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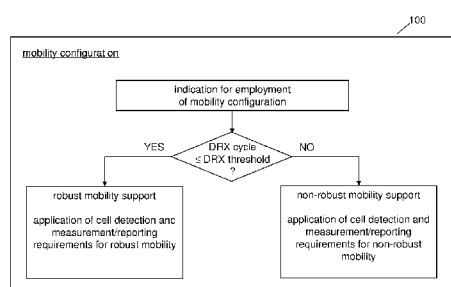


Figure 1

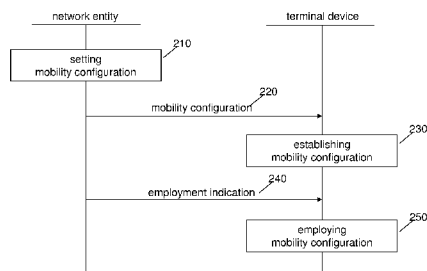


Figure 2

(57) Abstract: Providing a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold (e. g., by performing cell detection and measurement reporting more frequently than the DRX cycle) and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold (e. g., by omitting cell detection and measurement reporting so that these occur as or less frequently than the DRX cycle, or by omitting counting radio link failures, or by omitting performing call-reestablishments), and providing an indication for employment of the mobility configuration to at least one DRX-enabled terminal device.



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Title

**SUPPORT OF ROBUST MOBILITY DEPENDING ON DRX CYCLE LENGTH AND  
TERMINAL SPEED**

5 Field

The present invention relates to measures (including methods, apparatuses and computer program products) for enabling/realizing efficient mobility support for DRX-enabled terminal devices.

10

Background

In modern and future mobile communication systems, including 3GPP systems such as UMTS, LTE and the like, proper mobility support for terminal devices plays a vital role. To this end, certain cell detection and measurement/reporting requirements are defined so as to attain desired performance (including e.g. timely cell detection, measurement accuracy and the like).

20 Such requirements may deviate for different states of terminal devices and/or scenarios of communication. For example, in order to achieve optimization, specific requirements may be needed for terminal devices under a high speed scenario, such as the scenario of 3GPP HST SI (high speed train study item).

25

In such high speed scenario, it is a problem to ensure mobility robustness for the terminal devices moving with high speed, such as UEs of users traveling in a high speed train. Such problem even escalates for terminal devices applying DRX (Discontinuous Reception), especially when operating  
30 in Connected mode. The reason for this is that in Connected mode network-controlled HO mobility is applied, which is assisted by cell detection and measurement/reporting operations of the terminal devices. Yet, when applying DRX, such cell detection and measurement/reporting operations of

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the terminal devices may be delayed (especially, when longer DRX cycles are used), thus impeding proper mobility support.

5 In order to solve such drawbacks in terms of enabling proper mobility support for a terminal devices, especially when operating in a problematic scenario such as a high speed scenario, it is conceivable that

10 - the network simply does not configure the terminal devices with DRX configuration (i.e. the terminal devices do not apply DRX), thus ensuring sufficiently frequent measurements on the terminal devices' side to ensure robust mobility, or

- the network only allows very short DRX cycles by DRX configuration (i.e. the terminal devices apply DRX only with very short delays), thus equally ensuring sufficiently frequent measurements on the terminal devices' side to ensure robust mobility, or

15 - the standardization introduces stricter requirements for the terminal devices (i.e. tighten cell detection and measurement/reporting requirements), thus enabling the terminal devices to detect and report (certain) cells faster and/or more accurate.

20 Among these conceivable approaches, the third approach would require modifications in existing standardization. Irrespective thereof, a problem of all of these approaches is to identify the relevant scenario, either at the network or the terminal device. But, even if assuming the relevant scenario can be identified, a further problem is that these approaches impact power  
25 saving opportunities/amounts of the terminal devices. This is essentially because all of these approaches result in that the terminal devices would have to dispense with benefits from appropriate DRX application (i.e. using no or less optimal DRX operation) or be subject to disadvantages from adoption of stricter requirements (i.e. requiring more or more accurate  
30 measurement/reporting).

Therefore, even if mobility support for DRX-enabled terminal devices could be enabled with the above approaches, this would go to the detriment of efficiency, e.g. in terms of power saving opportunities /amounts.

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Accordingly, there is a demand for enabling/realizing efficient mobility support for DRX-enabled terminal devices.

## 5 Summary

Various exemplifying embodiments of the present invention aim at addressing at least part of the above issues and/or problems and drawbacks.

10

Various aspects of exemplifying embodiments of the present invention are set out in the appended claims.

15 According to an example aspect of the present invention, there is provided a method comprising providing a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold, and providing an indication for employment of the mobility  
20 configuration to at least one DRX-enabled terminal device.

According to an example aspect of the present invention, there is provided a method comprising establishing a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle  
25 equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold, obtaining an indication for employment of the mobility configuration, and employing the mobility configuration on the basis of obtained indication.

30

According to an example aspect of the present invention, there is provided an apparatus comprising at least one processor and at least one memory including a computer program code, wherein the at least one memory and the computer program code are configured, with the at least one processor,

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to cause the apparatus to perform at least the following: providing a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for  
5 a DRX cycle higher than the predetermined DRX threshold, and providing an indication for employment of the mobility configuration to at least one DRX-enabled terminal device

According to an example aspect of the present invention, there is provided  
10 an apparatus comprising at least one processor and at least one memory including a computer program code, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to perform at least the following: establishing a mobility configuration for DRX-enabled terminal devices, which requires  
15 support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold, obtaining an indication for employment of the mobility configuration, and employing the mobility configuration on the basis of obtained indication

20 According to an example aspect of the present invention, there is provided a computer program product comprising (computer-executable) computer program code which, when the program code is executed (or run) on a computer or the program is run on a computer (e.g. a computer of an  
25 apparatus according to any one of the aforementioned apparatus-related example aspects of the present invention), is configured to cause the computer to carry out the method according to any one of the aforementioned method-related example aspects of the present invention.

30 The computer program product may comprise or may be embodied as a (tangible/non-transitory) computer-readable (storage) medium or the like, on which the computer-executable computer program code is stored, and/or the program is directly loadable into an internal memory of the computer or a processor thereof.

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Further developments and/or modifications of the aforementioned exemplary aspects of the present invention are set out in the following.

- 5 By way of exemplifying embodiments of the present invention, efficient mobility support for DRX-enabled terminal devices can be enabled/realized.

#### Brief description of the drawings

- 10 In the following, the present invention will be described in greater detail by way of non-limiting examples with reference to the accompanying drawings, in which

- Figure 1 shows a schematic diagram of a DRX configuration for DRX-enabled terminal devices according to exemplifying embodiments of the present invention,

- Figure 2 shows a schematic diagram of a mobility support procedure according to exemplifying embodiments of the present invention,

- 20 Figure 3 shows a schematic diagram illustrating an example of a structure of an apparatus according to exemplifying embodiments of the present invention, and

- 25 Figure 4 shows a schematic diagram illustrating an example of functional structures of individual apparatuses according to exemplifying embodiments of the present invention.

#### Detailed description

- 30 The present invention is described herein with reference to particular non-limiting examples and to what are presently considered to be conceivable embodiments of the present invention. A person skilled in the art will

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appreciate that the present invention is by no means limited to these examples and embodiments, and may be more broadly applied.

It is to be noted that the following description of the present invention and its embodiments mainly refers to specifications being used as non-limiting examples for certain exemplifying network configurations and system deployments. Namely, the present invention and its embodiments are mainly described in relation to 3GPP specifications being used as non-limiting examples. As such, the description of exemplifying embodiments given herein specifically refers to terminology which is directly related thereto. Such terminology is only used in the context of the presented non-limiting examples and embodiments, and does naturally not limit the invention in any way. Rather, any other system configuration or deployment may equally be utilized as long as complying with what is described herein and/or exemplifying embodiments described herein are applicable to it.

