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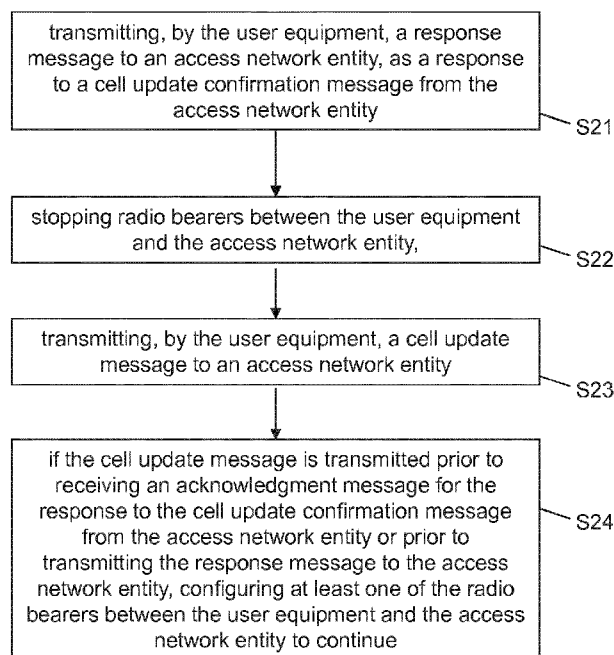
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[Continued on next page]

- (54) **Title:** RECOVERY FROM CELL UPDATE LOOP AFTER CELL RESELECTION

Fig. 2



- (57) **Abstract:** The present invention provides methods, apparatuses and a computer program product relating to recovery from cell update loop after cell reselection. The present invention includes transmitting, by the user equipment, a response message to an access network entity, as a response to a cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity, transmitting, by the user equipment, a cell update message to an access network entity, and if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity, configuring at least one of the radio bearers between the user equipment and the access network entity to continue.



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DESCRIPTION

TITLE

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Recovery from cell update loop after cell reselection

Field of the invention

15 The present invention relates to recovery from cell update loop after cell reselection. In particular, the present invention relates to apparatuses, methods and a program for recovery from cell update loop after cell reselection.

Background of the invention

20

When a UE (user equipment) in Cell_FACH (FACH, forward access channel), Cell_PCH (PCH, paging channel) or URA_PCH (URA, UMTS registration area, UMTS, Universal Mobile Telecommunications System) states moves from one RNC (radio network controller) cell to another RNC cell in the RNC border area, it may trigger a Cell Update or URA Update
25 procedure in the new RNC due to change of Cell or URA. The Target RNC then forwards the Cell Update to the Source RNC using UPLINK SIGNALLING TRANSFER INDICATION message. SRNC of the UE then decides if it wants to perform SRNS (serving radio network subsystem) relocation procedure or keep the UE in anchoring.

30 If SRNC (serving radio network controller) decides to perform SRNS relocation, it sends RELOCATION REQUIRED to the involved CN (core network) nodes. Target RNC then sends CELL UPDATE CONFIRM or URA UPDATE CONFIRM on DCCH (dedicated control channel) to the UE informing the new U-RNTI (UTRAN - radio network temporary identity). When UE receives the RRC (radio resource control) message containing the new U-RNTI
35 and "Downlink counter synchronisation info" IE (information element), it stops all AM (acknowledged mode) and UM (unacknowledged mode) Radio Bearers (including SRB1 (signalling radio bearer 1) and performs action as specified in 3GPP TS 25.331, Sec 8.3.1.6. SRNS relocation procedure also initialises the ciphering and integrity protection for SRBs and ciphering for data RBs (radio bearers). The UE calculates START value for ciphering for

5 each CN domain and sends them in the response message to UTRAN. The UE uses the same START value for re-initialising the ciphering for each AM and Radio Bearers after it has received the RLC (radio link control) acknowledgement for the response message. UTRAN does the same when it receives the response message. The signalling flow for SRNS Relocation triggered due to cell reselection from DRNC cell is described in 3GPP TS 23.060,
10 Sec 6.9.2.2.3.

Fig. 1 shows a signaling diagram for the procedure partly taken from the above mentioned document.

15 In step S1, the user equipment sends a Cell Update/ URA update message to the source SRNC. In step S2, the source SRNC sends a Relocation Required message to the old SGSN, and then in step S3, the old SGSN sends a Forward Relocation Request message to the new SGSN. After that, the new SGSN sends a Relocation Request message to the target RNC in step S4-1 and receives a Relocation Request Acknowledge message from the target
20 RNC in step S4-2 and Radio Access Bearers are established between the target RNC and the new SGSN. In step S5, the new SGSN sends a Forward Relocation Response to the old SGSN.

After that, the old SGSN sends a Relocation Command message to the source SRNC in step
25 S6 and the old SRNC forwards data to the target RNC in step S7. In step S8, the source SRNC sends a Relocation Commit message to the target RNC and the target RNC sends a Relocation Detect message to the new SGSN in step S9.

Then, in step S10-1, the target SRNC sends a Cell Update Confirm / URA Update message
30 to the user equipment and the UE MS may start sending uplink user data to the target SRNC. Then, the UE sends a RAN Mobility Information Confirm message to the target SRNC in step S10-2, which indicates that the UE is also ready to receive downlink data from the target SRNC. Receiving the RAN Mobility Information Confirm message at the target SRNC from the UE indicates that the new SRNC-ID + S-RNTI (SRNC – RNTI) are
35 successfully exchanged with the UE by the radio protocols. Then, the target SRNC initiates the Relocation Complete procedure by sending the Relocation Complete message to the new SGSN in step S11. The purpose of the Relocation Complete procedure is to indicate by the target SRNC the completion of the relocation of the SRNS to the core network (CN).

5 Then, the new SGSN signals to the old SGSN the completion of the SRNS relocation procedure by sending a Forward Relocation Complete message in step S12-1 and the New SGSN responds with a Forward Relocation Complete Acknowledge message in step S12-2. The new SGSN sends a Update PDP Context Request message to the GGSN and receives a Update PDP Context Response message therefrom in steps S13-1 and S13-2,
10 respectively.

Further, the old SGSN sends an lu Release Command message to the source RNC in step S14-1, and the source RNC responds with an lu Release Complete message in step S14-2. Finally, the Routing Area Update procedure takes place.

15

In the example shown in Fig. 1, it is assumed that the UE moves from cell 1 (under control of the source RNC) to cell 2 (under control of the target RNC) and then to cell 3 (also under control of the target RNC). The uplink message in step S1 is sent to cell 2 and the uplink message in step S10-2 is sent to cell 2. The uplink message in step S10-x is then sent to cell
20 3. With respect to the signaling diagram shown in Fig. 1, it is to be noted although cell 2 is under the control of the target RNC, the Cell Update message is forwarded to the source RNC when it is received in step S1.

However, there might appear a case in which the UE makes Cell reselection to new cell (step S10-x in Fig. 1) just after it sent the response message to the UTRAN (step S10-2 in Fig. 1), and before receiving the RLC acknowledgement for the response message. Thus, there is possibility of dead lock situation where the UE gets stuck forever.

The problem is that when UTRAN receives the response message from the UE, it can apply the new ciphering configuration for the AM and UM RLCs even without knowing if UE re-
30 ceived the RLC acknowledgement for the response message.

On the other hand, when UE triggers new Cell Update procedure due to cell reselection before receiving the RLC acknowledgement for the response message, AM and UM RLCs are still in the stopped state in the UE and UE has not yet applied the new ciphering configura-
35 tion on these Radio Bearers. Hence, even if UTRAN sends CELL UPDATE CONFIRM to the UE for the newly initiated CELL UPDATE, there is no way UE can receive the CELL UPDATE CONFIRM because its SRB1 RLC is in stopped state and UE has not yet applied the new ciphering configuration using the START value transmitted in the response message

5 earlier. As a result, the newly initiated CELL UPDATE procedure cannot be completed. If UE was able to complete the CELL UPDATE procedure, then it would resume the RLC re-transmission of the response message for relocation and then receive the RLC Acknowledgement for that. But now the UE can never receive RLC ACKNOWLEDGEMENT for the response message for the relocation leading to a deadlock. This leads to situation when UE
10 keeps repeating the CELL UPDATE message and UTRAN keeps sending CELL UPDATE CONFIRM and this signaling goes in loop until UE enters idle mode. This brings bad end user experience for stalled data transfer for long duration and bad KPIs for the operator when the call drops finally.

15 So far, there has not been presented a solution to this problem and it has been seen with latest commercial devices in the field. The only solution available from the network (NW) side was to release the RRC Connection of the user, if it goes into signaling loop of CELL UPDATE – CELL UPDATE CONFIRM signaling. There is no way how NW can influence or recover the UE. From the device side, only possible solution was that UE would enter idle
20 mode on its own when it notices this hanging situation.

