 4

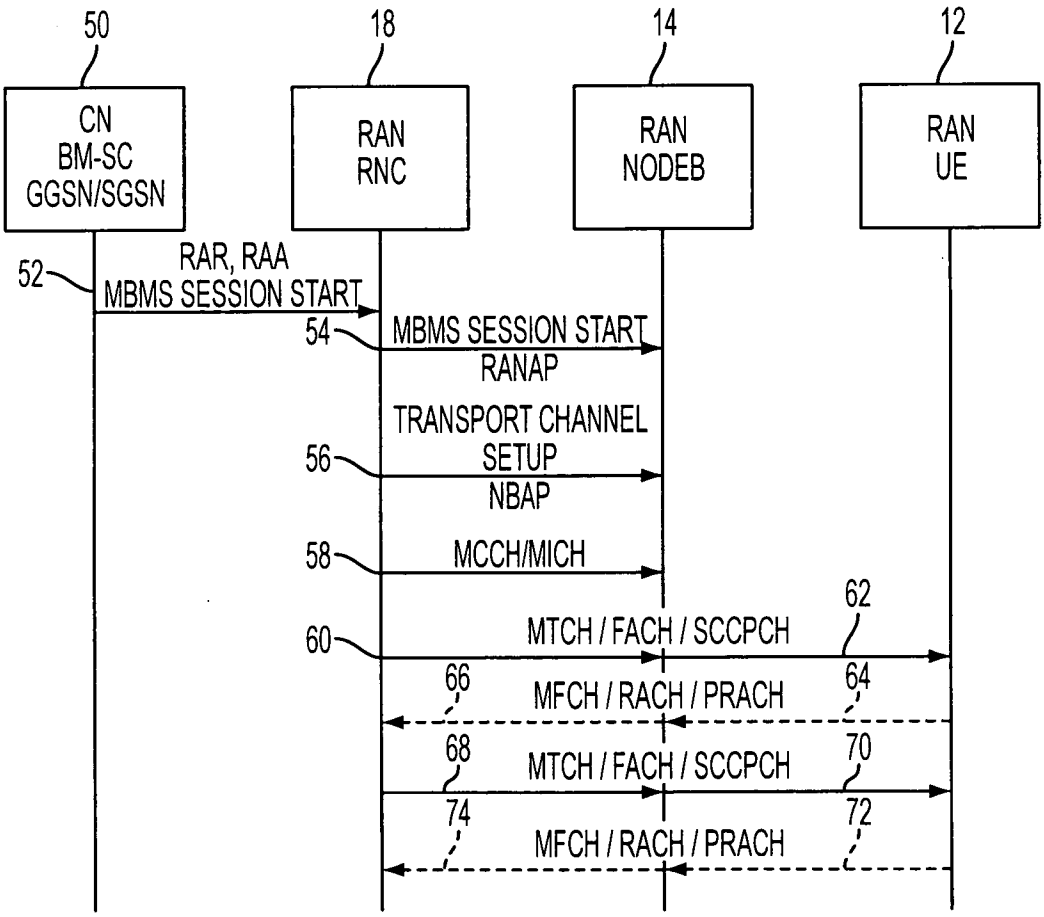
50
18
14
12
CN
BM-SC
GGSN/SGSN
RAN
RNC
RAN
NODEB
RAN
UE
52
RAR, RAA
MBMS SESSION START
54
MBMS SESSION START
RANAP
TRANSPORT CHANNEL
SETUP
56
NBAP
58
MCCH/MICH
62
60
MTCH / FACH / SCCPCH
66
MFCH / RACH / PRACH
64
68
MTCH / FACH / SCCPCH
70
74
MFCH / RACH / PRACH
72