Hereinafter, various exemplifying embodiments and implementations of the present invention and its aspects are described using several variants and/or alternatives. It is generally to be noted that, according to certain needs and constraints, all of the described variants and/or alternatives may be provided alone or in any conceivable combination (also including combinations of individual features of the various variants and/or alternatives). In this description, the words "comprising" and "including" should be understood as not limiting the described exemplifying embodiments and implementations to consist of only those features that have been mentioned, and such exemplifying embodiments and implementations may also contain features, structures, units, modules etc. that have not been specifically mentioned.

In the drawings, it is to be noted that lines/arrows interconnecting individual blocks or entities are generally meant to illustrate an operational coupling there-between, which may be a physical and/or logical coupling, which on the one hand is implementation-independent (e.g. wired or

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wireless) and on the other hand may also comprise an arbitrary number of intermediary functional blocks or entities not shown.

According to exemplifying embodiments of the present invention, in general  
5 terms, there are provided measures and mechanisms for enabling/realizing  
efficient mobility support for DRX-enabled terminal devices. Such measures  
and mechanisms are based on a mobility configuration (such as e.g. a DRX  
configuration) for DRX-enabled terminal devices, as well as an indication for  
employment of the mobility (e.g. DRX) configuration for at least one DRX-  
10 enabled terminal device, as detailed below.

While a high speed scenario is used as an illustrative example for  
enabling/realizing efficient mobility support for DRX-enabled terminal  
devices, the present invention and its embodiments are not limited thereto.  
15 Rather, the present invention and its embodiments are applicable to any  
one of different states of terminal devices and/or scenarios of  
communication, for which specific requirements may be needed for terminal  
applying DRX (Discontinuous Reception), especially when operating in  
Connected mode.

20

Figure 1 shows a schematic diagram of a mobility configuration for DRX-  
enabled terminal devices according to exemplifying embodiments of the  
present invention.

25 As shown in Figure 1, the mobility configuration 100 according to  
exemplifying embodiments of the present invention, which may e.g. be a  
DRX configuration, differentiates between the requirement of robust  
mobility support and the allowability of non-robust mobility support on the  
basis of a DRX cycle of a DRX-enabled terminal device (e.g. UE) in question  
30 and a predetermined DRX threshold.

According to the mobility (e.g. DRX) configuration 100, support of robust  
mobility is required for a DRX cycle equal to or lower than the  
predetermined DRX threshold, and non-support of robust mobility is allowed

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for a DRX cycle higher than the predetermined DRX threshold. More specifically, the mobility (e.g. DRX) configuration 100 defines cell detection and measurement/reporting requirements for robust mobility support for a DRX cycle equal to or lower than the predetermined DRX threshold and  
5 defines cell detection and measurement/reporting requirements for non-robust mobility support for a DRX cycle higher than the predetermined DRX threshold.

10 Herein, any cell detection and measurement/reporting requirements may generally refer to corresponding operation/s of a terminal device (e.g. UE).

Robust mobility (in Connected mode) generally refers to handover controlled mobility with a low amount of handover failures. When discussing robust mobility, it usually refers to mobility controlled by the network, with  
15 the goal of minimizing the error cases leading to unsuccessful handovers (e.g. handover failures, radio link failures, late measurement reporting from UE, etc.). In order to achieve this goal, the UE is required to continuously search for neighbor cells, measure both serving and neighbor cells, report the measurement results or declare radio link failure under certain  
20 conditions, and execute the handover or trigger re-establishment according to the network control. Accordingly, associated performance requirements are also developed for robust mobility.

In contrast thereto, non-robust mobility (in Connected mode) generally  
25 refers to mobility which is not handover/network controlled like robust mobility, thus usually resulting in a higher amount of handover failures. That is, the UE is not required to perform the above-outlined operations for robust mobility.

30 As evident from the above, in or for supporting robust mobility, specific one or more events are executed (by the UE), measured and/or reported, which are configured to identify mobility (HO) problem symptom/s (e.g. with regard to serving cell and/or neighbor cell relations, etc.). Otherwise, in or for not supporting robust mobility, such specific one or more events are not

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executed, measured and/or reported (by the UE), and therefore mobility (HO) problem symptom/s (e.g. with regard to serving cell and/or neighbor cell relations, etc.) cannot be identified. Accordingly, it can be said that at least some cell detection and measurement/reporting requirements for (support of) robust mobility are stricter (in other words, tighter) than those for (support of) non-robust mobility.

It is to be noted that the case of a DRX cycle equal to or lower than the predetermined DRX threshold represents an active period (e.g. a period of data transmission), while the case of a DRX cycle higher than the predetermined DRX threshold represents an inactive period (e.g. a period during connected mode where there is no data exchange between UE and network, or an idle period during connected mode or idle mode). Also, it is to be noted that the case of a DRX cycle equal to or lower than the predetermined DRX threshold encompasses a DRX cycle of 0, which represents a non-DRX operation.

Further, it is to be noted that the predetermined DRX threshold may be a fixed standard value (which may e.g. be statically specified by standardization) or a variably configurable value (which may e.g. be dynamically specified by a network entity).

In view of the above, it can be seen that exemplifying embodiments of the present invention address the objective of achieving efficient mobility support for DRX-enabled terminal devices by way of a specific mobility configuration, namely by defining specific requirements (providing for non-robust mobility support) for a terminal device for long DRX cycles and defining specific requirements (providing for robust mobility support) for any terminal device for non-DRX or short DRX cycles. This means that, when a terminal device is subject to a predefined state or scenario (such as a high speed scenario), the terminal device can still enable power saving opportunities/amounts (i.e. DRX is applied whenever possible, e.g. during an inactive period) while at the same time robust mobility support can be

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ensured (i.e. short/non-DRX is applied, e.g. during an actual data transfer period).

5 As shown in Figure 1, the mobility configuration 100 according to exemplifying embodiments of the present invention, which may e.g. be a DRX configuration, defines an indication for employment thereof. That is, it is defined when the mobility (e.g. DRX) configuration 100 is to be employed by a correspondingly configured DRX-enabled terminal device (e.g. UE).

10 According to the mobility (e.g. DRX) configuration 100, such indication may relate to a predefined scenario in which the DRX-enabled terminal device (e.g. UE) in question is operating (e.g. a high speed scenario), or may be independent from any such predefined scenario but relate to (higher layer) signaling from a network entity.

15 Figure 2 shows a schematic diagram of a mobility support procedure according to exemplifying embodiments of the present invention. Such procedure may be implemented between a network entity such as a communication control entity for controlling at least one DRX-enabled terminal device (e.g. an eNB in E-UTRAN) and the at least one DRX-enabled  
20 terminal device (e.g. a UE in UMTS, LTE, etc.), especially when operating in Connected mode.

As shown in Figure 2, the network entity may set the mobility configuration  
25 100 (as illustrated in Figure 1) in a process 210 and transmit the thus set mobility configuration to one or more terminal devices under control of the network entity in a process 220. That is, the mobility configuration is provided from the network entity to the terminal device. Upon receipt thereof, the terminal device may be configured by the mobility configuration  
30 100 (as illustrated in Figure 1), e.g. by initialization, installation or implementation thereof, such that the mobility configuration is employable at the terminal device a process 230. That is, the mobility configuration is established by the terminal device.