None of these two solutions are preferred one but those were the only available/possible solution to make the end user experience better from worse, in the field at the cost of bad KPIs and increased NAS signaling.

25

Summary of the Invention

It is therefore an object of the present invention to overcome the above mentioned problems and to provide methods, apparatuses and a program for recovery from cell update loop after
30 cell reselection.

According to an aspect of the present invention there is provided a method for use in a user equipment, comprising:

35 transmitting, by the user equipment, a response message to an access network entity, as a response to a cell update confirmation message from the access network entity,
stopping radio bearers between the user equipment and the access network entity,
transmitting, by the user equipment, a cell update message to an access network entity, and

5 if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity,

configuring at least one of the stopped radio bearers between the user equipment and the access network entity to continue.

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According to further refinements of the present invention as defined under the above aspect

- the method further comprises inserting, by the user equipment, into the cell update message, a parameter value for ciphering of the at least one continued radio bearer between the user equipment and the access network entity, the parameter value corresponding to the parameter value included in the response message, and configuring ciphering of the at least one continued radio bearer between the user equipment and the access network entity based on the parameter value;

15

- the method further comprises configuring radio bearer 1 between the user equipment and the access network entity to continue;

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- the method further comprises configuring all stopped radio bearers between the user equipment and the access network entity to continue;

- stopping radio bearers between the user equipment and the access network entity means stopping radio bearers in acknowledged mode and in unacknowledged mode.

25

According to another aspect of the present invention there is provided a method for use in an access network entity, comprising:

transmitting, by the access network entity, a cell update confirmation message to user equipment

30

receiving, at the access network entity, a cell update message from the user equipment prior to receiving a response message to the cell update confirmation message from the user equipment, and

configuring ciphering of radio bearers between the user equipment and the access network entity based on a parameter value included in the cell update message received from the user equipment.

35

According to another aspect of the present invention there is provided a method for use in a user equipment, comprising:

- 5 transmitting, by the user equipment, a response message to an access network entity, as a response to a first cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity, and
- 10 if the user equipment has not received an acknowledgment message for the response to the first cell update confirmation message from the access network entity,
- transmitting, by the user equipment, a cell update message to the access network entity, the cell update message including an indication for the access network entity that the user equipment has not yet received the acknowledgment message.
- 15 According to further refinements of the present invention as defined under the above aspect
- the method further comprises receiving, at the user equipment, a second cell update confirmation message as response to the cell update message on a common control channel;
 - the method further comprises configuring ciphering of the radio bearers between the user equipment and the access network entity, and retransmitting the response message to the
- 20 access network entity, as a response to the first cell update confirmation message from the access network entity;
- the method further comprises receiving an acknowledgment message for the response to the first cell update confirmation message from the access network entity, and starting the stopped radio link control.
- 25 According to another aspect of the present invention there is provided a method for use in an access network entity, comprising:
- transmitting, by the access network entity, a first cell update confirmation message to user equipment,
- 30 receiving, at the access network entity, a cell update message from the user equipment including an indication that the user equipment has not received an acknowledgment message for a response message to the first cell update confirmation message, and
- transmitting, by the access network entity, a second cell update confirmation message as response to the cell update message on a common control channel.
- 35 According to another aspect of the present invention there is provided an apparatus for use in a user equipment, comprising:
- at least one processor,
 - at least one interface to at least one other network element, and

5 at least one memory for storing instructions to be executed by the processor, wherein the at least one memory and the instructions are configured to, with the at least one processor, cause the apparatus at least to perform:

 transmitting, by the user equipment, a response message to an access network entity, as a response to a cell update confirmation message from the access network entity,

10 stopping radio bearers between the user equipment and the access network entity,

 transmitting, by the user equipment, a cell update message to an access network entity, and

 if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity,

15 configuring at least one of the stopped radio bearers between the user equipment and the access network entity to continue.

According to further refinements of the present invention as defined under the above aspect

20 - the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform inserting, by the user equipment, into the cell update message, a parameter value for ciphering of the at least one continued radio bearer between the user equipment and the access network entity, the parameter value corresponding to the parameter value included in the response message, and configuring ciphering of
25 the at least one continued radio bearer between the user equipment and the access network entity based on the parameter value;

 - the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform configuring radio bearer 1 between the user equipment and the access network entity to continue;

30 - the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform configuring all stopped radio bearers between the user equipment and the access network entity to continue;

 - stopping radio bearers between the user equipment and the access network entity means stopping radio bearers in acknowledged mode and in unacknowledged mode.

35 According to another aspect of the present invention there is provided an apparatus for use in an access network entity, comprising:

 at least one processor,

 at least one interface to at least one other network element, and

- 5 at least one memory for storing instructions to be executed by the processor, wherein
the at least one memory and the instructions are configured to, with the at least one
processor, cause the apparatus at least to perform:
- transmitting, by the access network entity, a cell update confirmation message to user
equipment
- 10 receiving, at the access network entity, a cell update message from the user equip-
ment prior to receiving a response message to the cell update confirmation message from
the user equipment, and
- configuring ciphering of radio bearers between the user equipment and the access
network entity based on a parameter value included in the cell update message received
- 15 form the user equipment.

According to another aspect of the present invention there is provided an apparatus for use
in a user equipment, comprising:

- at least one processor,
- 20 at least one interface to at least one other network element, and
- at least one memory for storing instructions to be executed by the processor, wherein
the at least one memory and the instructions are configured to, with the at least one
processor, cause the apparatus at least to perform:
- transmitting, by the user equipment, a response message to an access network enti-
- 25 ty, as a response to a first cell update confirmation message from the access network entity,
stopping radio bearers between the user equipment and the access network entity,
and
- if the user equipment has not received an acknowledgment message for the response
to the first cell update confirmation message from the access network entity,
- 30 transmitting, by the user equipment, a cell update message to the access network
entity, the cell update message including an indication for the access network entity that the
user equipment has not yet received the acknowledgment message.

- According to further refinements of the present invention as defined under the above aspect
- 35 - the at least one memory and the instructions are further configured to, with the at least one
processor, cause the apparatus to perform receiving, at the user equipment, a second cell
update confirmation message as response to the cell update message on a common control
channel;

- 5 - the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform configuring ciphering of the radio bearers between the user equipment and the access network entity, and retransmitting the response message to the access network entity, as a response to the first cell update confirmation message from the access network entity;
- 10 - the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform receiving an acknowledgment message for the response to the first cell update confirmation message from the access network entity, and starting the stopped radio link control.
- 15 According to another aspect of the present invention there is provided an apparatus for use in an access network entity, comprising:
- at least one processor,
- at least one interface to at least one other network element, and
- at least one memory for storing instructions to be executed by the processor, wherein
- 20 the at least one memory and the instructions are configured to, with the at least one processor, cause the apparatus at least to perform:
- transmitting, by the access network entity, a first cell update confirmation message to user equipment,
- receiving, at the access network entity, a cell update message from the user equipment
- 25 including an indication that the user equipment has not received an acknowledgment message for a response message to the first cell update confirmation message, and
- transmitting, by the access network entity, a second cell update confirmation message as response to the cell update message on a common control channel.
- 30 According to another aspect of the present invention there is provided an apparatus for use in a user equipment, comprising:
- means for transmitting, by the user equipment, a response message to an access network entity, as a response to a cell update confirmation message from the access network entity,
- 35 means for stopping radio bearers between the user equipment and the access network entity,
- means for transmitting, by the user equipment, a cell update message to an access network entity, and

5 if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity,

means for configuring at least one of the stopped radio bearers between the user equipment and the access network entity to continue.

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According to another aspect of the present invention there is provided an apparatus for use in an access network entity, comprising:

means for transmitting, by the access network entity, a cell update confirmation message to user equipment

15

means for receiving, at the access network entity, a cell update message from the user equipment prior to receiving a response message to the cell update confirmation message from the user equipment, and

means for configuring ciphering of radio bearers between the user equipment and the access network entity based on a parameter value included in the cell update message received from the user equipment.

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According to another aspect of the present invention there is provided an apparatus for use in a user equipment, comprising:

means for transmitting, by the user equipment, a response message to an access network entity, as a response to a first cell update confirmation message from the access network entity,

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means for stopping radio bearers between the user equipment and the access network entity, and

if the user equipment has not received an acknowledgment message for the response to the first cell update confirmation message from the access network entity,

30

means for transmitting, by the user equipment, a cell update message to the access network entity, the cell update message including an indication for the access network entity that the user equipment has not yet received the acknowledgment message.

