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- (71) **Applicant:** NOKIA SOLUTIONS AND NETWORKS
OY [FI/FI]; Karaportti 3, 02610 Espoo (FI).
- (72) **Inventors:** SELVAGANAPATHY, Srinivasan; M20,
Royal Palm Apartments, II Cross, LBShastry Nagar, HAL
Post, Bangalore 560 117 (IN). ALI, Amaanat; Soukantie
14B, 25, Espoo 02360 (FI).
- (74) **Agent:** AARNIO, Ari; Nokia Technologies Oy, IPR De-
partment, Karakaari 7, 02610 Espoo (FI).

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- (54) **Title:** DIRECT RESOURCE ALLOCATION FOR STATIONARY DEVICES FOR NETWORK INITIATED DATA TRANSFER

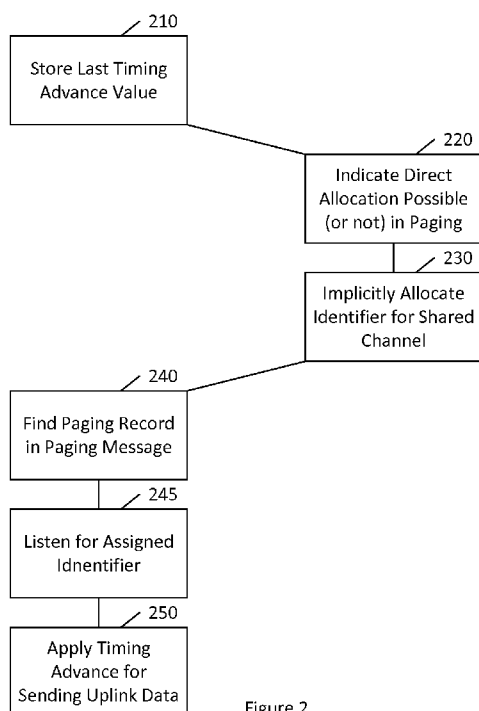


Figure 2

- (57) **Abstract:** In the case of network initiated data transfer, stationary devices may benefit from a direct resource allocation, which may permit a random access procedure to be bypassed. A method can include finding (240) a paging record of a user equipment in a paging message, listening (245) for an implicitly assigned identifier on a shared control channel based on the paging record and applying (250) a stored timing advance value for sending uplink data of the user equipment based on the identifier.

DESCRIPTION

TITLE:

Direct Resource Allocation for Stationary Devices for Network Initiated Data Transfer

BACKGROUND:

Field:

[0001] Various communication systems may benefit from appropriate resource allocation for devices. For example, in the case of network initiated data transfer, stationary devices may benefit from a direct resource allocation, which may permit a random access procedure to be bypassed.

Description of the Related Art:

[0002] Machine type communication is standardized in release 12 (Rel-12) of the third generation partnership project (3GPP). High level aspects of optimization related to the low data rate and small data volume transmissions have been discussed.

[0003] When the device wants to send a smaller amount of data in a radio network, it conventionally has to start with a random access procedure followed by dedicated radio connection establishment to transfer the actual information via the radio nodes.

[0004] The main purpose of the random access procedure in a long term evolution (LTE) network include synchronization of the uplink timing with the radio network, including timing advance calculation, and obtaining the uplink resources in shared channels for sending the radio resource control (RRC) message.

[0005] Figure 1 illustrates steps involved in a random access procedure. As shown in Figure 1, the random access procedure can include, at 110, transmission of a preamble. The random access procedure can also include detection of the preamble, at 115, and random access (RA)-Response at 120 with uplink resource allocation for transmission of Msg3. Upon detection of the allocation at 125, there can be Msg3 transmission at 130. This can then be followed by contention resolution at 140.

[0006] The RRC connection setup procedure can be followed. After the setup procedure, the UE can start the UE's non-access stratum (NAS) layer transmission. As part of small data enhancements, it may be possible to transmit the first data packet as part of an NAS-packet data unit (PDU) itself or immediately after RRC connection setup.

[0007] When there is a need to start network initiated data transmission for idle mode UE, conventionally the paging procedure will be followed by the above procedure.

SUMMARY:

[0008] According to certain embodiments, a method can include finding a paging record of a user equipment in a paging message. The method can also include listening for an implicitly assigned identifier on a shared control channel based on the paging record. The method can further include applying a stored timing advance value for sending uplink data of the user equipment based on the identifier.

[0009] In certain embodiments, a method can include preparing a paging message for a user equipment. The method can also include indicating implicitly, in the paging message, an identifier for the user equipment for shared channel usage. The method can further include sending the paging message to the user equipment.

[0010] An apparatus, according to certain embodiments, can include at least one processor and at least one memory including computer program code. The at least one memory and the computer program code can be configured to, with the at least one processor, cause the apparatus at least to find a paging record of a user equipment in a paging message. The at least one memory and the computer program code can also be configured to, with the at least one processor, cause the apparatus at least to listen for an implicitly assigned identifier on a shared control channel based on the paging record. The at least one memory and the computer program code can further be configured to, with the at least one processor, cause the apparatus at least to apply a stored timing advance value for sending uplink data of the user equipment based on the identifier.