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As shown in Figure 2, the network entity may determine an employment indication and transmit the thus determined employment indication to at least one terminal device under control of the network entity in a process 240. That is, the employment indication is provided from the network entity to the terminal device. Upon receipt thereof, i.e. upon obtaining the employment indication, the terminal device may use the employment indication to initiate employment of the previously established mobility configuration on the basis of obtained employment indication (as described in connection with Figure 1) in step 250.

It is to be noted that the sequence of processes shown in Figure 2 is for illustrative purposes only, and the present invention and its embodiments are not limited thereto. Rather, for example, the mobility configuration and its employment indication may be provided from the network entity to the terminal device at the same time or (at least partly) in parallel with each other, and/or establishing and employing the mobility configuration at the terminal device may be a (at least partly) integrated process.

According to exemplifying embodiments of the present invention, the employment indication may be different depending on whether the mobility configuration relates to (higher layer) signaling or a predefined scenario.

In the former case, the indication may comprise an instruction to employ the mobility configuration in (higher layer) signaling. Upon receipt of such instruction, any terminal device in receipt of such instruction initiates employment of the corresponding mobility configuration.

In the latter case, the indication may comprise information on the predefined scenario in which the mobility configuration is to be employed.

On the one hand, the network entity may detect presence of the scenario for a terminal device on the basis of a predefined condition, and may indicate information of presence of the scenario to said terminal device. For example, assuming relation to a high speed scenario, when the network

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entity knows a current speed of a terminal device under its control, it can detect whether or not the current speed of the terminal device is equal to or larger than a predefined speed condition (i.e. a speed threshold) and, if so, indicate to the terminal device that a high speed scenario is present.

5     Thereby, the terminal device is caused to employ the associated mobility configuration having a high speed scenario as employment indication. In this case, the employment indication is transmitted (in (higher layer) signaling) to one specific terminal device under the control of the network entity. As evident, under certain circumstances, the network can indicate to

10    a respective UE when the network sees the UE to be in high speed scenario, which could be based on network implementation (e.g. current UE speed, amount of HOs during a period of time, UE having specific cells as serving cells (e.g. cells along the track of a train), or the like).

15    On the other hand, the network entity may not detect presence of the scenario for a terminal device, but may indicate information of a predefined condition for detecting presence of the scenario to at least one terminal device. For example, assuming relation to a high speed scenario, when the network entity does not know a current speed of one or more terminal

20    devices under its control, it can indicate an applicable predefined speed condition (i.e. a speed threshold) to these one or more terminal devices in order to enable these one or more terminal devices to locally detect presence of a high speed scenario, respectively. Thus, any one of these one or more terminal devices may detect whether its current speed is equal to

25    or larger than the predefined speed condition (i.e. a speed threshold) included in the indicated information from the network entity. Thereby, any one of these one or more terminal devices may be self-triggered to employ the associated mobility configuration having a high speed scenario as employment indication. In this case, the employment indication may be

30    broadcast (in SIB) to all terminal devices under the control of the network entity.

According to exemplifying embodiments of the present invention, the mobility (e.g. DRX) configuration may include – e.g. as part or in the

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context of the definition of the cell detection and measurement/reporting requirements for non-/robust mobility support – specifications of the (expected/instructed) behavior of the terminal device for supporting/following non-/robust mobility. For example, UE behavior for supporting/following non-robust mobility may be included, such as e.g. a condition on which the UE not trigger re-establishment when RLF is detected.

According to exemplifying embodiments of the present invention, a terminal device having a DRX cycle higher than a predetermined DRX threshold may be allowed not to support robust mobility by usage of a mobility configuration, as outlined above. In this regard, employment of a mobility configuration, if the DRX cycle is higher than the predetermined DRX threshold, may for example include on or more of the following operational aspects.

The terminal device (which has established a corresponding mobility configuration) may be configured to omit taking at least part of specified measurements and/or sending corresponding measurement reports. That is, a UE which is in a state or scenario, where robust mobility is not required or at least not expected to be ensured (i.e. the UE is allowed not to support robust mobility), could be configured to be not required to produce and/or send measurement reports to the network. Such operational aspect could be a specified behavior or network-configurable behavior.

The terminal device (which has established a corresponding mobility configuration) may be configured to omit counting potential radio link failure events as radio link failures and/or sending corresponding radio link failure reports. That is, a UE which is in a state or scenario, where robust mobility is not required or at least not expected to be ensured (i.e. the UE is allowed not to support robust mobility), could be configured to enable that potential Radio Link Failures (RLFs) are not counted and potentially reported as RLFs, thereby keeping Key Performance Indicators (KPIs) lower.

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The terminal device (which has established a corresponding mobility configuration) may be configured to omit performing call re-establishment in case of a radio link failure. That is, a UE which is in a state or scenario, where robust mobility is not required or at least not expected to be ensured  
5 (i.e. the UE is allowed not to support robust mobility), could be configured to avoid to perform call re-establishment in case of RLF.

The terminal device (which has established a corresponding mobility configuration) may be configured to perform call re-establishment on the  
10 basis of specific conditions only. That is, a UE which is in a state or scenario, where robust mobility is not required or at least not expected to be ensured (i.e. the UE is allowed not to support robust mobility), could be configured to count potential radio link failure events as a special RLF event, and the action normally triggered of performing call re-establishment in the new  
15 serving cell could be conditioned, e.g. with respect to the special RLF event.

The terminal device (which has established a corresponding mobility configuration) may be configured to assume a network connection as released after end of data transmission. That is, a UE which is in a state or  
20 scenario, where robust mobility is not required or at least not expected to be ensured (i.e. the UE is allowed not to support robust mobility), could be configured to assume that the connection is released immediately after data transmissions have ended, i.e. when all DRX timers have expired that keep the radio-frequency (RF) unit/s of the UE in an on state.

25  
It is noted that the above-outlined operations of a terminal device having a DRX cycle higher than a predetermined DRX threshold are basically different from or even contrary to those operations as conventionally applicable. For example, an operation described to be omitted above, is usually not omitted  
30 but performed conventionally. According to exemplifying embodiments of the present invention, a terminal device having a DRX cycle equal to or lower than a predetermined DRX threshold carries out such operations as conventionally applicable (i.e. those which are basically different from or even contrary to the above-outlined operations).

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From the above, it can be seen that the network (i.e. the controlling network entity) can sent a mobility configuration and an employment indication to the controlled one or more terminal devices. In order to support full flexibility,

- the mobility configuration may include
  - DRX threshold above which the terminal device should support/follow non-robust mobility (at least, if the DRX threshold is not a fixed standard value), and/or
  - UE behavior (at least, for supporting/following non-robust mobility), e.g. the condition on which the UE should not trigger re-establishment when RLF is detected, and
  - the employment indication may include
    - a direct instruction that/whether the UE should employ (i.e. utilize or carry out) the mobility configuration, or
    - a condition on which the UE should employ (i.e. utilize or carry out) the mobility configuration, e.g. UE speed threshold (e.g. for the case of a high speed scenario).

In view of the above, it can be seen that exemplifying embodiments of the present invention address the objective of achieving efficient mobility support for DRX-enabled terminal devices by way of a specific indication from the network, which is configured to initiate employment of a specific mobility configuration. Such indication from a network entity such as an eNB in UMTS, LTE, etc. can allow a terminal device to not support robust mobility – e.g. not send measurement reports to the network – unless the DRX cycle is low or no DRX is applied. Such indication can be any generic indication capable of achieving its above-described purpose. Such indicator can be carrier-specific (such that the corresponding mobility configuration is employed for one or more specified carriers only) or general for the recipient terminal device (such that the corresponding mobility configuration is employed for all carriers of the respective terminal device).

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The above-described mobility configuration, employment indication and mobility support procedure according to exemplifying embodiments of the present invention can be specified in related standard specifications (e.g. specifications relating to requirements for support of radio resource management in E-UTRAN) accordingly.