35

According to another aspect of the present invention there is provided an apparatus for use in an access network entity, comprising:

means for transmitting, by the access network entity, a first cell update confirmation message to user equipment,

5 means for receiving, at the access network entity, a cell update message from the user equipment including an indication that the user equipment has not received an acknowledgment message for a response message to the first cell update confirmation message, and

10 means for transmitting, by the access network entity, a second cell update confirmation message as response to the cell update message on a common control channel.

According to another aspect of the present invention there is provided a user equipment comprising an apparatus for use in user equipment as defined under the above aspects.

15 According to another aspect of the present invention there is provided an access network entity comprising an apparatus for use in an access network entity as defined under the above aspects.

20 According to another aspect of the present invention there is provided a computer program product comprising code means adapted to produce steps of any of the methods as described above when loaded into the memory of a computer.

25 According to a still further aspect of the invention there is provided a computer program product as defined above, wherein the computer program product comprises a computer-readable medium on which the software code portions are stored.

30 According to a still further aspect of the invention there is provided a computer program product as defined above, wherein the program is directly loadable into an internal memory of the processing device.

Brief Description of the Drawings

35 These and other objects, features, details and advantages will become more fully apparent from the following detailed description of aspects/embodiments of the present invention which is to be taken in conjunction with the appended drawings, in which:

Fig. 1 is diagram illustrating signaling for a combined cell / URA Update and SRNS Relocation Procedure;

5 Fig. 2 is a flowchart illustrating an example of a method according to certain embodiments of the present invention;

Fig. 3 is a flowchart illustrating another example of a method according to certain embodiments of the present invention;

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Fig. 4 is a diagram illustrating an example of an apparatus according to certain embodiments of the present invention;

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Fig. 5 is a flowchart illustrating another example of a method according to certain embodiments of the present invention;

Fig. 6 is a flowchart illustrating another example of a method according to certain embodiments of the present invention;

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Fig. 7 is a diagram illustrating another example of an apparatus according to certain embodiments of the present invention.

Detailed Description

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In the following, examples and embodiments of the present invention are described with reference to the drawings. For illustrating the present invention, the examples and embodiments will be described in connection with a cellular communication network based on a 3GPP based communication system, for example an LTE/LTE-A based system or a system according to 3G. However, it is to be noted that the present invention is not limited to an application using such types of communication system, but is also applicable in other types of communication systems and the like.

30

35

Basic system architecture of a communication network where examples of embodiments of the invention are applicable may comprise a commonly known architecture of one or more communication systems comprising a wired or wireless access network subsystem and a core network. Such an architecture may comprise one or more access network control elements, radio access network elements, access service network gateways or base transceiver stations, such as a base station or eNB, which control a coverage area also referred to as a cell and with which one or more communication elements or terminal devices such as a UE

5 or another device having a similar function, such as a modem chipset, a chip, a module etc., which can also be part of a UE or attached as a separate element to a UE, or the like, are capable to communicate via one or more channels for transmitting several types of data. Furthermore, core network elements such as gateway network elements, policy and charging control network elements, mobility management entities and the like may be comprised.

10 The general functions and interconnections of the described elements, which also depend on the actual network type, are known to those skilled in the art and described in corresponding specifications, so that a detailed description thereof is omitted herein. However, it is to be noted that several additional network elements and signaling links may be employed for a
15 communication to or from a communication element or terminal device like a UE and a communication network control element like a radio network controller or SGSN, GGSN, besides those described in detail herein below.

Furthermore, the described network elements, such as communication network control elements, like an eNB, RNC, and the like, as well as corresponding functions as described here-
20 in may be implemented by software, e.g. by a computer program product for a computer, and/or by hardware. In any case, for executing their respective functions, correspondingly used devices, nodes or network elements may comprise several means and components (not shown) which are required for control, processing and communication/signaling func-
25 tionality. Such means may comprise, for example, one or more processor units including one or more processing portions for executing instructions, programs and for processing data, memory means for storing instructions, programs and data, for serving as a work area of the processor or processing portion and the like (e.g. ROM, RAM, EEPROM, and the like), input means for inputting data and instructions by software (e.g. floppy disc, CD-ROM, EEPROM, and the like), user interface means for providing monitor and manipulation possibilities to a
30 user (e.g. a screen, a keyboard and the like), interface means for establishing links and/or connections under the control of the processor unit or portion (e.g. wired and wireless inter- face means, an antenna, etc.) and the like. It is to be noted that in the present specification processing portions should not be only considered to represent physical portions of one or
35 more processors, but may also be considered as a logical division of the referred processing tasks performed by one or more processors.

According to certain embodiments of the present invention, there are proposed possible ways how the above described problem can be resolved with either a UE only change or UE

- 5 – NW based solution, which could involve also some ASN.1 (Abstract Syntax Notation.1) changes, if existing IEs are not reused.

According to certain embodiments of the present invention, a first solution to solve the problem, with only UE based solution is that new UE behaviour is introduced in Section
10 8.3.1.7 of document 3GPP TS 25.331, to perform action as it has received the RLC acknowledgement for the response message.

The UE has knowledge that it has not yet completed the SRNS relocation procedure when it initiates new Cell Update procedure while NW does not know that UEs RLCs are in stopped
15 state or UE has not yet applied new ciphering configurations for AM/UM RBs and re-established the RLCs.

This solution is early implementable and does not need any change in the NW side. The problem will then remain with only legacy devices which cannot implement this new
20 behaviour and those will still use either of the workarounds which NW or UE vendor can implement to release the RRC Connection.

For the case that UE does not know if UTRAN had received the earlier transmitted response message since it did not receive the RLC acknowledgement, it must use include START
25 value for ciphering in the CELL UPDATE message as the last transmitted START in the response message. If UTRAN has not yet received the response message, then it must configure ciphering in its side for AM and UM RLCs using the START value in the CELL UPDATE message or it can wait for the RLC level re-transmission of the response message, which would come after this CELL UPDATE procedure has been completed.

30

One example of an implementation for this solution according to certain embodiments of the present invention can be done by adding new requirements for UE behaviour as followed.

The UE behaviour could be added in Sec 8.3.1.7 of document 3GPP TS 25.331.

35

- 1> if the IE "Downlink counter synchronisation info" was included in the received CELL UPDATE CONFIRM or URA UPDATE CONFIRM message:

- 5 2> when RLC has confirmed the successful transmission of the response message or if
 UE initiates a Cell Update as per Section 8.3.1 before RLC has confirmed the
 successful transmission of the response message or a new Cell Update is initiated
 before response message has been submitted:
- 3> if the variable PDCP_SN_INFO is empty:
- 10 4> configure the RLC entity for all AM and UM radio bearers and AM and UM
 signalling radio bearers except RB2 to "continue".
- 3> else:
- 4> configure the RLC entity for signalling radio bearers RB1, RB3 and RB4 to
 "continue";
- 15 4> configure the RLC entity for UM and AM radio bearers for which the IE "PDCP
 SN Info" is not included to "continue".
- 3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set
 the first 20 bits of all the HFN component of the respective COUNT-C values to
 the START value included in the response message for the corresponding CN
20 domain;
- 3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits
 of all the HFN component of the respective COUNT-C values to the START value
 included in the response message for the CN domain stored in the variable LAT-
 EST_CONFIGURED_CN_DOMAIN;
- 25 When UTRAN received the CELL UPDATE after having received the response message for
 SRNS relocation, UTRAN behaviour does not change. If UTRAN has not received yet the
 response message, then it must configure ciphering for AM and UM RLCs using the START
 value in the CELL UPDATE message.
- 30 A second solution according to certain embodiments of the present invention would be that
 UTRAN is aware of this deadlock situation in the UE, so as to act in a different way. One way
 would be that UE could set Reconfiguration Status Indicator or similar new IE in the CELL
 UPDATE message, so that UTRAN could know that UE is still waiting for the RLC
35 acknowledgement for the previous response message. In this case, the UTRAN should send

- 5 CELL UPDATE CONFIRM to the UE on CCCH so that UE can complete the Cell Update procedure, apply the new ciphering configuration and then re-transmit the response message of SRNS relocation procedure, receive the RLC acknowledgement and start the AM and UM RLCs.
- 10 Alternatively, other option is that UE starts only its SRB1, if initiating a CELL UPDATE before having received the RLC acknowledgement for the response message confirming SRNS relocation. Also the UE must configure ciphering on SRB1 using the transmitted START value in the CELL UPDATE for latest CN for which SRB ciphering is configured. This is similar to the first solution described above but UE applies the action only on SRB1 in this
- 15 case. This solution allows UE to receive CELL UPDATE CONFIRM on DCCH while also limiting the UE's action.

This second solution according to certain embodiments of the present invention would require changes in UE and NW to clearly state the actions in this situation.

20

The UE behaviour would need changes in the document 3GPP TS 25.331 in section 8.3.1.3 as follows.