[0011] An apparatus, in certain embodiments, can include at least one processor and at least one memory including computer program code. The at least one memory and the computer program code can be configured to, with the at least one processor, cause the apparatus at least to prepare a paging message for a user equipment. The at least one memory and the computer program code can also be configured to, with the at least one processor, cause the apparatus at least to indicate implicitly, in the paging message, an identifier for the user equipment for shared channel usage. The at least one memory and the computer program code can further be configured to, with the at least one processor, cause the apparatus at least to send the paging message to the user equipment.

[0012] According to certain embodiments, an apparatus can include means for finding a paging record of a user equipment in a paging message. The apparatus can also include means for listening for an implicitly assigned identifier on a shared control channel based on the paging record. The apparatus can further include means for applying a stored timing advance value for sending uplink data of the user equipment based on the identifier.

[0013] In certain embodiments, an apparatus can include means for preparing a paging message for a user equipment. The apparatus can also include means for indicating implicitly, in the paging message, an identifier for the user equipment for shared channel usage. The apparatus can further include means for sending the paging message to the user equipment.

[0014] A computer program product can, according to certain embodiments, encode instructions for performing a process. The process can include finding a paging record of a user equipment in a paging message. The process can also include listening for an implicitly assigned identifier on a shared control channel based on the paging record. The process can further include applying a stored timing advance value for sending uplink data of the user equipment based on the identifier.

[0015] A computer program product can, in certain embodiments, encode instructions for performing a process. The process can include preparing a paging message for a user equipment. The process can also include indicating implicitly, in the paging message, an identifier for the user equipment for shared channel usage. The process can further include sending the paging message to the user equipment.

[0016] According to certain embodiments, a non-transitory computer-readable medium can be encoded with instructions that, when executed in hardware, perform a process. The process can include finding a paging record of a user equipment in a paging message. The process can also include listening for an implicitly assigned identifier on a shared control channel based on the paging record. The process can further include applying a stored timing advance value for sending uplink data of the user equipment based on the identifier.

[0017] In certain embodiments, a non-transitory computer-readable medium can be encoded with instructions that, when executed in hardware, perform a process. The process can include preparing a paging message for a user equipment. The process can also include indicating implicitly, in the paging message, an identifier for the user equipment for shared channel usage. The process can further include sending the paging message to the user equipment.

BRIEF DESCRIPTION OF THE DRAWINGS:

[0018] For proper understanding of the invention, reference should be made to the accompanying drawings, wherein:

[0019] Figure 1 illustrates steps involved in a random access procedure.

[0020] Figure 2 illustrates a method according to certain embodiments.

[0021] Figure 3 illustrates functionality of a user equipment according to certain embodiments.

[0022] Figure 4 illustrates implicit resource allocation mapping according to certain embodiments.

[0023] Figure 5 illustrates paging a stationary user equipment with a fixed timing advance, according to certain embodiments.

[0024] Figure 6 illustrates a system according to certain embodiments.

DETAILED DESCRIPTION:

[0025] Certain embodiments optimize steps used in starting data transmission from idle mode when such transmission is triggered, for example by paging. For example, when stationary or limited mobility devices are used, the static nature of the device can be used further to reduce amount of signaling and resource utilization in the network.

[0026] When resources are to be allocated in response to a page message in the existing system, such resource allocation can follow the random access procedure and radio resource control (RRC) connection setup. Certain embodiments make use of static devices having a fixed timing advance to allow direct resource allocation and small data transmission.

[0027] Figure 2 illustrates a method according to certain embodiments. As shown in Figure 2, at 210 a user equipment (UE) can store the UE's last timing advance value as part of transition to idle state.

[0028] The core network node can include additional information to indicate, at 220, that direct resource allocation is possible or not in a paging message sent towards a radio-node, such as the UE. At 230, the UE can be implicitly allocated with an identifier to be used for shared channel operation based on the position of the UE's UE identifier in the paging message.

[0029] When the UE finds the UE's paging record in the paging message at 240, the UE can, at 245, start listening to the shared control channel for the implicitly assigned identifier.

[0030] At 250, the UE can apply the stored timing advance when the UE sends the UE's uplink data using uplink shared channels. The radio bearer characteristic to be used for this transmission can be predefined or pre-sigaled between UE and network nodes, for example using system information or at the time of registration.

[0031] As the timing advance is known and the identifier to be checked in shared control channel is known, the UE can start the UE's UL/DL data transmission in shared channel directly without random access.

[0032] Certain embodiments may be variously implemented. For example, implementations of various aspects can be made with respect to numerous elements of a long term evolution (LTE) system. The following illustrate some example implementation in LTE, without limitation to such embodiments.

[0033] Figure 3 illustrates functionality of a user equipment according to certain embodiments. As shown in Figure 3, at 310 a UE can decide the UE's static nature. The decision can be

based on many attributes, such as measured signal strength in last measurement and standard deviation of timing advance for a last specific number of radio resource control (RRC) connections is very small, such as below a predetermined threshold.

[0034] When the static nature is confirmed, at 320 the UE can inform the network that the UE is static. This information can be provided in the UE's registration. Optionally, the UE can, at 325, trigger new registration to indicate this information.

[0035] Optionally, the static nature can be provisioned, at 305, via operations, administration and maintenance (OAM) techniques, such as via subscriber identification module (SIM) or over-the-air (OTA) provisioning.