For example, in 3GPP TS 36.133, the teaching of exemplifying embodiments of the present invention can be specified in connection with intra-frequency and inter-frequency (and RAT) measurement requirements, e.g. in the context of section 8.1.2.2.1.2 relating to requirements of E-UTRAN intra-frequency measurements when DRX is used.

Namely, it could be defined, e.g. in the context of section 8.1.2.2.1.2 of 3GPP TS 36.133 V13.0.0 (2015-07), that the thus described requirements apply only for low DRX cycles, such as for DRX-cycle length(s)  $\leq 0.04$  seconds, when the UE is in high speed scenario (or a similar state or scenario where robust mobility is not required or at least not expected to be ensured (i.e. the UE is allowed not to support robust mobility)).

The above example assumes that the applicable DRX threshold for robust mobility is fixed in the standard specification (e.g. with 0.04 seconds). Yet, it is equally feasible that the applicable DRX threshold for robust mobility is not fixed, but variably configurable by the network or, particularly, a controlling network entity in a dynamic fashion.

For such a case, it could be defined, e.g. in the context of section 8.1.2.2.1.2 of 3GPP TS 36.133, that the thus described requirements apply only for low DRX cycles equal to or below a configurable threshold, such as for DRX-cycle length(s)  $\leq \text{THRESHOLD CYCLE}$ , when the UE is in high speed scenario (or a similar state or scenario where robust mobility is not required or at least not expected to be ensured (i.e. the UE is allowed not to support robust mobility)).

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The above examples assumes that robust mobility is not required or at least not expected to be ensured (i.e. the UE is allowed not to support robust mobility) in high speed scenario. Yet, as outlined above, applicability of the principles of the present invention is not limited thereto. Rather, instead of  
5 the high speed scenario, any other scenario or state can be assumed, in which robust mobility is not required or at least not expected to be ensured, while a linkage to any such scenario or state is not required anyway. Instead, applicability of the principles of the present invention can be controlled by the network, e.g. a controlling network entity.

10

For such case, it could be defined, e.g. in the context of section 8.1.2.2.1.2 of 3GPP TS 36.133, that the thus described requirements apply only for low DRX cycles equal to or below a fixed or configurable threshold, when the UE receives an indication, e.g. through higher layer signaling, that mobility  
15 support is relaxed, i.e. network-controlled (HO) mobility support, is relaxed. Such indication can be regarded as an instruction to employ the mobility configuration, as mentioned above.

It is to be noted that the above-given wording for certain definitions in  
20 related standard specifications and the above-mentioned passages for introduction of such definitions in related standard specifications are merely illustrative and exemplary. The thus defined behavior could equally be defined in a different wording, at different passages or even in different specifications, as is to be understood by a person skilled in the art.

25

Conformance of any network entity, terminal device or system with such specification could be reflected in reporting and testing.

As is evident from the above, the teaching of exemplifying embodiments of  
30 the present invention can for example be applied to an UE in a high speed scenario, such as exemplarily outlined hereinafter.

Based on an eNB indication that the serving cell is a cell which supports the high speed scenario, it can be determined that this teaching can be applied

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on the specific UE. Alternatively, the eNB could indicate applicability of this teaching to the specific UE, e.g. after a certain amount of radio link failures (identified either by reporting or call re-establishment), and the network can configure the UE such that the UE will be allowed not to be required to fulfill cell detection and measurement/reporting requirements, if DRX in use has longer cycles than a set threshold.

It should be noted that, even though the UE is not required to fulfill the monitoring requirements (cell detection and measurement/reporting requirements in general), the UE would anyway monitor once active. But due to the combination of high speed and long DRX cycles (or – in general – inactive period) the measurement/reporting would potentially not be useful or sufficiently frequent to be usable for enabling/supporting robust mobility all the time. Such infrequent measurement/reporting could lead to inaccurate measurements, too infrequent measurements, too late event triggering (measurement reporting to network), and too late handover, just to mention some examples.

When the UE experiences RLF while not supporting robust mobility, such an RLF event could not be counted as a normal RLF (as if robust mobility was supported). For example, it could be counted as a special RLF event. If the UE is allowed not to support robust mobility and experiences RLF, the action normally triggered of performing call re-establishment in the new serving cell could be conditioned. Either it could be defined that call re-establishment will not be allowed, e.g. in a related specification, and it could also be network-configurable whether or not the UE shall perform call re-establishment in these conditions.

By virtue of exemplifying embodiments of the present invention, as evident from the above, efficient mobility support for DRX-enabled terminal devices can be enabled/realized.

To this end, according to exemplifying embodiments of the present invention, a specific mobility configuration for DRX-enabled terminal

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devices, as well as an indication for employment of the mobility configuration for at least one DRX-enabled terminal device are taught. Thereby, the network (i.e. a controlling network entity) has control of giving one or more terminal devices a mobility configuration which ensures robust  
5 mobility while data transfer is ongoing (i.e. in an active period of non-DRX or short DRX cycles), and accepts non-robust mobility while no data transfer is ongoing (i.e. in an inactive period of long DRX cycles).

Specifically, specific mobility-related requirements for terminal devices are  
10 defined only for a specific state or scenario (such as a high speed scenario) and only for a case of non-DRX operation or DRX operation with short(er) DRX cycles. Stated in other words, only if DRX is in use by a terminal device and the DRX cycle in use by the terminal device is short enough, there will be specifically defined requirements in terms of cell detection and/or  
15 measurement/reporting to be applied; otherwise, when the DRX cycle goes beyond a threshold cycle, there are no specifically defined requirements in terms of cell detection and/or measurement/reporting to be applied.

The above-described methods, procedures and functions may be  
20 implemented by respective functional elements, entities, modules, units, processors, or the like, as described below.

While in the foregoing exemplifying embodiments of the present invention are described mainly with reference to methods, procedures and functions,  
25 corresponding exemplifying embodiments of the present invention also cover respective apparatuses, entities, modules, units, network nodes and/or systems, including both software and/or hardware thereof.

Respective exemplifying embodiments of the present invention are  
30 described below referring to Figures 3 and 4, while for the sake of brevity reference is made to the detailed description of respective corresponding configurations/setups, schemes, methods and functionality, principles and operations according to Figures 1 and 2.

- 20 -

In Figures 3 and 4, the blocks are basically configured to perform respective methods, procedures and/or functions as described above. The entirety of blocks are basically configured to perform the methods, procedures and/or functions as described above, respectively. With respect to Figures 3 and 4,  
5 it is to be noted that the individual blocks are meant to illustrate respective functional blocks implementing a respective function, process or procedure, respectively. Such functional blocks are implementation-independent, i.e. may be implemented by means of any kind of hardware or software or combination thereof, respectively.

10 Further, in Figures 3 and 4, only those functional blocks are illustrated, which relate to any one of the above-described methods, procedures and/or functions. A skilled person will acknowledge the presence of any other conventional functional blocks required for an operation of respective structural arrangements, such as e.g. a power supply, a central processing  
15 unit, respective memories or the like. Among others, one or more memories are provided for storing programs or program instructions for controlling or enabling the individual functional entities or any combination thereof to operate as described herein in relation to exemplifying embodiments.

20 Figure 3 shows a schematic diagram illustrating an example of a structure of an apparatus according to exemplifying embodiments of the present invention.

25 As indicated in Figure 3, according to exemplifying embodiments of the present invention, an apparatus 300 may comprise at least one processor 310 and at least one memory 320 (and possibly also at least one interface 330), which may be operationally connected or coupled, for example by a bus 340 or the like, respectively.