1> if the variable ORDERED_RECONFIGURATION is set to TRUE:

25

2> include the IE "Reconfiguration Status Indicator" and set it to TRUE.

1> if the IE "Cell update cause" is set to "radio link failure" or "RLC Unrecoverable error" and the UE has submitted a reconfiguration response message to RLC and the UE has not received the RLC acknowledgement for the response message:

2> include the IE "Reconfiguration Status Indicator" and set it to TRUE.

30

1> if the Cell Update is initiated during ongoing SRNS relocation when RLC acknowledgement for response message has not yet been received or SRB1 is in stopped state,:

2> include the IE "Reconfiguration Status Indicator" and set it to TRUE.

35

Additionally, section 8.3.1.5 of document 3GPP TS 25.331 should be modified as follows.

- 5 1> in case the procedure was triggered by reception of a CELL UPDATE:
- 2> if SRNS relocation was performed:
- 3> transmit a CELL UPDATE CONFIRM message on the downlink DCCH.
- 2> if CELL UPDATE was received with "reconfiguration status indicator" set to TRUE
 and this is the first message in uplink from the UE after response message for
10 SRNS relocation:
- 3> transmit a CELL UPDATE CONFIRM message on the downlink CCCH.
- 2> otherwise:
- 3> update the START value for each CN domain as maintained in UTRAN (refer to
 subclause 8.5.9) with "START" in the IE "START list" for the CN domain as indi-
15 cated by "CN domain identity" in the IE "START list";
- 3> transmit a CELL UPDATE CONFIRM message on the downlink DCCH or option-
 ally on the CCCH but only if ciphering is not required; and
- 3> optionally set the IE "RLC re-establish indicator (RB2, RB3 and RB4)" and/or the
 IE "RLC re-establish indicator (RB5 and upwards)" to TRUE to request a RLC re-
20 establishment in the UE, in which case the corresponding RLC entities should
 also be re-established in UTRAN; or

The second solution according to certain embodiments of the present invention would require similar changes as the first solution in Sec 8.3.1.7 of document 3GPP TS 25.331, but only in the case of SRB1 reactivation as described above.

25 It is possible to introduce a new IE in the CELL UPDATE message also to indicate this situation but preference is given to reusing existing IE and hence "Reconfiguration Status Indicator" has been used in the above text. However, it is noted that this is merely an example and any other suitable IE or a new IE may be used for the indication.

30 Fig. 2 is a flowchart illustrating an example of a method according to certain embodiments of the present invention.

5 According to certain embodiments of the present invention, the method may be implemented in a user equipment or part of a user equipment and comprises transmitting in a step S21, by the user equipment, a response message to an access network entity, as a response to a cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity in a step S22, transmitting, by the
10 user equipment, a cell update message to an access network entity in a step S23, and if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity, configuring at least one of the radio bearers between the user equipment and the access network entity to continue in a
15 step S24.

According to certain embodiments of the present invention, the method further comprises configuring all stopped radio bearers between the user equipment and the access network entity to continue.

20

According to certain embodiments of the present invention, the method further comprises inserting, by the user equipment, into the cell update message, a parameter value for ciphering of the at least one continued radio bearer between the user equipment and the access network entity, the parameter value corresponding to the parameter value included in the
25 response message, and configuring ciphering of the at least one continued radio bearer between the user equipment and the access network entity based on the parameter value.

According to certain embodiments of the present invention, the method further comprises
30 configuring radio bearer 1 between the user equipment and the access network entity to continue.

According to certain embodiments of the present invention, the method further comprises configuring all stopped radio bearers between the user equipment and the access network
35 entity to continue.

According to certain embodiments of the present invention, stopping radio bearers between the user equipment and the access network entity means stopping radio bearers in acknowledged mode and in unacknowledged mode.

5

Fig. 3 is a flowchart illustrating another example of a method according to certain embodiments of the present invention.

According to certain embodiments of the present invention, the method may be implemented in a user equipment or part of a user equipment and comprises transmitting in a step S31, by the user equipment, a response message to an access network entity, as a response to a first cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity in a step S32, and if the user equipment has not received an acknowledgment message for the response to the first cell update confirmation message from the access network entity, transmitting, by the user equipment, a cell update message to the access network entity, the cell update message including an indication for the access network entity that the user equipment has not yet received the acknowledgment message in a step S33.

According to certain embodiments of the present invention, the method further comprises receiving, at the user equipment, a second cell update confirmation message as response to the cell update message on a common control channel.

According to certain embodiments of the present invention, the method further comprises configuring ciphering of the radio bearers between the user equipment and the access network entity, and retransmitting the response message to the access network entity, as a response to the first cell update confirmation message from the access network entity.

According to certain embodiments of the present invention, the method further comprises receiving an acknowledgment message for the response to the first cell update confirmation message from the access network entity, and starting the stopped radio link control.

Fig. 4 is a block diagram showing an example of an apparatus according to certain embodiments of the present invention.

35

In Fig. 4, a block circuit diagram illustrating a configuration of an apparatus 40, such as of a user equipment or part of a user equipment, is shown, which is configured to implement the above described aspects of the invention. It is to be noted that the apparatus 40 shown in Fig. 4 may comprise several further elements or functions besides those described herein

5 below, which are omitted herein for the sake of simplicity as they are not essential for understanding the invention. Furthermore, even though reference is made to a user equipment, the apparatus may be also another device having a similar function, such as a chipset, a chip, a module etc., which can also be part of a user equipment or attached as a separate element to a user equipment, or the like.

10

The apparatus 40 may comprise a processing function or processor 41, such as a CPU or the like, which executes instructions given by programs or the like related to the flow control mechanism. The processor 41 may comprise one or more processing portions dedicated to specific processing as described below, or the processing may be run in a single processor.

15

Portions for executing such specific processing may be also provided as discrete elements or within one or more further processors or processing portions, such as in one physical processor like a CPU or in several physical entities, for example. Reference sign 42 denotes transceiver or input/output (I/O) units (interfaces) connected to the processor 41. The I/O units 42 may be used for communicating with one or more management entities and or user equipments. The I/O units 42 may be a combined unit comprising communication equipment towards several network elements, or may comprise a distributed structure with a plurality of different interfaces for different network elements. Reference sign 43 denotes a memory usable, for example, for storing data and programs to be executed by the processor 41 and/or as a working storage of the processor 41.

25

The processor 41 is configured to execute processing related to the above described aspects. In particular, the processor 41 is configured to perform transmitting a response message to an access network entity, as a response to a cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity, transmitting a cell update message to an access network entity, and if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity, configuring at least one of the radio bearers between the user equipment and the access network entity to continue.

35

Further, the processor 41 is configured to perform transmitting a response message to an access network entity, as a response to a first cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity, and if the user equipment has not received an acknowledgment message for

5 the response to the first cell update confirmation message from the access network entity, transmitting a cell update message to the access network entity, the cell update message including an indication for the access network entity that the user equipment has not yet received the acknowledgment message.

10 For further functions of the apparatus according to further example embodiments of the present invention, reference is made to the above description of methods according to certain embodiments of the present invention, as described in connection with Figs. 2 and 3.

According to certain aspects of the present invention, there is also provided a user equipment that comprises any apparatus as defined above.
15

Fig. 5 is a flowchart illustrating another example of a method according to certain embodiments of the present invention.

20 According to certain embodiments of the present invention, the method may be implemented in a access network entity or part of a network access entity, like e.g. a radio network controller, and comprises transmitting in a step S51, by the access network entity, a cell update confirmation message to user equipment, receiving, at the access network entity, a cell update message from the user equipment prior to receiving a response message to the cell
25 update confirmation message from the user equipment in a step S52, and configuring ciphering of radio bearers between the user equipment and the access network entity based on a parameter value included in the cell update message received from the user equipment in a step S53.

30 Fig. 6 is a flowchart illustrating another example of a method according to certain embodiments of the present invention.

According to certain embodiments of the present invention, the method may be implemented in a access network entity or part of a network access entity, like e.g. a radio network controller, and comprises transmitting, by the access network entity, a first cell update confirmation
35 message to user equipment in a step S61, receiving, at the access network entity, a cell update message from the user equipment including an indication that the user equipment has not received an acknowledgment message for a response message to the first cell update confirmation message in a step S62, and transmitting, by the access network entity, a se-

5 cond cell update confirmation message as response to the cell update message on a common control channel in a step S63.

Fig. 7 is a block diagram showing an example of an apparatus according to certain embodiments of the present invention.

10

In Fig. 7, a block circuit diagram illustrating a configuration of an apparatus 70, such as of an access network entity or part of the access network entity, like e.g. a radio network controller, is shown, which is configured to implement the above described aspects of the invention. It is to be noted that the apparatus 70 shown in Fig. 7 may comprise several further elements or
15 functions besides those described herein below, which are omitted herein for the sake of simplicity as they are not essential for understanding the invention. Furthermore, even though reference is made to an access network entity, the apparatus may be also another device having a similar function, such as a chipset, a chip, a module etc., which can also be part of a access network entity or attached as a separate element to a access network entity,
20 or the like.