[0036] In addition to informing the network, the UE can, at 330, store the last value of timing advance. Thus, the UE may have last value of timing advance so that it can be used for, for example, a next paging response.

[0037] Figure 4 illustrates implicit resource allocation mapping according to certain embodiments. As shown in Figure 4, at 410 a specific number of cell radio network temporary identifiers (C-RNTIs) can be reserved at an evolved Node B (eNB) and at a UE. Each of the C-RNTIs can map to a particular location of a corresponding paging record inside a paging message.

[0038] For example, C-RNTI values from 10 through 26 can be reserved to map to each index of the paging record list. The radio link control (RLC)/ medium access control (MAC) attributes and other radio parameter(s) to be used for the data for the direct transmission can be eNB specific. The RLC/MAC attributes and other radio attributes can be signaled, at 420, to UE as part of a first RRC connection between the UE and the eNB.

[0039] Figure 5 illustrates paging a stationary user equipment with a fixed timing advance, according to certain embodiments. As shown in Figure 5, at 510, a mobility management entity (MME) can send a paging message along with an indication that the UE is stationary and that direct allocation is possible without a random access (RA) procedure.

[0040] Then, at 520, the eNB can send a paging message using an RRC-Paging message. Furthermore, at 530, the eNB can start sending uplink allocation to the UE which was marked for direct allocation via physical downlink control channel (PDCCH) using C-RNTI mapping to the paging record index.

[0041] At 540, the UE can listen to PDCCH for this C-RNTI. Then, at 550, the UE can send the uplink data packet via the allocated uplink resource.

[0042] At 560, the eNB can check buffer status report (BSR) information in the uplink message. Then, at 570, the eNB can decide whether to provide further allocation in uplink. If the eNB knows that more data transfer is required in either link, the eNB may, at 575, assign

a new identifier to be used in shared channels. The eNB may also, at 577, release the temporary identifier for paging purposes.

[0043] Additionally, the received uplink packet from the UE can be forwarded to a code network (CN) node, at 580, along with the paging-identifier to MME/ serving gateway (SGW) for further routing. Thus, at 590, the UL packet can be received at the MME.

[0044] Although the above examples have been applied to LTE, the same or similar mechanisms can be applied to other communication systems. For example, the above mechanisms can be extended to global system for mobile communication (GSM) with direct mapping of temporary block flow (TBF) assignments to the location of the paging record.

[0045] In high speed packet access (HSPA), a paging record can provide an index to a common enhanced dedicated channel (E-DCH) resource. This resource may be used by a UE to complete an UL transmission.

[0046] Certain embodiments may have various benefits and/or advantages. For example, in certain embodiments the random access step and RRC connection step can be completely eliminated when the idle mode UE is paged from network. This may result in fast response and may also result in a reduction of signaling and resource usage for machine type communication (MTC) devices.

[0047] In the context of internet of things (IoT), an application server can schedule UL data transmission or location/tracking area updating of a UE using the paging as a synchronization mechanism. All devices can be barred from UL access unless the network pages the UE. This mechanism can prevent UEs from autonomously starting an uplink data transfer and causing uplink congestion to the network.

[0048] In certain embodiments, the temporary identifier assigned to a user equipment (UE) can be assigned in such a way that the identifier is unique across paging occasions within a specific duration. In certain embodiments, therefore, the implicit assignment of identifier may not only use the position of paging record, but may also consider the current system frame number and subframe number.

[0049] Figure 6 illustrates a system according to certain embodiments of the invention. In one embodiment, a system may include multiple devices, such as, for example, at least one UE 610, at least one base station 620, which may be an eNB or other base station or access point, and at least one network element 630, which may be a core network element, such as a mobility management entity or other element, such as a serving gateway or the like.

[0050] Each of these devices may include at least one processor, respectively indicated as 614, 624, and 634. At least one memory can be provided in each device, and indicated as 615, 625, and 635, respectively. The memory may include computer program instructions or

computer code contained therein. The processors 614, 624, and 634 and memories 615, 625, and 635, or a subset thereof, can be configured to provide means corresponding to the various blocks of any of Figures 2 through 5.

[0051] As shown in Figure 6, transceivers 616, 626, and 636 can be provided, and each device may also include an antenna, respectively illustrated as 617, 627, and 637. Other configurations of these devices, for example, may be provided. For example, network element 630 may be configured for wired communication and in such a case antenna 637 can illustrate any form of communication hardware, without requiring a conventional antenna.

[0052] Transceivers 616, 626, and 636 can each, independently, be a transmitter, a receiver, or both a transmitter and a receiver, or a unit or device that is configured both for transmission and reception.

[0053] Processors 614, 624, and 634 can be embodied by any computational or data processing device, such as a central processing unit (CPU), application specific integrated circuit (ASIC), or comparable device. The processors can be implemented as a single controller, or a plurality of controllers or processors.

[0054] Memories 615, 625, and 635 can independently be any suitable storage device, such as a non-transitory computer-readable medium. A hard disk drive (HDD), random access memory (RAM), flash memory, or other suitable memory can be used. The memories can be combined on a single integrated circuit as the processor, or may be separate from the one or more processors. Furthermore, the computer program instructions stored in the memory and which may be processed by the processors can be any suitable form of computer program code, for example, a compiled or interpreted computer program written in any suitable programming language.