30 The processor 310 and/or the interface 330 of the apparatus 300 may also include a modem or the like to facilitate communication over a (hardwire or wireless) link, respectively. The interface 330 of the apparatus 300 may include a suitable transmitter, receiver or transceiver connected or coupled

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to one or more antennas, antenna units, such as antenna arrays or communication facilities or means for (hardwire or wireless) communications with the linked, coupled or connected device(s), respectively. The interface 330 of the apparatus 300 is generally configured to communicate with at least one other apparatus, device, node or entity (in particular, the interface thereof).

The memory 320 of the apparatus 300 may represent a (non-transitory/tangible) storage medium and store respective software, programs, program products, macros or applets, etc. or parts of them, which may be assumed to comprise program instructions or computer program code that, when executed by the respective processor, enables the respective electronic device or apparatus to operate in accordance with the exemplifying embodiments of the present invention. Further, the memory 320 of the apparatus 300 may (comprise a database to) store any data, information, or the like, which is used in the operation of the apparatus.

In general terms, respective apparatuses (and/or parts thereof) may represent means for performing respective operations and/or exhibiting respective functionalities, and/or the respective devices (and/or parts thereof) may have functions for performing respective operations and/or exhibiting respective functionalities.

In view of the above, the thus illustrated apparatus 300 is suitable for use in practicing one or more of the exemplifying embodiments of the present invention, as described herein.

When in the subsequent description it is stated that the processor (or some other means) is configured to perform some function, this is to be construed to be equivalent to a description stating that a (i.e. at least one) processor or corresponding circuitry, potentially in cooperation with a computer program code stored in the memory of the respective apparatus or otherwise available (it should be appreciated that the memory may also be an external memory or provided/realized by a cloud service or the like), is

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configured to cause the apparatus to perform at least the thus mentioned function.

5 According to exemplifying embodiments of the present invention, the thus illustrated apparatus 3000 may represent or realize/embody a (part of a) network entity. Specifically, the thus illustrated apparatus 300 may be configured to perform a procedure and/or exhibit a functionality and/or implement a mechanism, as described for the network entity, in any one of Figures 1 and 2.

10

Accordingly, the apparatus 300 may be caused or the apparatus 300 or its at least one processor 310 (possibly together with computer program code stored in its at least one memory 320), in its most basic form, is configured to provide a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold, and to provide an indication for employment of the mobility configuration to at least one DRX-enabled terminal device.

20

According to exemplifying embodiments of the present invention, the thus illustrated apparatus 300 may represent or realize/embody a (part of a) terminal device. Specifically, the thus illustrated apparatus 300 may be configured to perform a procedure and/or exhibit a functionality and/or implement a mechanism, as described for the terminal device, in any one of Figures 1 and 2.

25

Accordingly, the apparatus 300 may be caused or the apparatus 300 or its at least one processor 310 (possibly together with computer program code stored in its at least one memory 320), in its most basic form, is configured to establish a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold, to

30

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obtain an indication for employment of the mobility configuration, and to employ the mobility configuration on the basis of obtained indication.

As mentioned above, any apparatus according to exemplifying embodiments of the present invention may be structured by comprising respective units or means for performing corresponding operations, procedures and/or functions. For example, such units or means may be implemented/realized on the basis of an apparatus structure, as exemplified in Figure 3, i.e. by one or more processors 310, one or more memories 320, one or more interfaces 330, or any combination thereof.

Figure 4 shows a schematic diagram illustrating an example of functional structures of individual apparatuses according to exemplifying embodiments of the present invention. It is to be noted that the individual apparatuses shown in Figure 4 are inherently independent from each other but could be operable to interwork, i.e. exemplifying embodiments of the present invention cover any one of these apparatuses alone or any combination of such apparatuses (including one or more of one, two or three of these apparatuses).

As shown in Figure 4, an apparatus 400 according to exemplifying embodiments of the present invention may represent a (part of a) network entity, such as an eNB of E-UTRAN or the like. Such apparatus may comprise (at least) a unit or means for providing a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold (denoted as mobility configuration providing unit/means 410), and a unit or means for providing an indication for employment of the mobility configuration to at least one DRX-enabled terminal device (denoted as employment indication providing unit/means 420).

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As shown in Figure 4, an apparatus 500 according to exemplifying embodiments of the present invention may represent a (part of a) terminal device, such as an UE in UMTS, LTE or the like. Such apparatus may comprise (at least) a unit or means for establishing a mobility configuration for DRX-enabled terminal devices, which requires support of robust mobility for a DRX cycle equal to or lower than a predetermined DRX threshold and allows non-support of robust mobility for a DRX cycle higher than the predetermined DRX threshold (denoted as mobility configuration establishing unit/means 510), a unit or means for obtaining an indication for employment of the mobility configuration (denoted as employment indication obtaining unit/means 520), and a unit or means for employing the mobility configuration on the basis of obtained indication (denoted as mobility configuration employing unit/means 530).

For further details regarding the operability/functionality of the individual apparatuses (or units/means thereof) according to exemplifying embodiments of the present invention, reference is made to the above description in connection with any one of Figures 1 and 2, respectively.

According to exemplifying embodiments of the present invention, any one of the (at least one) processor, the (at least one) memory and the (at least one) interface, as well as any one of the illustrated units/means, may be implemented as individual modules, chips, chipsets, circuitries or the like, or one or more of them can be implemented as a common module, chip, chipset, circuitry or the like, respectively.

According to exemplifying embodiments of the present invention, a system may comprise any conceivable combination of the thus depicted apparatuses and other network elements or functional entities, which are configured to cooperate as described above.

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

- 25 -

adapted to perform the described functions of the respective parts. The mentioned method steps can be realized in individual functional blocks or by individual devices, or one or more of the method steps can be realized in a single functional block or by a single device.

5

Generally, any method step is suitable to be implemented as software or by hardware without changing the idea of the present invention. Such software may be software code independent and can be specified using any known or future developed programming language, such as e.g. Java, C++, C, and  
10 Assembler, as long as the functionality defined by the method steps is preserved. Such hardware may be hardware type independent and can be implemented using any known or 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  
15 (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) components or DSP (Digital Signal Processor) components. A device/apparatus may be represented by a semiconductor  
20 chip, a chipset, or a (hardware) module comprising such chip or chipset; this, however, does not exclude the possibility that a functionality of a device/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  
25 code portions for execution/being run on a processor. A device may be regarded as a device/apparatus or as an assembly of more than one device/apparatus, whether functionally in cooperation with each other or functionally independently of each other but in a same device housing, for example.

30

Apparatuses and/or units/means or parts thereof can be implemented as individual devices, but this does not exclude that they may be implemented in a distributed fashion throughout the system, as long as the functionality

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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  
5 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)  
medium having stored thereon a respective data structure or code  
10 means/portions or embodied in a signal or in a chip, potentially during  
processing thereof.

The present invention also covers any conceivable combination of method  
steps and operations described above, and any conceivable combination of  
15 nodes, apparatuses, modules or elements described above, as long as the  
above-described concepts of methodology and structural arrangement are  
applicable.

In view of the above, there are provided measures for enabling/realizing  
20 efficient mobility support for DRX-enabled terminal devices. Such measures  
are based on a mobility configuration for DRX-enabled terminal devices,  
which requires support of robust mobility for a DRX cycle equal to or lower  
than a predetermined DRX threshold and allows non-support of robust  
mobility for a DRX cycle higher than the predetermined DRX threshold, and  
25 an indication for employment of the mobility configuration for at least one  
DRX-enabled terminal device.

Even though the invention is described above with reference to the  
examples according to the accompanying drawings, it is to be understood  
30 that the invention is not restricted thereto. Rather, it is apparent to those  
skilled in the art that the present invention can be modified in many ways  
without departing from the scope of the inventive idea as disclosed herein.