The apparatus 70 may comprise a processing function or processor 71, such as a CPU or the like, which executes instructions given by programs or the like related to the flow control mechanism. The processor 71 may comprise one or more processing portions dedicated to
25 specific processing as described below, or the processing may be run in a single processor. Portions for executing such specific processing may be also provided as discrete elements or within one or more further processors or processing portions, such as in one physical processor like a CPU or in several physical entities, for example. Reference sign 72 denotes transceiver or input/output (I/O) units (interfaces) connected to the processor 71. The I/O
30 units 72 may be used for communicating with one or more management entities and or user equipments. The I/O units 72 may be a combined unit comprising communication equipment towards several network elements, or may comprise a distributed structure with a plurality of different interfaces for different network elements. Reference sign 73 denotes a memory usable, for example, for storing data and programs to be executed by the processor 71 and/or
35 as a working storage of the processor 71.

The processor 71 is configured to execute processing related to the above described aspects. In particular, the processor 71 is configured to perform transmitting a cell update confirmation message to user equipment, receiving a cell update message from the user equip-

- 5 ment prior to receiving a response message to the cell update confirmation message from the user equipment, and configuring ciphering of the radio bearers between the user equipment and the access network entity based on a parameter value included in the cell update message received from the user equipment.
- 10 Further, the processor 71 is configured to perform transmitting a first cell update confirmation message to user equipment, receiving a cell update message from the user equipment including an indication that the user equipment has not received an acknowledgment message for a response message to the first cell update confirmation message, and transmitting a second cell update confirmation message as response to the cell update message on a
- 15 common control channel.

According to certain aspects of the present invention, there is also provided an access network entity that comprises any apparatus as defined above.

- 20 In the foregoing exemplary description of the apparatuses, only the units/means that are relevant for understanding the principles of the invention have been described using functional blocks. The apparatus may comprise further units/means that are necessary for its respective operation as user equipment or access network entity, respectively. However, a description of these units/means is omitted in this specification. The arrangement of the functional
- 25 blocks of the apparatus is not construed to limit the invention, and the functions may be performed by one block or further split into sub-blocks.

- When in the foregoing description it is stated that the apparatus (or some other means) is configured to perform some function, this is to be construed to be equivalent to a description
- 30 stating that a (i.e. at least one) processor or corresponding circuitry, potentially in cooperation with computer program code stored in the memory of the respective apparatus, is configured to cause the apparatus to perform at least the thus mentioned function. Also, such function is to be construed to be equivalently implementable by specifically configured circuitry or means for performing the respective function (i.e. the expression "unit configured to" is
- 35 construed to be equivalent to an expression such as "means for").

For the purpose of the present invention as described herein above, it should be noted that - method steps likely to be implemented as software code portions and being run using a processor at an apparatus (as examples of devices, apparatuses and/or modules thereof, or

- 5 as examples of entities including apparatuses and/or modules therefore), are software code independent and can be specified using any known or future developed programming language as long as the functionality defined by the method steps is preserved;
- generally, any method step is suitable to be implemented as software or by hardware without changing the idea of the aspects/embodiments and its modification in terms of the
- 10 functionality implemented;
- method steps and/or devices, units or means likely to be implemented as hardware components at the above-defined apparatuses, or any module(s) thereof, (e.g., devices carrying out the functions of the apparatuses according to the aspects/embodiments as described above) are hardware independent and can be implemented using any known or
- 15 future developed hardware technology or any hybrids of these, such as MOS (Metal Oxide Semiconductor), CMOS (Complementary MOS), BiMOS (Bipolar MOS), BiCMOS (Bipolar CMOS), ECL (Emitter Coupled Logic), TTL (Transistor-Transistor Logic), etc., using for example ASIC (Application Specific IC (Integrated Circuit)) components, FPGA (Field-programmable Gate Arrays) components, CPLD (Complex Programmable Logic Device)
- 20 components or DSP (Digital Signal Processor) components;
- devices, units or means (e.g. the above-defined apparatuses, or any one of their respective units/means) can be implemented as individual devices, units or means, but this does not exclude that they are implemented in a distributed fashion throughout the system, as long as the functionality of the device, unit or means is preserved;
- 25 - an apparatus may be represented by a semiconductor chip, a chipset, or a (hardware) module comprising such chip or chipset; this, however, does not exclude the possibility that a functionality of an apparatus or module, instead of being hardware implemented, be implemented as software in a (software) module such as a computer program or a computer program product comprising executable software code portions for execution/being run on a
- 30 processor;
- a device may be regarded as an apparatus or as an assembly of more than one apparatus, whether functionally in cooperation with each other or functionally independently of each other but in a same device housing, for example.
- 35 In general, it is to be noted that respective functional blocks or elements according to above-described aspects can be implemented by any known means, either in hardware and/or software, respectively, if it is only adapted to perform the described functions of the respective parts. The mentioned method steps can be realized in individual functional blocks or by

5 individual devices, or one or more of the method steps can be realized in a single functional block or by a single device.

Generally, any method step is suitable to be implemented as software or by hardware without changing the idea of the present invention. Devices and means can be implemented as
10 individual devices, but this does not exclude that they are implemented in a distributed fashion throughout the system, as long as the functionality of the device is preserved. Such and similar principles are to be considered as known to a skilled person.

Software in the sense of the present description comprises software code as such comprising code means or portions or a computer program or a computer program product for performing the respective functions, as well as software (or a computer program or a computer program product) embodied on a tangible medium such as a computer-readable (storage)
15 medium having stored thereon a respective data structure or code means/portions or embodied in a signal or in a chip, potentially during processing thereof.

20 It is noted that the aspects/embodiments and general and specific examples described above are provided for illustrative purposes only and are in no way intended that the present invention is restricted thereto. Rather, it is the intention that all variations and modifications which fall within the scope of the appended claims are covered.

25

CLAIMS

1. A method for use in a user equipment, comprising:

transmitting, by the user equipment, a response message to an access network entity, as a response to a cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity, transmitting, by the user equipment, a cell update message to an access network entity, and

if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity,

configuring at least one of the stopped radio bearers between the user equipment and the access network entity to continue.

2. The method according to claim 1, further comprising

inserting, by the user equipment, into the cell update message, a parameter value for ciphering of the at least one continued radio bearer between the user equipment and the access network entity, the parameter value corresponding to the parameter value included in the response message, and

configuring ciphering of the at least one continued radio bearer between the user equipment and the access network entity based on the parameter value.

3. The method according to claim 1 or 2, further comprising:

configuring radio bearer 1 between the user equipment and the access network entity to continue.

4. The method according to claim 3, further comprising

configuring all stopped radio bearers between the user equipment and the access network entity to continue.

5. The method according to any one of claims 1 to 4, wherein

stopping radio bearers between the user equipment and the access network entity means stopping radio bearers in acknowledged mode and in unacknowledged mode.

6. A method for use in an access network entity, comprising:

transmitting, by the access network entity, a cell update confirmation message to user equipment

receiving, at the access network entity, a cell update message from the user equipment prior to receiving a response message to the cell update confirmation message from the user equipment, and

configuring ciphering of radio bearers between the user equipment and the access network entity based on a parameter value included in the cell update message received from the user equipment.

7. A method for use in a user equipment, comprising:

transmitting, by the user equipment, a response message to an access network entity, as a response to a first cell update confirmation message from the access network entity,

stopping radio bearers between the user equipment and the access network entity, and

if the user equipment has not received an acknowledgment message for the response to the first cell update confirmation message from the access network entity,

transmitting, by the user equipment, a cell update message to the access network entity, the cell update message including an indication for the access network entity that the user equipment has not yet received the acknowledgment message.

8. The method according to claim 7, further comprising

receiving, at the user equipment, a second cell update confirmation message as response to the cell update message on a common control channel.

9. The method according to claim 8, further comprising

configuring ciphering of the radio bearers between the user equipment and the access network entity, and

retransmitting the response message to the access network entity, as a response to the first cell update confirmation message from the access network entity.

10. The method according to claim 9, further comprising

receiving an acknowledgment message for the response to the first cell update confirmation message from the access network entity, and

starting the stopped radio link control.

11. A method for use in an access network entity, comprising:

- transmitting, by the access network entity, a first cell update confirmation message to user equipment,

- receiving, at the access network entity, a cell update message from the user equipment including an indication that the user equipment has not received an acknowledgment message for a response message to the first cell update confirmation message, and

- transmitting, by the access network entity, a second cell update confirmation message as response to the cell update message on a common control channel.