[0055] The memory and the computer program instructions can be configured, with the processor for the particular device, to cause a hardware apparatus such as UE 610, base station 620, and network element 630, to perform any of the processes described herein (see, for example, any of Figures 2 through 5). Therefore, in certain embodiments, a non-transitory computer-readable medium can be encoded with computer instructions that, when executed in hardware, perform a process such as one of the processes described herein. Alternatively, certain embodiments of the invention can be performed entirely in hardware.

[0056] Furthermore, although Figure 6 illustrates a system including a UE, base station, and network element, embodiments of the invention may be applicable to other configurations, and configurations involving additional elements. For example, not shown, additional UEs may be present, and additional core network elements may be present.

[0057] While certain embodiments have been described in terms of stationary devices, certain embodiments may also be applicable to devices that are merely stationary with respect to an access point or base station. For example, devices on an airplane, bus, train, boat, automobile, or other vehicle may be moving with respect to the Earth as the vehicle moves, but may be stationary with respect to an access point located on the vehicle. Other variations and modifications are also permitted.

[0058] One having ordinary skill in the art will readily understand that the invention as discussed above may be practiced with steps in a different order, and/or with hardware elements in configurations which are different than those which are disclosed. Therefore, although the invention has been described based upon these preferred embodiments, it would be apparent to those of skill in the art that certain modifications, variations, and alternative constructions would be apparent, while remaining within the spirit and scope of the invention. In order to determine the metes and bounds of the invention, therefore, reference should be made to the appended claims.

WE CLAIM:

1. A method, comprising:
finding a paging record of a user equipment in a paging message;
listening for an implicitly assigned identifier on a shared control channel based on the paging record; and
applying a stored timing advance value for sending uplink data of the user equipment based on the identifier.
2. The method of claim 1, wherein the listening for the implicitly assigned identifier is based on a position of the paging record and a current system frame number and subframe number of the paging record.
3. The method of claim 1 or claim 2, further comprising:
storing a timing advance value when transitioning to an idle state, wherein the timing advance value is applied when sending the uplink data.
4. The method of any of claims 1-3, further comprising:
determining that the user equipment is static, wherein the paging message is sent based on the user equipment being static.
5. The method of claim 4, further comprising:
receiving static provisioning via a subscriber identity module or over the air provisioning, wherein the determining is based on the static provisioning.
6. The method of claim 4 or claim 5, further comprising:
informing a network that the user equipment is static based on the determination that the user equipment is static.
7. The method of claim 6, wherein the informing the network is performed in a registration.
8. The method of claim 6 or claim 7, further comprising:
triggering a new registration to inform the network that the user equipment is static.
9. The method of any of claims 1-8, wherein the uplink data is sent without the user

equipment performing a random access procedure.

10. The method of any of claims 1-9, wherein the method is performed by the user equipment.

11. A method, comprising:
preparing a paging message for a user equipment;
indicating implicitly, in the paging message, an identifier for the user equipment for shared channel usage; and
sending the paging message to the user equipment.

12. The method of claim 11, wherein implicitly indicating the identifier comprises using a position of the paging record and a current system frame number and subframe number of the paging record.

13. The method of claim 11 or claim 12, further comprising:
receiving a message from a core network element indicating that direct resource allocation is possible, wherein the preparing the paging message is based on receiving the message.

14. The method of any of claims 11-13, further comprising:
receiving an uplink message based on the paging message; and
checking the uplink message for buffer status report information of the user equipment.

15. The method of claim 14, further comprising:
deciding further uplink allocation for the user equipment based on the buffer status report.

16. The method of claim 14 or claim 15, further comprising:
upon deciding that more data transfer is needed in uplink or downlink, assigning a new identifier to be used in at least one shared channel; and
releasing the identifier for paging purposes.

17. The method of any of claims 11-16, wherein the paging message is configured to permit the user equipment to send uplink data without performing a random access procedure.

18. The method of any of claims 11-17, wherein the method is performed by an evolved Node B.

19. An apparatus, comprising:
at least one processor; and
at least one memory including computer program code,
wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to
find a paging record of a user equipment in a paging message;
listen for an implicitly assigned identifier on a shared control channel based on the paging record; and
apply a stored timing advance value for sending uplink data of the user equipment based on the identifier.

20. The apparatus of claim 19, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to listen for the implicitly assigned identifier based on a position of the paging record and a current system frame number and subframe number of the paging record.

21. The apparatus of claim 19 or claim 20, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to store a timing advance value when transitioning to an idle state, wherein the timing advance value is applied when sending the uplink data.

22. The apparatus of any of claims 19-21, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to determine that the user equipment is static, wherein the paging message is sent based on the user equipment being static.

23. The apparatus of claim 22, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to receive static provisioning via a subscriber identity module or over the air provisioning, wherein the determining is based on the static provisioning.

24. The apparatus of claim 22 or claim 23, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to inform a network that the user equipment is static based on the determination that the user equipment is static.

25. The apparatus of claim 24, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to inform the network in a registration.

26. The apparatus of claim 24 or claim 25, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to trigger a new registration to inform the network that the user equipment is static.

27. The apparatus of any of claims 19-26, wherein the uplink data is sent without the user equipment performing a random access procedure.

28. The apparatus of any of claims 19-27, wherein the apparatus comprises the user equipment.

29. An apparatus, comprising:
at least one processor; and
at least one memory including computer program code,
wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to
prepare a paging message for a user equipment;
indicate implicitly, in the paging message, an identifier for the user equipment for shared channel usage; and
send the paging message to the user equipment.