List of acronyms and abbreviations

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|    |         |                                               |
|----|---------|-----------------------------------------------|
|    | 3GPP    | 3rd Generation Partnership Project            |
|    | DRX     | Discontinuous Reception                       |
|    | E-UTRAN | Evolved UMTS Terrestrial Radio Access Network |
| 5  | eNB     | evolved NodeB (E-UTRAN base station)          |
|    | HO      | Handover                                      |
|    | LTE     | Long Term Evolution                           |
|    | RAT     | Radio Access Technology                       |
|    | RLF     | Radio Link Failure                            |
| 10 | SIB     | System Information Block                      |
|    | UE      | User Equipment                                |
|    | UMTS    | Universal Mobile Telecommunications System    |

Claims

1. A method comprising  
providing a mobility configuration for DRX-enabled terminal devices,  
5 which requires support of robust mobility for a DRX cycle equal to or lower  
than a predetermined DRX threshold and allows non-support of robust  
mobility for a DRX cycle higher than the predetermined DRX threshold, and  
providing an indication for employment of the mobility configuration  
to at least one DRX-enabled terminal device.
- 10 2. The method according to claim 1, wherein the mobility configuration  
defines cell detection and measurement/reporting requirements for robust  
mobility support for a DRX cycle equal to or lower than the predetermined  
DRX threshold and defines cell detection and measurement/reporting  
15 requirements for non-robust mobility support for a DRX cycle higher than  
the predetermined DRX threshold.
3. The method according to claim 1 or 2, wherein, by the mobility  
configuration, a DRX-enabled terminal device employing the mobility  
20 configuration, if the DRX cycle is higher than the predetermined DRX  
threshold, is configured to  
omit taking at least part of specified measurements and/or sending  
corresponding measurement reports, and/or  
omit counting potential radio link failure events as radio link failures  
25 and/or sending corresponding radio link failure reports, and/or  
omit performing call re-establishment in case of a radio link failure,  
and/or  
perform call re-establishment on the basis of specific conditions only,  
and/or  
30 assume a network connection as released after end of data  
transmission.

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4. The method according to any one of claims 1 to 3, wherein the indication comprises information on a predefined scenario in which the mobility configuration is to be employed.
- 5 5. The method according to claim 4, wherein  
presence of the scenario is detected for a terminal device on the basis  
of a predefined condition, and  
information of presence of the scenario is indicated to said terminal  
device.
- 10 6. The method according to claim 4, wherein  
information of a predefined condition for detecting presence of the  
scenario is indicated to at least one terminal device.
- 15 7. The method according to any one of claims 4 to 6, wherein the  
predefined scenario is a high-speed scenario in which a terminal device has  
a speed equal to or higher than a predefined speed condition.
8. The method according to any one of claims 1 to 3, wherein the indication  
20 comprises an instruction to employ the mobility configuration.
9. The method according to any one of claims 1 to 8, wherein the  
predetermined DRX threshold is a fixed standard value or variably  
configurable value.
- 25 10. The method according to any one of claims 1 to 9, wherein  
the method is operable at or by a network entity such as a  
communication control entity for controlling the at least one DRX-enabled  
terminal device.
- 30 11. A method comprising  
establishing a mobility configuration for DRX-enabled terminal  
devices, which requires support of robust mobility for a DRX cycle equal to  
or lower than a predetermined DRX threshold and allows non-support of

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robust mobility for a DRX cycle higher than the predetermined DRX threshold,

obtaining an indication for employment of the mobility configuration, and

5 employing the mobility configuration on the basis of obtained indication.

12. The method according to claim 11, wherein the mobility configuration defines cell detection and measurement requirements for robust mobility support for a DRX cycle equal to or lower than the predetermined DRX threshold and defined cell detection and measurement requirements for non-robust mobility support for a DRX cycle higher than the predetermined DRX threshold.

15 13. The method according to claim 11 or 12, wherein, if the DRX cycle is higher than the predetermined DRX threshold, said employing comprises  
omitting taking at least part of specified measurements and/or sending corresponding measurement reports, and/or  
omitting counting potential radio link failure events as radio link  
20 failures and/or sending corresponding radio link failure reports, and/or  
omitting performing call re-establishment in case of a radio link failure, and/or  
performing call re-establishment on the basis of specific conditions only, and/or  
25 assuming a network connection as released after end of data transmission.

14. The method according to any one of claims 11 to 13, wherein the indication comprises information on a predefined scenario in which the  
30 mobility configuration is to be employed.

15. The method according to claim 14, wherein  
the indication indicates information of presence of the scenario.

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16. The method according to claim 14, wherein  
the indication indicates information of a predefined condition for  
detecting presence of the scenario, and  
presence of the scenario is detected on the basis of the predefined  
5 condition.
17. The method according to any one of claims 14 to 16, wherein the  
predefined scenario is a high-speed scenario in which a terminal device has  
a speed equal to or higher than a predefined speed condition.
- 10 18. The method according to any one of claims 11 to 13, wherein the  
indication comprises an instruction to employ the mobility configuration.
19. The method according to any one of claims 11 to 18, wherein the  
15 predetermined DRX threshold is a fixed standard value or a variably  
configurable value.
20. The method according to any one of claims 11 to 19, wherein  
the method is operable at or by a DRX-enabled terminal device,  
20 and/or  
the mobility configuration and the indication are received from a  
network entity such as a communication control entity for controlling the  
DRX-enabled terminal device.
- 25 21. An apparatus comprising  
at least one processor and at least one memory including a computer  
program code, wherein the at least one memory and the computer program  
code are configured, with the at least one processor, to cause the apparatus  
to perform at least the following:  
30 providing a mobility configuration for DRX-enabled terminal devices,  
which requires support of robust mobility for a DRX cycle equal to or lower  
than a predetermined DRX threshold and allows non-support of robust  
mobility for a DRX cycle higher than the predetermined DRX threshold, and

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providing an indication for employment of the mobility configuration to at least one DRX-enabled terminal device.

22. The apparatus according to claim 1, wherein the mobility configuration  
5 defines cell detection and measurement/reporting requirements for robust mobility support for a DRX cycle equal to or lower than the predetermined DRX threshold and defines cell detection and measurement/reporting requirements for non-robust mobility support for a DRX cycle higher than the predetermined DRX threshold.

10

23. The apparatus according to claim 21 or 22, wherein, by the mobility configuration, a DRX-enabled terminal device employing the mobility configuration, if the DRX cycle is higher than the predetermined DRX threshold, is configured to

15 omit taking at least part of specified measurements and/or sending corresponding measurement reports, and/or

omit counting potential radio link failure events as radio link failures and/or sending corresponding radio link failure reports, and/or

omit performing call re-establishment in case of a radio link failure,  
20 and/or

perform call re-establishment on the basis of specific conditions only, and/or

assume a network connection as released after end of data transmission.

25

24. The apparatus according to any one of claims 21 to 23, wherein the indication comprises information on a predefined scenario in which the mobility configuration is to be employed.

30 25. The apparatus according to claim 24, wherein

presence of the scenario is detected for a terminal device on the basis of a predefined condition, and

information of presence of the scenario is indicated to said terminal device.

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26. The apparatus according to claim 24, wherein  
information of a predefined condition for detecting presence of the  
scenario is indicated to at least one terminal device.

5

27. The apparatus according to any one of claims 24 to 26, wherein the  
predefined scenario is a high-speed scenario in which a terminal device has  
a speed equal to or higher than a predefined speed condition.

10 28. The apparatus according to any one of claims 21 to 23, wherein the  
indication comprises an instruction to employ the mobility configuration.