12. An apparatus for use in a user equipment, comprising:

- at least one processor,

- at least one interface to at least one other network element, and

- at least one memory for storing instructions to be executed by the processor, wherein the at least one memory and the instructions are configured to, with the at least one processor, cause the apparatus at least to perform:

- transmitting, by the user equipment, a response message to an access network entity, as a response to a cell update confirmation message from the access network entity,

- stopping radio bearers between the user equipment and the access network entity,

- transmitting, by the user equipment, a cell update message to an access network entity, and

- if the cell update message is transmitted prior to receiving an acknowledgment message for the response to the cell update confirmation message from the access network entity or prior to transmitting the response message to the access network entity,

- configuring at least one of the stopped radio bearers between the user equipment and the access network entity to continue.

13. The apparatus according to claim 12, wherein the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform:

- inserting, by the user equipment, into the cell update message, a parameter value for ciphering of the at least one continued radio bearer between the user equipment and the access network entity, the parameter value corresponding to the parameter value included in the response message, and

configuring ciphering of the at least one continued radio bearer between the user equipment and the access network entity based on the parameter value.

14. The apparatus according to claim 12 or 13, wherein the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform:

configuring radio bearer 1 between the user equipment and the access network entity to continue.

15. The apparatus according to claim 14, further comprising

configuring all stopped radio bearers between the user equipment and the access network entity to continue.

16. The apparatus according to any one of claims 12 to 15, wherein

stopping radio bearers between the user equipment and the access network entity means stopping radio bearers in acknowledged mode and in unacknowledged mode.

17. An apparatus for use in an access network entity, comprising:

at least one processor,

at least one interface to at least one other network element, and

at least one memory for storing instructions to be executed by the processor, wherein the at least one memory and the instructions are configured to, with the at least one processor, cause the apparatus at least to perform:

transmitting, by the access network entity, a cell update confirmation message to user equipment

receiving, at the access network entity, a cell update message from the user equipment prior to receiving a response message to the cell update confirmation message from the user equipment, and

configuring ciphering of radio bearers between the user equipment and the access network entity based on a parameter value included in the cell update message received from the user equipment.

18. An apparatus for use in a user equipment, comprising:

at least one processor,

at least one interface to at least one other network element, and

at least one memory for storing instructions to be executed by the processor, wherein the at least one memory and the instructions are configured to, with the at least one processor, cause the apparatus at least to perform:

transmitting, by the user equipment, a response message to an access network entity, as a response to a first cell update confirmation message from the access network entity, stopping radio bearers between the user equipment and the access network entity, and

if the user equipment has not received an acknowledgment message for the response to the first cell update confirmation message from the access network entity,

transmitting, by the user equipment, a cell update message to the access network entity, the cell update message including an indication for the access network entity that the user equipment has not yet received the acknowledgment message.

19. The apparatus according to claim 18, wherein the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform:

receiving, at the user equipment, a second cell update confirmation message as response to the cell update message on a common control channel.

20. The apparatus according to claim 19, wherein the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform:

configuring ciphering of the radio bearers between the user equipment and the access network entity, and

retransmitting the response message to the access network entity, as a response to the first cell update confirmation message from the access network entity.

21. The apparatus according to claim 20, wherein the at least one memory and the instructions are further configured to, with the at least one processor, cause the apparatus to perform:

receiving an acknowledgment message for the response to the first cell update confirmation message from the access network entity, and

starting the stopped radio link control.

22. An apparatus for use in an access network entity, comprising:

at least one processor,
at least one interface to at least one other network element, and
at least one memory for storing instructions to be executed by the processor, wherein
the at least one memory and the instructions are configured to, with the at least one
processor, cause the apparatus at least to perform:

transmitting, by the access network entity, a first cell update confirmation message to
user equipment,

receiving, at the access network entity, a cell update message from the user equip-
ment including an indication that the user equipment has not received an acknowledgment
message for a response message to the first cell update confirmation message, and

transmitting, by the access network entity, a second cell update confirmation mes-
sage as response to the cell update message on a common control channel.

23. An apparatus for use in a user equipment, comprising:

means for transmitting, by the user equipment, a response message to an access
network entity, as a response to a cell update confirmation message from the access net-
work entity,

means for stopping radio bearers between the user equipment and the access net-
work entity,

means for transmitting, by the user equipment, a cell update message to an access
network entity, and

if the cell update message is transmitted prior to receiving an acknowledgment mes-
sage for the response to the cell update confirmation message from the access network enti-
ty or prior to transmitting the response message to the access network entity,

means for configuring at least one of the stopped radio bearers between the user
equipment and the access network entity to continue.

24. An apparatus for use in an access network entity, comprising:

means for transmitting, by the access network entity, a cell update confirmation mes-
sage to user equipment

means for receiving, at the access network entity, a cell update message from the
user equipment prior to receiving a response message to the cell update confirmation mes-
sage from the user equipment, and

means for configuring ciphering of radio bearers between the user equipment and the access network entity based on a parameter value included in the cell update message received from the user equipment.

25. An apparatus for use in a user equipment, comprising:

means for transmitting, by the user equipment, a response message to an access network entity, as a response to a first cell update confirmation message from the access network entity,

means for stopping radio bearers between the user equipment and the access network entity, and

if the user equipment has not received an acknowledgment message for the response to the first cell update confirmation message from the access network entity,

means for transmitting, by the user equipment, a cell update message to the access network entity, the cell update message including an indication for the access network entity that the user equipment has not yet received the acknowledgment message.

26. An apparatus for use in an access network entity, comprising:

means for transmitting, by the access network entity, a first cell update confirmation message to user equipment,

means for receiving, at the access network entity, a cell update message from the user equipment including an indication that the user equipment has not received an acknowledgment message for a response message to the first cell update confirmation message, and

means for transmitting, by the access network entity, a second cell update confirmation message as response to the cell update message on a common control channel.

27. A computer program product including a program for a processing device, comprising software code portions for performing the steps of any one of claims 1 to 11 when the program is run on the processing device.

28. The computer program product according to claim 27, wherein the computer program product comprises a computer-readable medium on which the software code portions are stored.

29. The computer program product according to claim 27, wherein the program is directly loadable into an internal memory of the processing device.