30. The apparatus of claim 29, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to implicitly indicate the identifier by using a position of the paging record and a current system frame number and subframe number of the paging record.

31. The apparatus of claim 29 or claim 30, wherein the at least one memory and the

computer program code is configured to, with the at least one processor, cause the apparatus at least to receive a message from a core network element indicating that direct resource allocation is possible, wherein the preparing the paging message is based on receiving the message.

32. The apparatus of any of claims 29-31, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to:

- receive an uplink message based on the paging message; and
- check the uplink message for buffer status report information of the user equipment.

33. The apparatus of claim 32, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to decide further uplink allocation for the user equipment based on the buffer status report.

34. The apparatus of claim 32 or claim 33, wherein the at least one memory and the computer program code is configured to, with the at least one processor, cause the apparatus at least to

- upon deciding that more data transfer is needed in uplink or downlink, assign a new identifier to be used in at least one shared channel; and
- release the identifier for paging purposes.

35. The apparatus of any of claims 29-34, wherein the paging message is configured to permit the user equipment to send uplink data without performing a random access procedure.

36. The apparatus of any of claims 29-35, wherein the apparatus comprises an evolved Node B.

37. An apparatus, comprising:

- means for finding a paging record of a user equipment in a paging message;
- means for listening for an implicitly assigned identifier on a shared control channel based on the paging record; and
- means for applying a stored timing advance value for sending uplink data of the user equipment based on the identifier.

38. The apparatus of claim 37, wherein the listening for the implicitly assigned identifier is based on a position of the paging record and a current system frame number and subframe number of the paging record.

39. The apparatus of claim 37 or claim 38, further comprising:
means for storing a timing advance value when transitioning to an idle state, wherein the timing advance value is applied when sending the uplink data.

40. The apparatus of any of claims 37-39, further comprising:
means for determining that the user equipment is static, wherein the paging message is sent based on the user equipment being static.

41. The apparatus of claim 40, further comprising:
means for receiving static provisioning via a subscriber identity module or over the air provisioning, wherein the determining is based on the static provisioning.

42. The apparatus of claim 40 or claim 41, further comprising:
means for informing a network that the user equipment is static based on the determination that the user equipment is static.

43. The apparatus of claim 42, wherein the informing the network is performed in a registration.

44. The apparatus of claim 42 or claim 43, further comprising:
means for triggering a new registration to inform the network that the user equipment is static.

45. The apparatus of any of claims 37-44, wherein the uplink data is sent without the user equipment performing a random access procedure.

46. The apparatus of any of claims 37-45, wherein the apparatus comprises the user equipment.

47. An apparatus, comprising:

means for preparing a paging message for a user equipment;

means for indicating implicitly, in the paging message, an identifier for the user equipment for shared channel usage; and

means for sending the paging message to the user equipment.

48. The apparatus of claim 47, wherein implicitly indicating the identifier comprises using a position of the paging record and a current system frame number and subframe number of the paging record.

49. The apparatus of claim 47 or claim 48, further comprising:

means for receiving a message from a core network element indicating that direct resource allocation is possible, wherein the preparing the paging message is based on receiving the message.

50. The apparatus of any of claims 47-49, further comprising:

means for receiving an uplink message based on the paging message; and

means for checking the uplink message for buffer status report information of the user equipment.

51. The apparatus of claim 50, further comprising:

means for deciding further uplink allocation for the user equipment based on the buffer status report.

52. The apparatus of claim 50 or claim 51, further comprising:

means for, upon deciding that more data transfer is needed in uplink or downlink, assigning a new identifier to be used in at least one shared channel; and

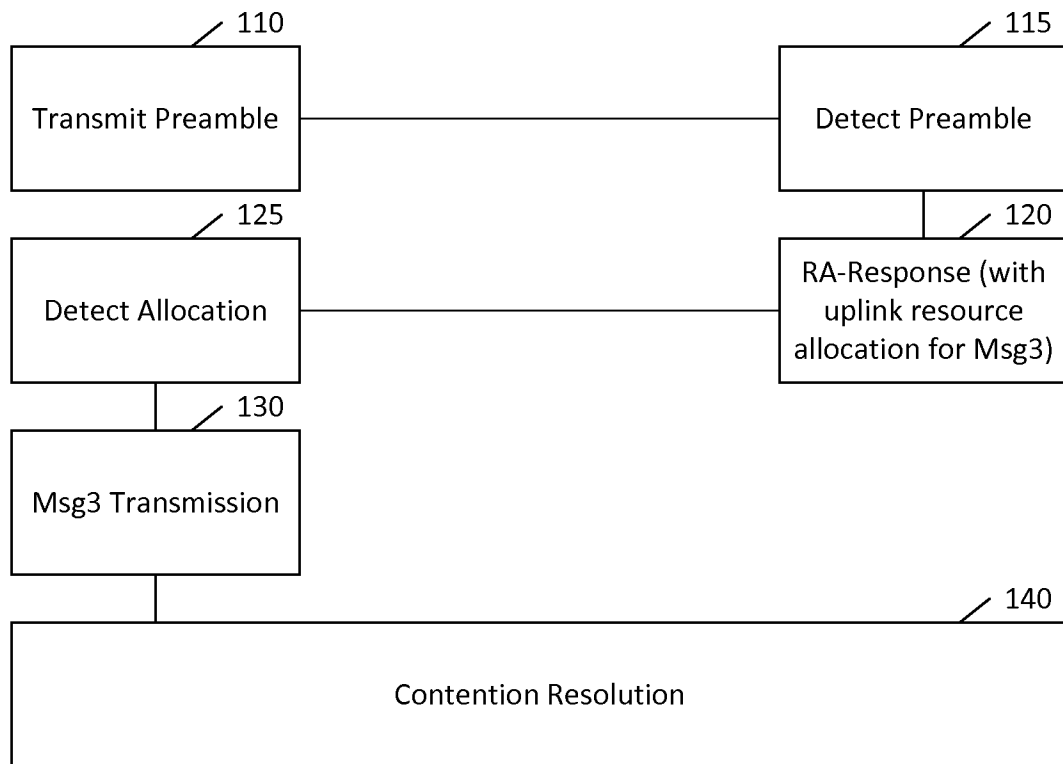
means for releasing the identifier for paging purposes.