29. The apparatus according to any one of claims 21 to 28, wherein the  
predetermined DRX threshold is a fixed standard value or variably  
15 configurable value.

30. The apparatus according to any one of claims 21 to 29, wherein  
the apparatus is operable as or at a network entity such as a  
communication control entity for controlling the at least one DRX-enabled  
20 terminal device.

31. An apparatus comprising  
at least one processor and at least one memory including a computer  
program code, wherein the at least one memory and the computer program  
25 code are configured, with the at least one processor, to cause the apparatus  
to perform at least the following:

establishing a mobility configuration for DRX-enabled terminal  
devices, which requires support of robust mobility for a DRX cycle equal to  
or lower than a predetermined DRX threshold and allows non-support of  
30 robust mobility for a DRX cycle higher than the predetermined DRX  
threshold,

obtaining an indication for employment of the mobility configuration,  
and

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employing the mobility configuration on the basis of obtained indication.

32. The apparatus according to claim 31, wherein the mobility configuration  
5 defines cell detection and measurement requirements for robust mobility support for a DRX cycle equal to or lower than the predetermined DRX threshold and defined cell detection and measurement requirements for non-robust mobility support for a DRX cycle higher than the predetermined DRX threshold.

10

33. The apparatus according to claim 31 or 32, wherein, if the DRX cycle is higher than the predetermined DRX threshold, said employing comprises

omitting taking at least part of specified measurements and/or sending corresponding measurement reports, and/or

15

omitting counting potential radio link failure events as radio link failures and/or sending corresponding radio link failure reports, and/or

omitting performing call re-establishment in case of a radio link failure, and/or

20

performing call re-establishment on the basis of specific conditions only, and/or

assuming a network connection as released after end of data transmission.

34. The apparatus according to any one of claims 31 to 33, wherein the  
25 indication comprises information on a predefined scenario in which the mobility configuration is to be employed.

35. The apparatus according to claim 34, wherein  
the indication indicates information of presence of the scenario.

30

36. The apparatus according to claim 34, wherein  
the indication indicates information of a predefined condition for detecting presence of the scenario, and

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presence of the scenario is detected on the basis of the predefined condition.

37. The apparatus according to any one of claims 34 to 36, wherein the  
5 predefined scenario is a high-speed scenario in which a terminal device has a speed equal to or higher than a predefined speed condition.

38. The apparatus according to any one of claims 31 to 33, wherein the  
10 indication comprises an instruction to employ the mobility configuration.

39. The apparatus according to any one of claims 31 to 38, wherein the predetermined DRX threshold is a fixed standard value or a variably configurable value.

15 40. The method according to any one of claims 31 to 39, wherein  
the apparatus is operable as or at a DRX-enabled terminal device,  
and/or  
the mobility configuration and the indication are received from a  
network entity such as a communication control entity for controlling the  
20 DRX-enabled terminal device.

41. A computer program product comprising computer program code which,  
when the computer program code is executed on a computer, is configured  
to cause the computer to carry out the method according to any one of  
25 claims 1 to 10 or any one of claims 11 to 20.