30. A user equipment, comprising
an apparatus according to any one of claims 12 to 16, 18 to 21, 23 and 25.

31. An access network entity, comprising:
an apparatus according to any one of claims 17, 22, 24 and 26.

Fig. 1

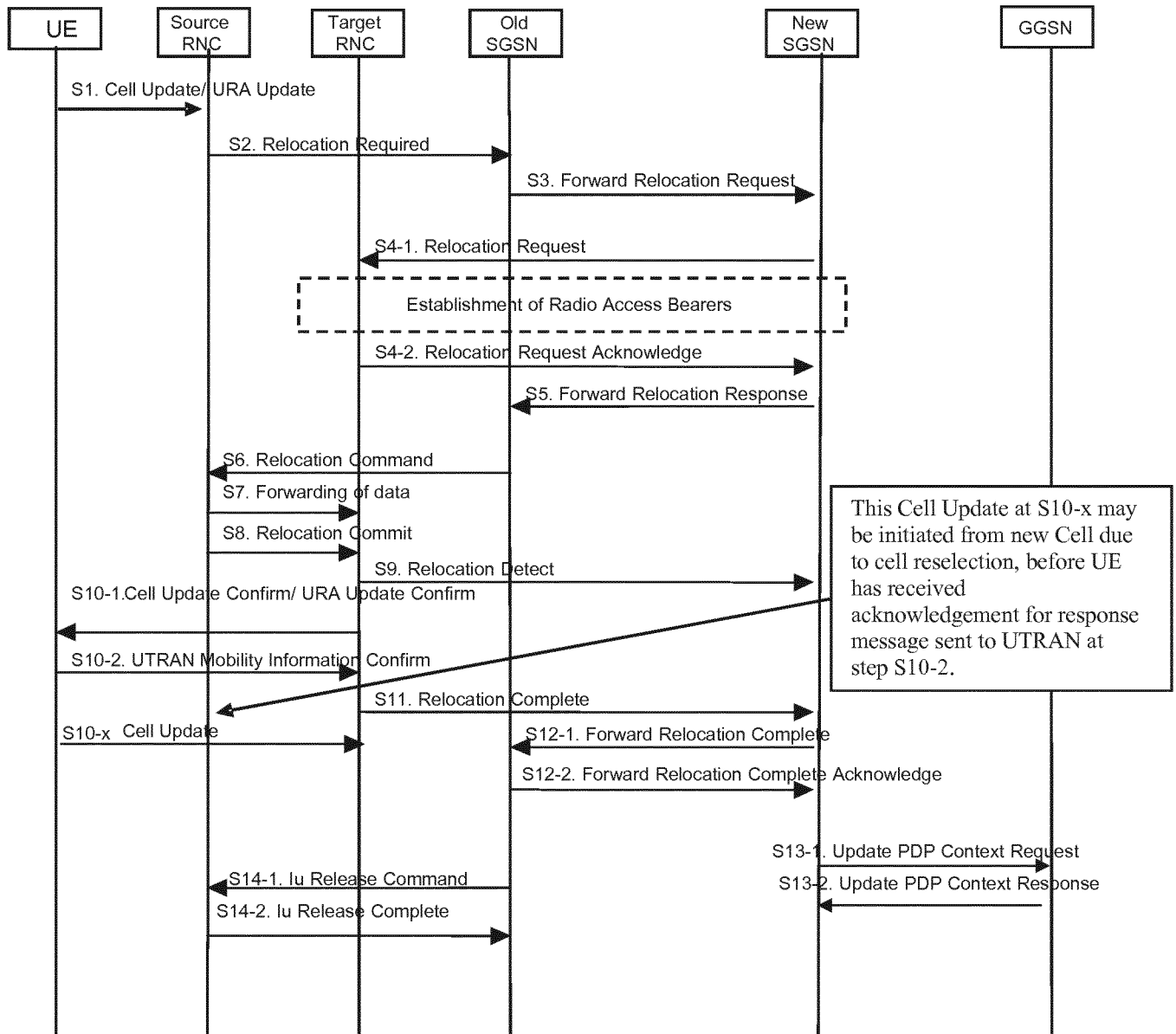


Fig. 2

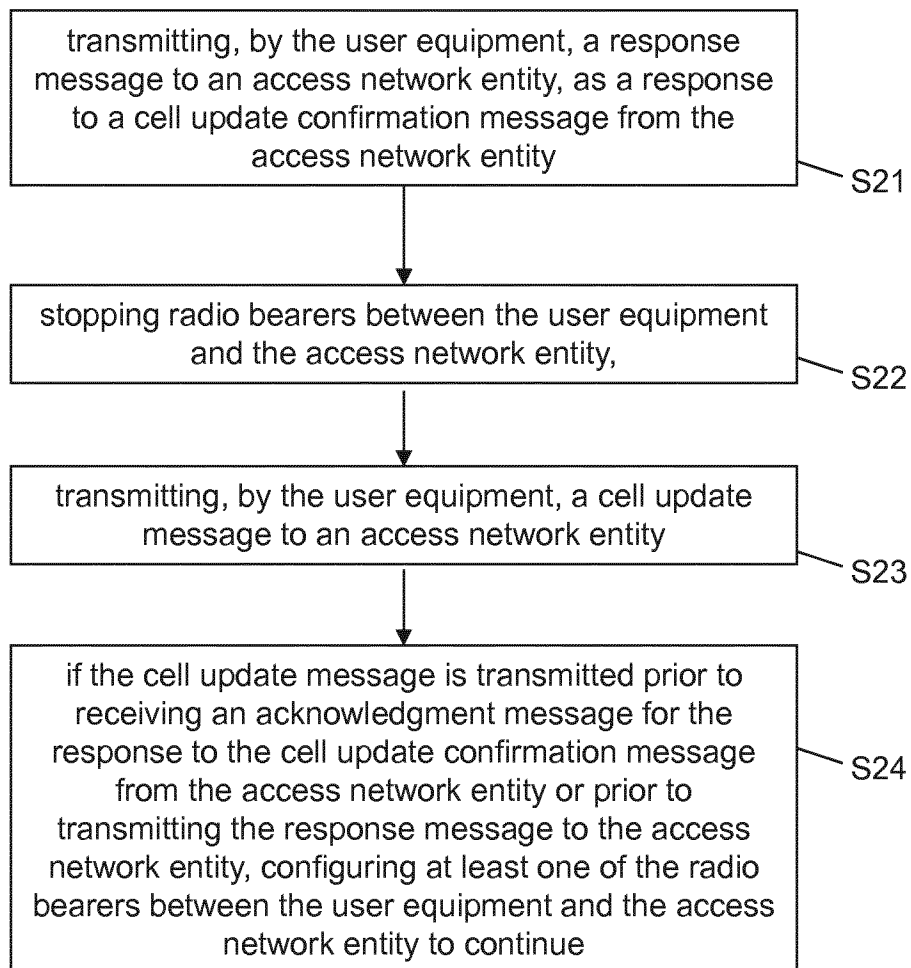


Fig. 3

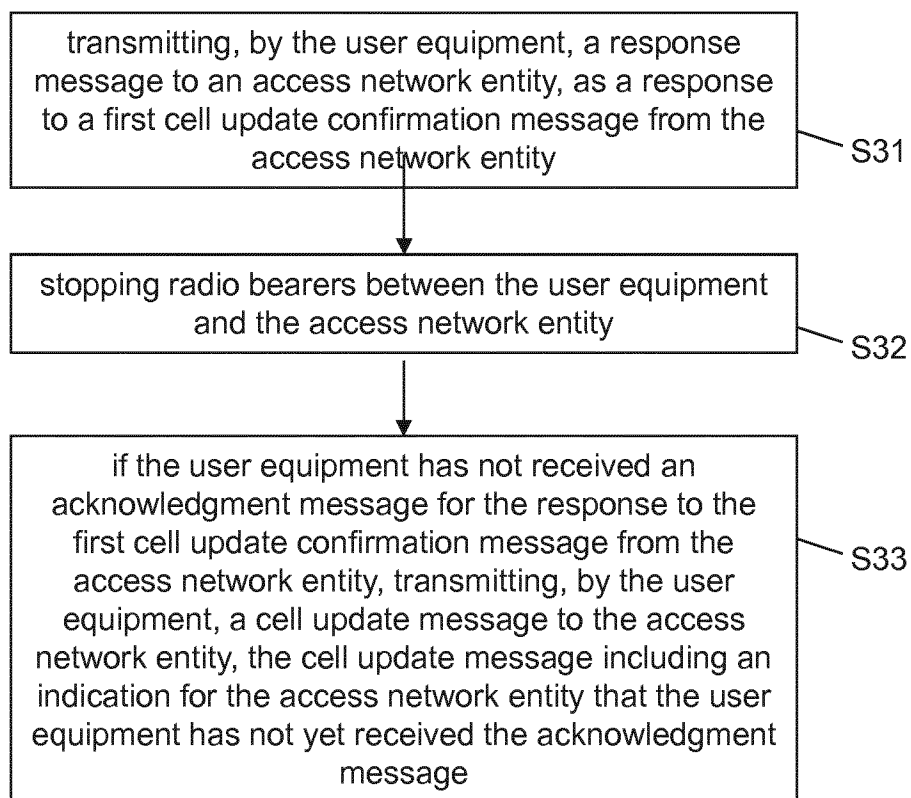


Fig. 4

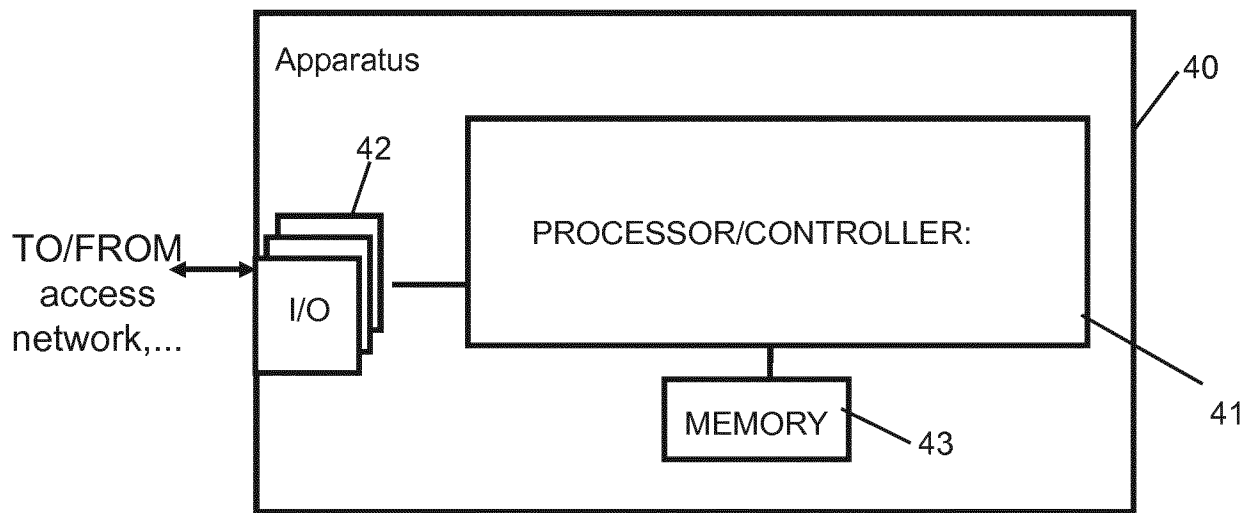


Fig. 5

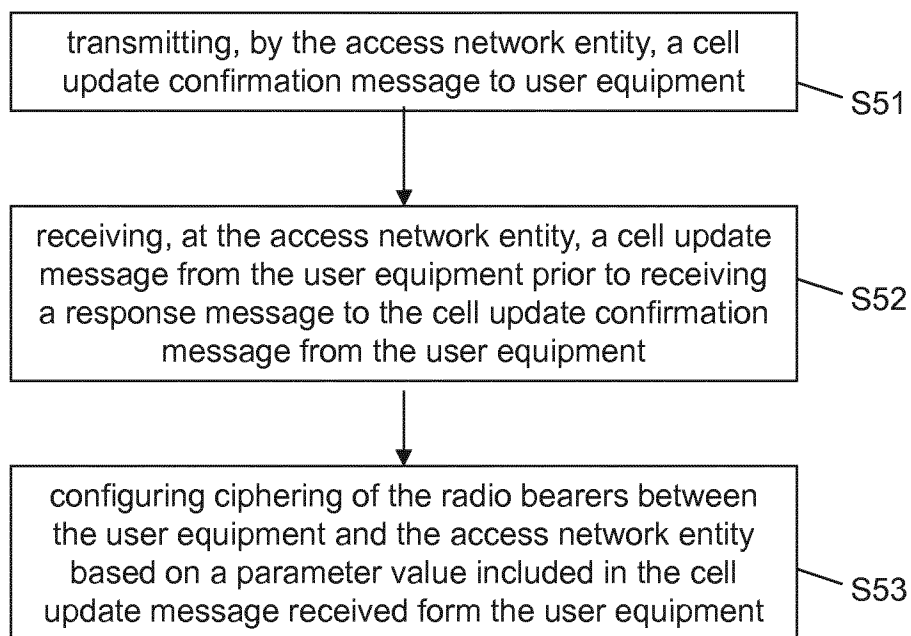


Fig. 6

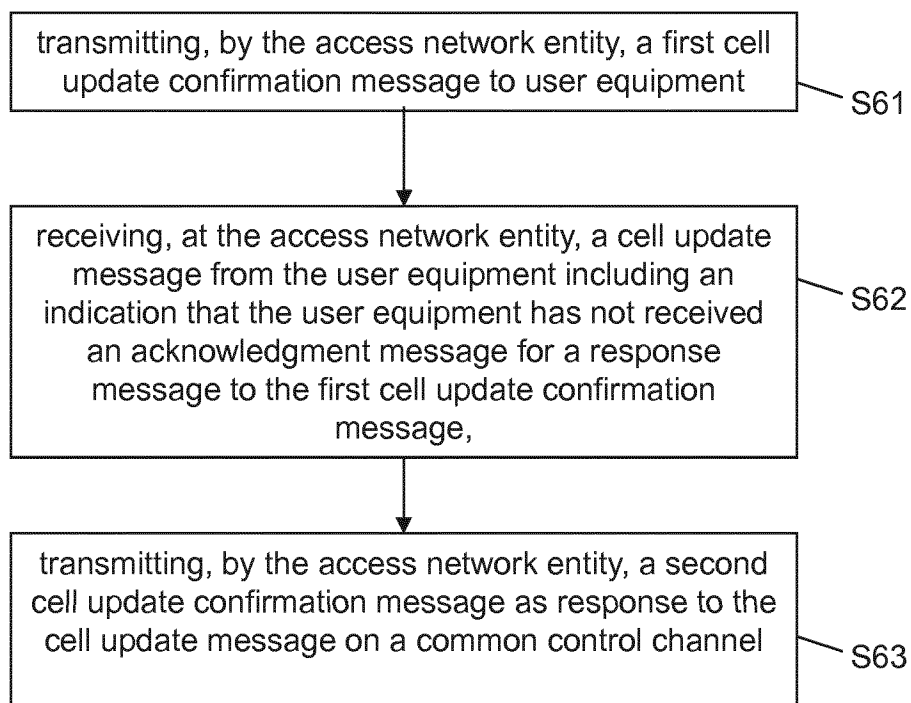
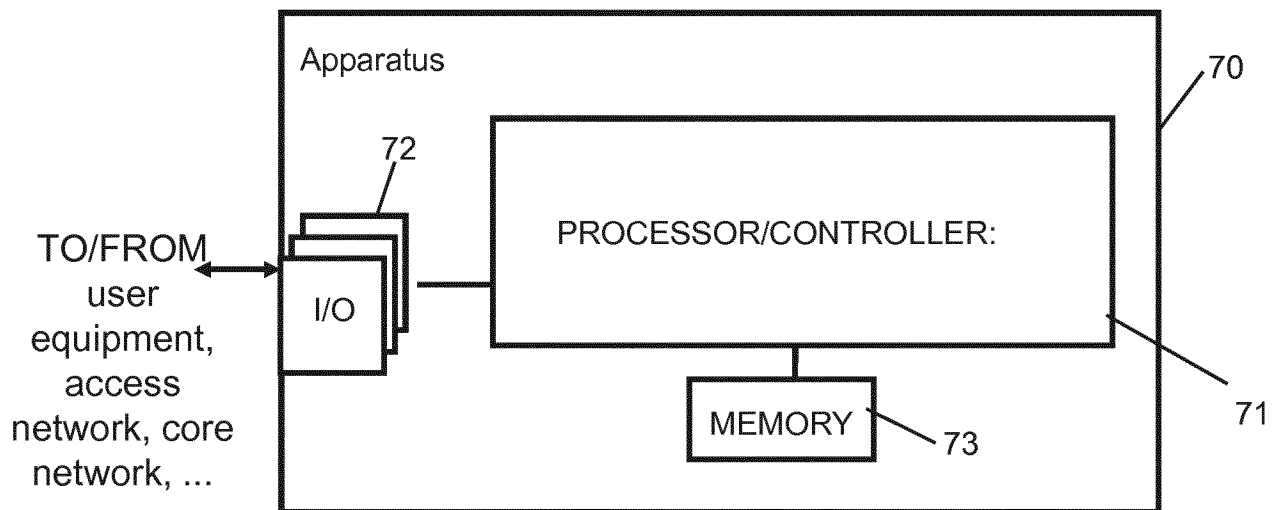


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2013/066630

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04W12/00 H04W36/00

ADD. H04W76/02

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)

H04W

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)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	NORTEL NETWORKS: "Security Issues", 3GPP DRAFT; R2-020729, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG2, no. Kobe, Japan; 20020404, 4 April 2002 (2002-04-04), XP050120355, [retrieved on 2002-04-04]	7-11, 18-22, 25-31
A	Cell re-selection during the Security Mode Control procedure; page 1, paragraph 2.1 - page 2, paragraph 2.2 Cell reselection at point 4 - UTRAN has received a SECURITY MODE COMPLETE/FAILURE message but the UE has not yet received RLC ack; page 6, paragraph 2.2.4 ----- -/--	1-6, 12-17, 23,24



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

"E" earlier 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

7 May 2014