53. The apparatus of any of claims 47-52, wherein the paging message is configured to permit the user equipment to send uplink data without performing a random access procedure.

54. The apparatus of any of claims 47-55, wherein the apparatus comprises an evolved Node B.

55. A computer program product encoding instructions for performing a process, the process comprising the method according to any of claims 1-18.

56. A non-transitory computer-readable medium encoded with instructions that, when executed in hardware, perform a process, the process comprising the method according to any of claims 1-18.



RELATED ART

Figure 1

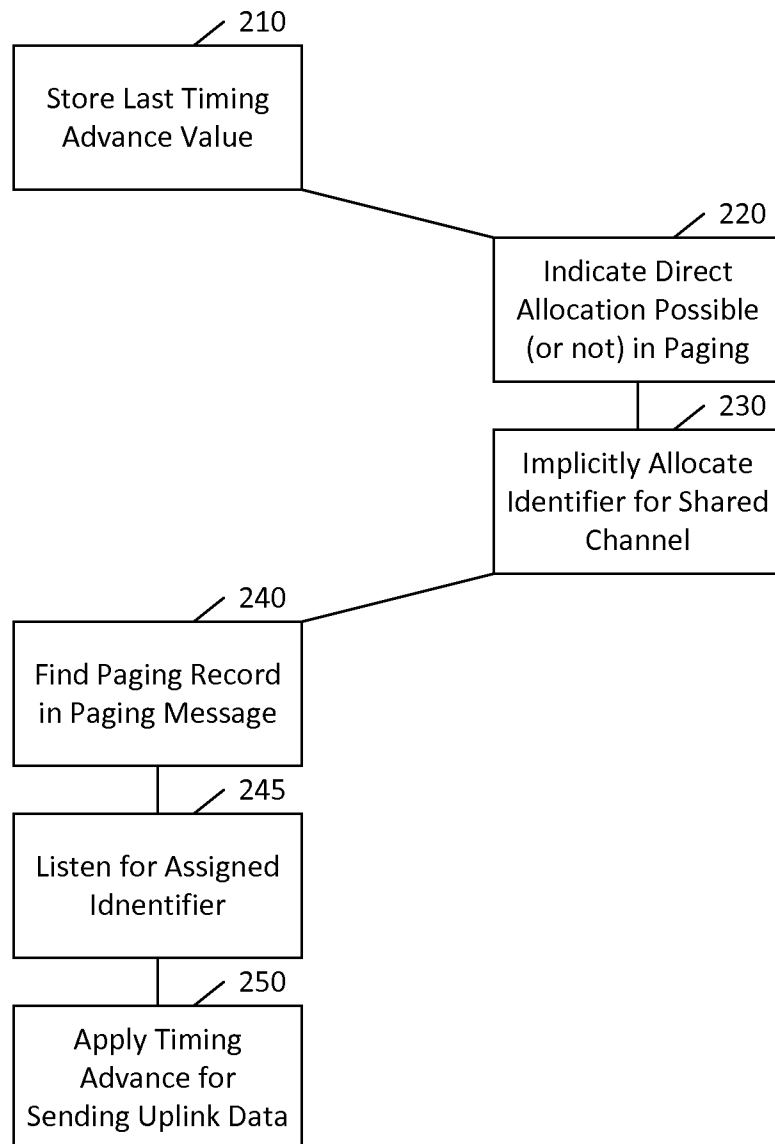


Figure 2

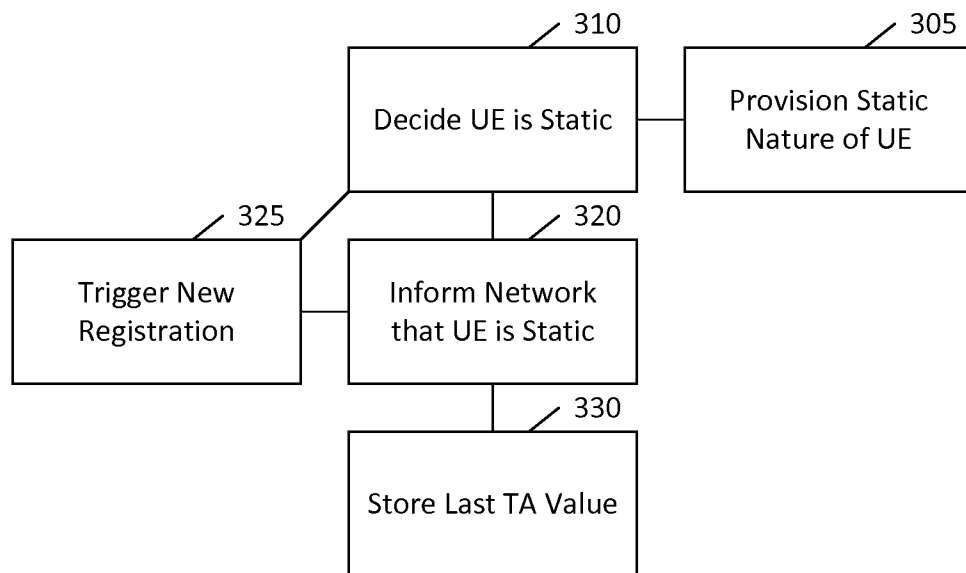


Figure 3

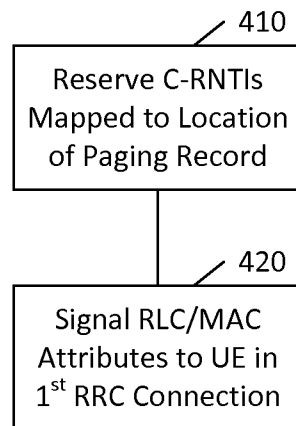


Figure 4

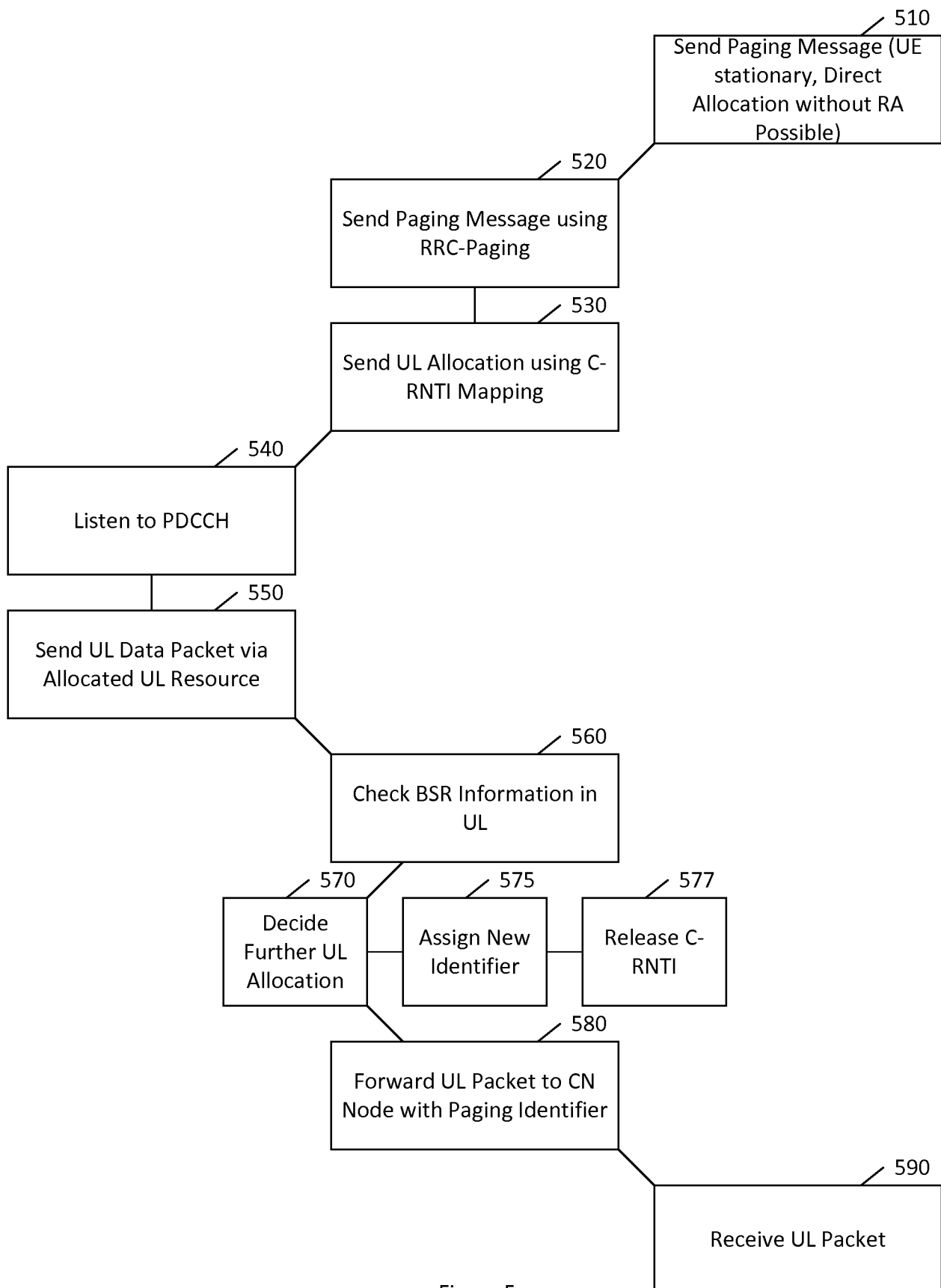