FIG. 5

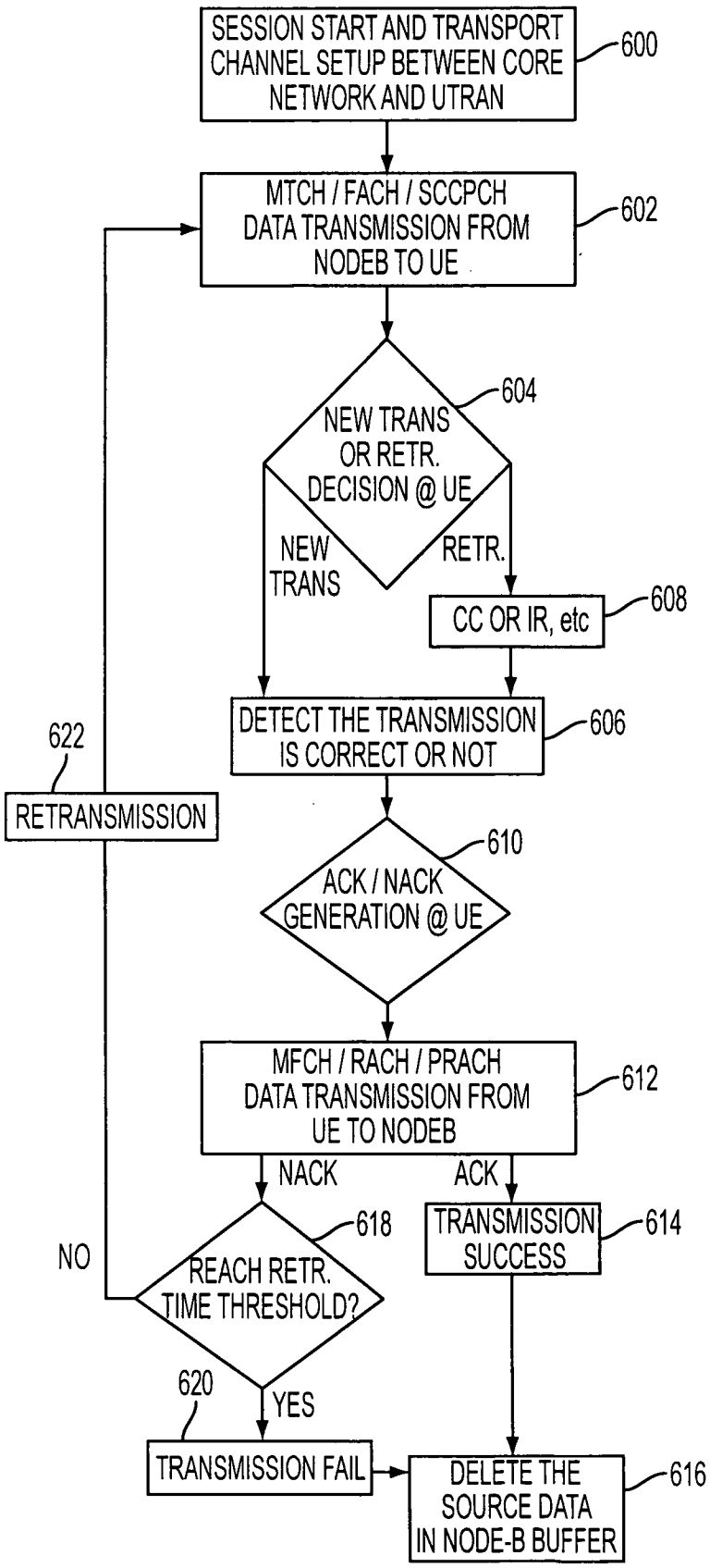
SESSION START AND TRANSPORT CHANNEL SETUP BETWEEN CORE NETWORK AND UTRAN
600
MTCH / FACH / SCCPCH DATA TRANSMISSION FROM NODEB TO UE
602
NEW TRANS OR RETR. DECISION @ UE
604
NEW TRANS
RETR.
CC OR IR, etc
608
DETECT THE TRANSMISSION IS CORRECT OR NOT
606
622
RETRANSMISSION
ACK / NACK GENERATION @ UE
610
MFCH / RACH / PRACH DATA TRANSMISSION FROM UE TO NODEB
612
NACK
ACK
TRANSMISSION SUCCESS
614
618
NO
REACH RETR. TIME THRESHOLD?
620
YES
TRANSMISSION FAIL
DELETE THE SOURCE DATA IN NODE-B BUFFER
616