Date of mailing of the international search report

13/05/2014

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/066630

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	QUALCOMM INCORPORATED: "Discussion of Cell update aborting ongoing Security Mode Command problem", 3GPP DRAFT; R2-106362 CELL UPDATE ABORTING SMC PROBLEM, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG2, no. Jacksonville, USA; 20101115, 9 November 2010 (2010-11-09), XP050492244, [retrieved on 2010-11-09]	7-11, 18-22, 25-31
A	Introduction; page 1, paragraph 1 Problem; page 1, paragraph 2 Reuse IE "Reconfiguration Status Indicator" in a cell update message to indicate which cipher configuration UE applied; page 2, paragraph 3.1 Proposal; page 3, paragraph 3.3 -----	1-6, 12-17, 23,24
A	"3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol; Iu Mode (Release 11)", 3GPP STANDARD; 3GPP TS 44.118, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. GERAN WG2, no. V11.0.0, 21 September 2012 (2012-09-21), pages 1-354, XP050649794, [retrieved on 2012-09-21] Cell Update procedure during security reconfiguration; page 109, paragraph 7.14.1.12.2 -----	1-31
A	WO 2011/091865 A1 (ERICSSON TELEFON AB L M [SE]; MCGANN TOM [IE]) 4 August 2011 (2011-08-04) page 9, line 3 - page 11, line 13 -----	1-31

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/066630

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011091865 A1	04-08-2011	CN 102726081 A	10-10-2012
		EP 2529565 A1	05-12-2012
		US 2012275340 A1	01-11-2012
		WO 2011091865 A1	04-08-2011