Figure 5

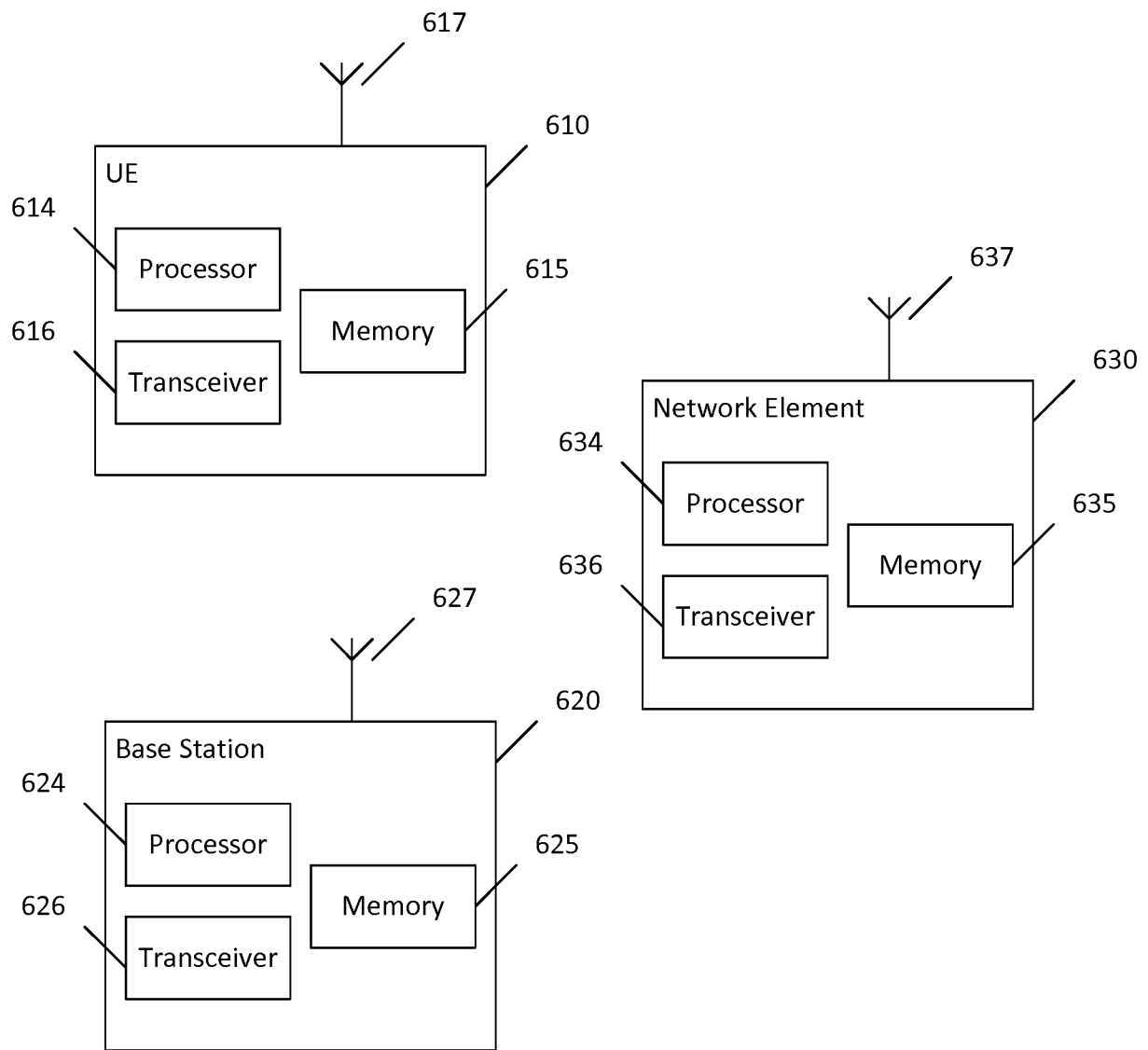


Figure 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/050723A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W4/00 H04W72/04
ADD.

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)

EPO-Internal, COMPENDEX, INSPEC, IBM-TDB, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 670 172 A1 (HUAWEI TECH CO LTD [CN]) 4 December 2013 (2013-12-04) paragraph [0007] - paragraph [0009] paragraph [0018] paragraph [0020] paragraph [0023] paragraph [0025] paragraph [0027] figure 2 ----- -/--	1-56



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

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"&" document member of the same patent family

Date of the actual completion of the international search

17 March 2016

Date of mailing of the international search report

29/03/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Farese, Luca

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/050723

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	NOKIA: "Uplink Synchronisation Recovery", 3GPP DRAFT; R2-062768 UL SYNCHRONIZATION RECOVERY, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG2, no. Seoul, South Korea; 20061009 - 20061013, 5 October 2006 (2006-10-05), XP050602792, [retrieved on 2006-10-05] paragraph [0003] -----	1,11,19, 29,37, 47,55,56

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/050723

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
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			EP 2670172 A1	04-12-2013
			ES 2549678 T3	30-10-2015
			US 2013343362 A1	26-12-2013
			WO 2012116624 A1	07-09-2012