FIG. 6

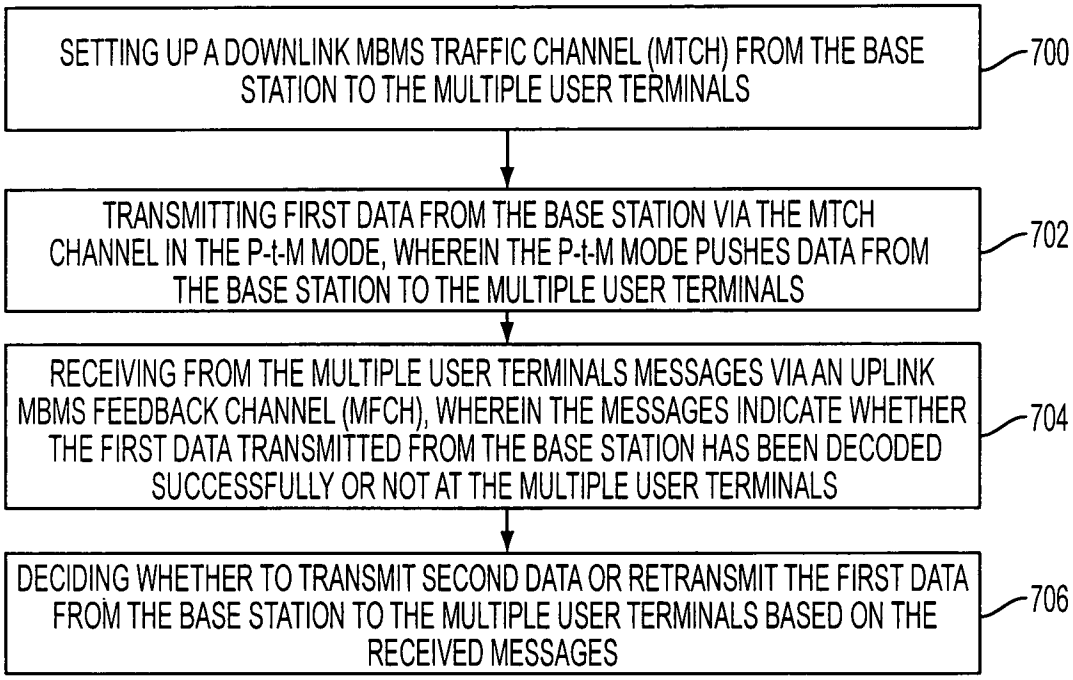
SETTING UP A DOWNLINK MBMS TRAFFIC CHANNEL (MTCH) FROM THE BASE STATION TO THE MULTIPLE USER TERMINALS
700
TRANSMITTING FIRST DATA FROM THE BASE STATION VIA THE MTCH CHANNEL IN THE P-t-M MODE, WHEREIN THE P-t-M MODE PUSHES DATA FROM THE BASE STATION TO THE MULTIPLE USER TERMINALS
702
RECEIVING FROM THE MULTIPLE USER TERMINALS MESSAGES VIA AN UPLINK MBMS FEEDBACK CHANNEL (MFCH), WHEREIN THE MESSAGES INDICATE WHETHER THE FIRST DATA TRANSMITTED FROM THE BASE STATION HAS BEEN DECODED SUCCESSFULLY OR NOT AT THE MULTIPLE USER TERMINALS
704
DECIDING WHETHER TO TRANSMIT SECOND DATA OR RETRANSMIT THE FIRST DATA FROM THE BASE STATION TO THE MULTIPLE USER TERMINALS BASED ON THE RECEIVED MESSAGES
706