100

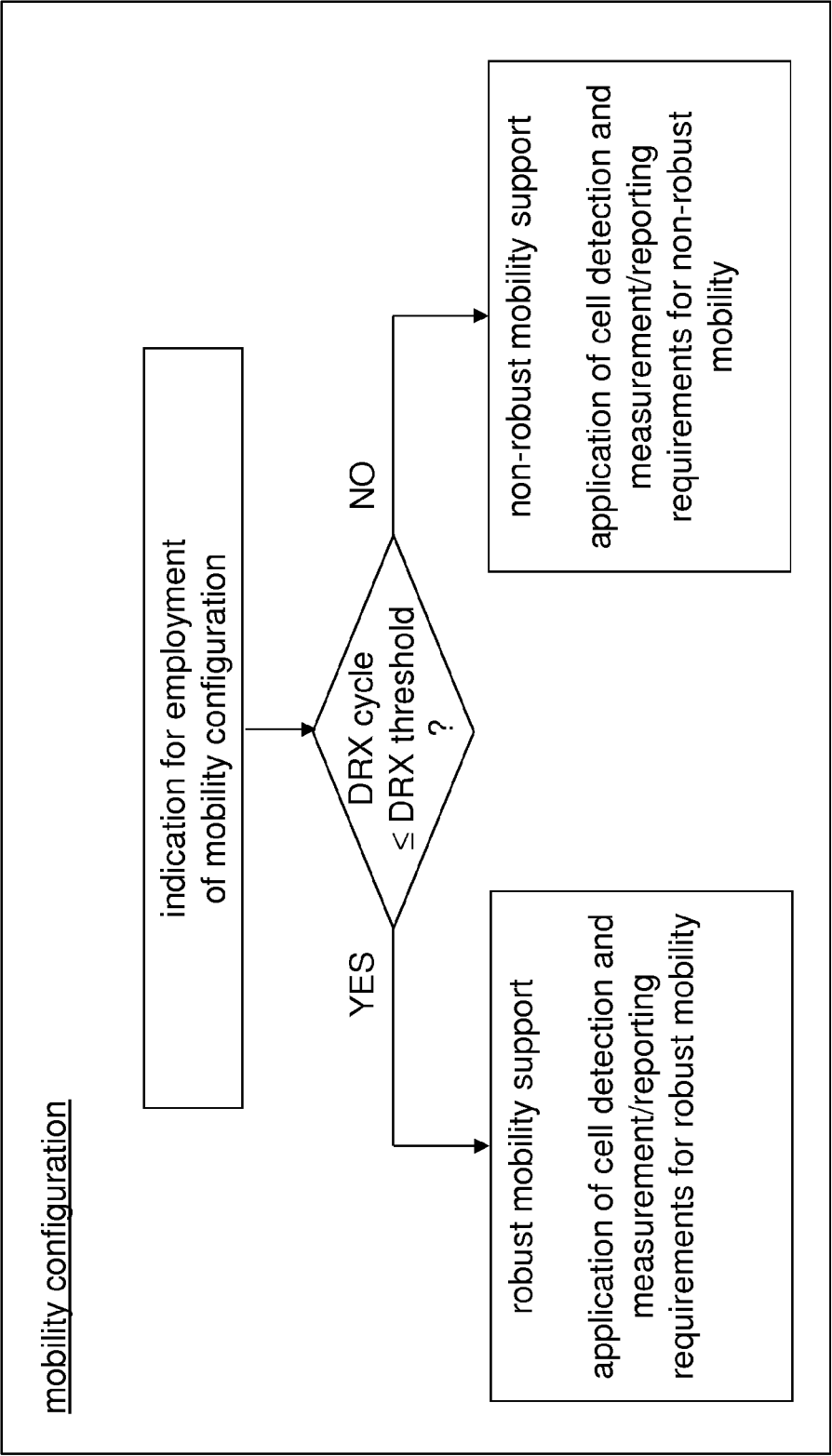


Figure 1

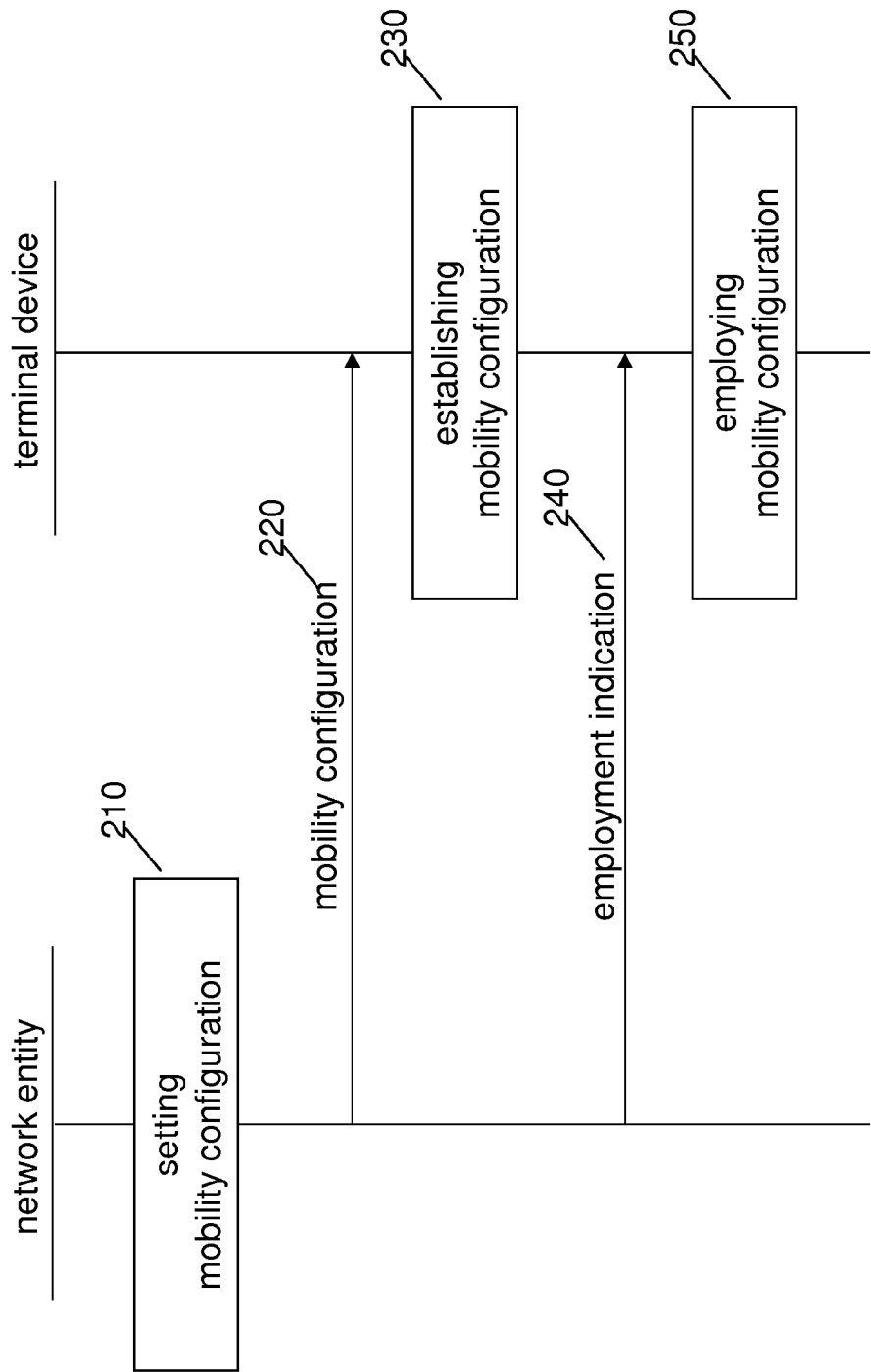


Figure 2

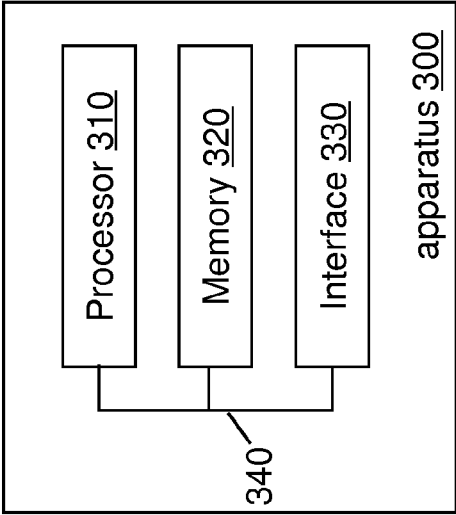


Figure 3

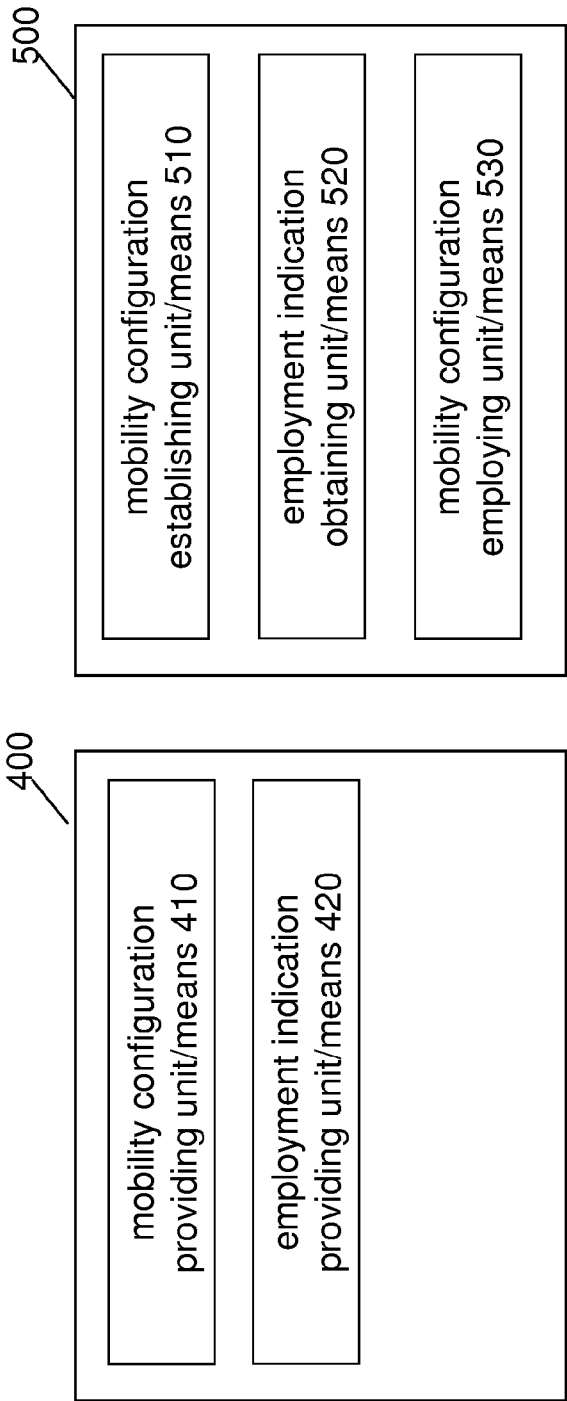


Figure 4

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2015/072760

## A. CLASSIFICATION OF SUBJECT MATTER

INV. H04W36/00

ADD. H04W36/32 H04W76/04

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, 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         | <p>CATT: "Analysis of UE Assistance Information for eDDA",<br/>3GPP DRAFT; R2-122159 ANALYSES OF UE ASSISTANCE INFORMATION FOR EDDA, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE,<br/>vol. RAN WG2, no. Prague, Czech Republic; 20120521 - 20120525,<br/>15 May 2012 (2012-05-15), XP050607159,<br/>[retrieved on 2012-05-15]<br/>section 2.1<br/>section 3</p> <p>-----<br/>-/--</p> | 1-41                  |



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

25 May 2016

Date of mailing of the international search report

06/06/2016

Name and mailing address of the ISA/

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Fax: (+31-70) 340-3016

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Domingos, Luis

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2015/072760

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Relevant to claim No. |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
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