FIG. 7

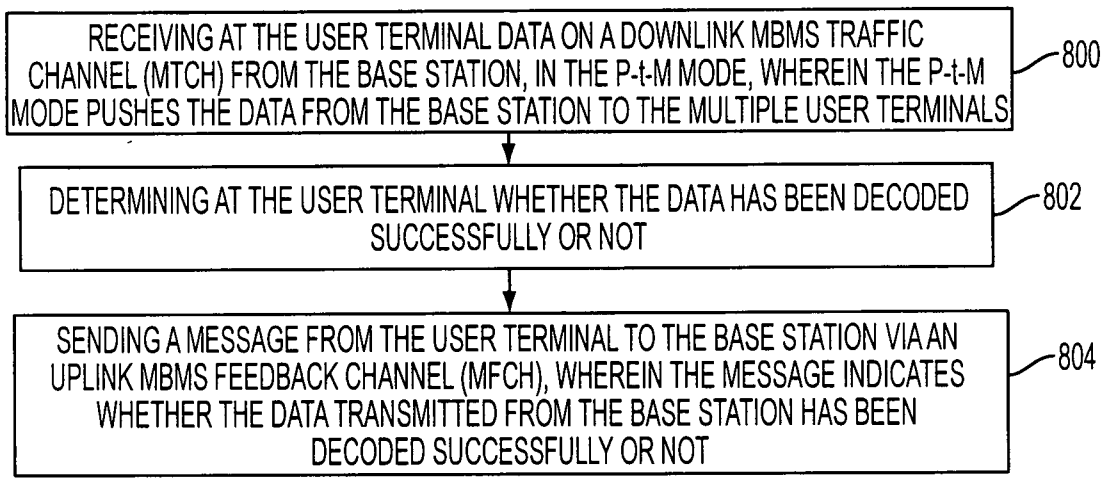
RECEIVING AT THE USER TERMINAL DATA ON A DOWNLINK MBMS TRAFFIC CHANNEL (MTCH) FROM THE BASE STATION, IN THE P-t-M MODE, WHEREIN THE P-t-M MODE PUSHES THE DATA FROM THE BASE STATION TO THE MULTIPLE USER TERMINALS
800
DETERMINING AT THE USER TERMINAL WHETHER THE DATA HAS BEEN DECODED SUCCESSFULLY OR NOT
802
SENDING A MESSAGE FROM THE USER TERMINAL TO THE BASE STATION VIA AN UPLINK MBMS FEEDBACK CHANNEL (MFCH), WHEREIN THE MESSAGE INDICATES WHETHER THE DATA TRANSMITTED FROM THE BASE STATION HAS BEEN DECODED SUCCESSFULLY OR NOT
804

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2008/050639

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: H04L, H04W

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 2007148934 A1 (LG ELECTRONICS INC.), 27 December 2007 (27.12.2007), paragraphs [13], [23],[48]-[60], abstract --	1-30
X	WO 2008024544 A2 (MOTOROLA,INC.), 28 February 2008 (28.02.2008), page 8, line 16 - page 9, line 7; page 11, line 5 - line 7, abstract --	1-30
A	WO 2008023945 A1 (ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE), 28 February 2008 (28.02.2008), page 5, line 1 - line 17, abstract --	1-30

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier 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 another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 January 2009	16 -01- 2009
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 RalfBoström / itw Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2008/050639

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE EPODOC/EPO CN1627725 A 20050615 LENOVO BEIJING CO LTD [CN] abstract --	6,12
T	WO 2008115023 A1 (ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE), 25 Sept 2008 (25.09.2008), abstract --	1-30
T	WO 2008147265 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 4 December 2008 (04.12.2008), abstract -- --------	1-30

International patent classification (IPC)
H04W 4/06 (2009.01)
H04L 1/18 (2006.01)

Download your patent documents at www.prv.se
The cited patent documents can be downloaded at www.prv.se by following the links:

- In English/Searches and advisory services/Cited documents (service in English) or
- e-tjänster/anförda dokument(service in Swedish).

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

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.

INTERNATIONAL SEARCH REPORT
Information on patent family members

01/11/2008

International application No.
PCT/SE2008/050639

WO	2007148934	A1	27/12/2007	AU	2007203852	A	12/07/2007
				AU	2007212916	A	16/08/2007
				EP	1969753	A	17/09/2008
				EP	1969784	A	17/09/2008
				EP	1980062	A	15/10/2008
				EP	1982550	A	22/10/2008
				KR	20070073577	A	10/07/2007
				KR	20070073578	A	10/07/2007
				KR	20070073588	A	10/07/2007
				KR	20070080552	A	10/08/2007
				WO	2007078142	A	12/07/2007
				WO	2007078155	A	12/07/2007
				WO	2007078156	A	12/07/2007
				WO	2007091831	A	16/08/2007
				WO	2007148881	A	27/12/2007
				WO	2007148895	A	27/12/2007
				WO	2007148933	A	27/12/2007
				WO	2007148935	A	27/12/2007
WO	2008024544	A2	28/02/2008	US	20080049749	A	28/02/2008
WO	2008023945	A1	28/02/2008	KR	20080018148	A	27/02/2008
WO	2008115023	A1	25/09/2008	KR	20080086384	A	25/09/2008
WO	2008147265	A1	04/12/2008	NONE			