



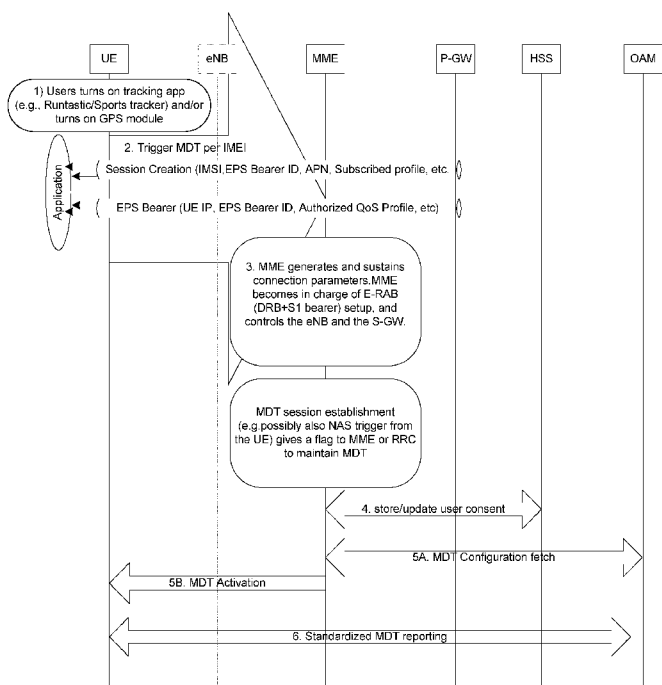
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(54) **Title:** APPLICATION BASED USER'S INVOLVEMENT IN MDT DATA COLLECTION



(57) **Abstract:** Application based user's involvement in MDT data collection. It is provided a method, comprising detecting if at least one of a predefined application and a module is started on a first terminal; triggering, if it is detected that the respective at least one of the application and the module is started, the first terminal to activate a measurement session in the first terminal.

Fig. 2

Description

Title

5 **Application based user's involvement in MDT data collection**

Field of the invention

10 The present invention relates to an apparatus, a method, and a computer program product related to MDT data collection. More particularly, the present invention relates to an apparatus, a method, and a computer program product related to MDT data collection based on at least one of an application or a status of a GNSS module.

Abbreviations

15	3GPP	3rd Generation Partnership Project
	AMBR	Aggregate Maximum Bit Rate
	AP	Access Point
	APN	Access Point Name
	BTS	Base Transceiver Station
20	CCO	Coverage and Capacity Optimization
	CDMA	Code Division Multiple Access
	DRB	Data Radio Bearer
	EDGE	Enhanced Datarate for GSM Evolution
	eNB	Evolved NodeB
25	EPS	Evolved Packet System

	E-RAB	E-UTRAN Radio Access Bearer
	E-UTRAN	Evolved UTRAN
	GNSS	Global Navigation Satellite System
	GPS	Global Positioning System
5	GSM	Global System for Mobile Communication
	GTP	GPRS Tunneling Protocol
	HSS	Home Subscriber Server
	ID	Identifier
	LTE	Long Term Evolution
10	LTE-A	LTE Advanced
	MDT	Minimization of Drive Test
	MME	Mobile Management Entity
	NAS	Non Access Stratum
	OAM	Operation and Maintenance
15	P-GW	Packet Data Network Gateway
	QoS	Quality of Service
	Rel	Release
	RRC	Radio Resource Control
	RRM	Radio Resource Management
20	S1AP	S1 Application Part
	S-GW	Serving Gateway
	TEID	Tunnel Endpoint Identifiers
	TS	Technical Specification
	UE	User Equipment

UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Terrestrial Radio Access Network
WiFi	Wireless Fidelity
WLAN	Wireless Local Area Network

5

Background of the invention

Minimization of Drive Test (MDT) is a standardized 3GPP feature which involves UEs collecting measurements and reporting them to the network. The fundamental concept aims at replacing dedicated and costly drive tests performed for network optimization purposes. MDT involves regular users of the cellular network and makes usage of their data that are collected anyway. MDT measurements are put into MDT Trace Records and signaled onwards to operators' OAM entity for further post-processing.

15 UE's involvement in MDT session is substantially transparent to its user. MDT design has taken care of not impacting regular operations and overall performance of the end user, i.e., MDT employs UE's measurements that are done on regular basis for RRM purposes without triggering MDT-specific measures. Hence, MDT records can consist of metrics, factors that determine network performance, possibly tagged with UE's position if GPS data, are available at the time of taking measurements; while radio signal strength measures are data available always and effortlessly, GNSS location availability is on best effort basis. The other data are easily available, while GNSS position is reported if it happens to be available for other purposes than MDT.

25 Regardless of the intentionally transparent and uninterrupted involvement, UE's participation in carrying out MDT measurements is managed by user consent due to privacy and legal obligations. If the user gives his consent, the user consent is stored in the centralized data base (HSS) and verified whenever users' device is selected by the network to be involved in MDT. If the user did not give his consent, MDT is not activated in the UE.

30

Nowadays mobile phones' users install and use a variety of applications. Extensive deployment of smart phones results in widespread manner to connect users with networking services.

5

Example of applications which generate data which are typically tagged with location information are Sports Tracker™ and Runtastic™. These are apps that track, record, store, workout data and related location information and further give the user possibility to share the workout data and related location information (e.g. on Facebook™, Twitter™).

10

Users who are recording data of their training with location are encouraged to share training map and data. Fig. 1 shows sample screenshots of the Runtastic application.

15

A possibility to increase GNSS data availability in MDT reports has been worked out in 3GPP Rel-11 MDT. Rel-11 allows to attempt to have detailed location information by the involved UE during MDT session.

20

While standardizing MDT in 3GPP, UE's ability to provide GPS information has been considered among various triggers for collecting/triggering MDT data (e.g. 3GPP R2-102071). Currently, in context of MDT configuration, RRC specification reads (see 3GPP TS 36.331):

1> if the received *otherConfig* includes the *obtainLocation*:

25

2> attempt to have detailed location information available for any subsequent measurement report;

30

NOTE: The UE is requested to attempt to have valid detailed location information available whenever sending a measurement report for which it is configured to include available detailed location information. The UE may not succeed e.g. because the user manually disabled the GPS hardware, due to no/poor satellite

coverage. Further details, e.g. regarding when to activate GNSS, are up to UE implementation.

If the UE receives MDT configuration with *obtainLocation* tag, it is requested to attempt to have valid location information, with no requirement to activate GPS. Likely if no GPS is running, it will be not turned on just for MDT purposes. 3GPP did not define stricter requirement to mitigate user's impact.

Unfortunately (to make things worse), pure possibility to provide detailed location information (even though there may be no guarantee that they will be provided) introduced the user consent requirement. 3GPP TS 32.422 specifies that MDT session can be activated only if centralized database at HSS has stored consent for particular user (see also e.g. US 2012/0208503). The requirement took care of data security, but at the same time has initiated questions in 3GPP towards MDT configuration effectiveness. Hence, various alternatives to MDT were proposed. For instance, CCO WI (see e.g. 3GPP SP-140060) aims at the same nature of measurements to be collected for the same purpose (Coverage and Capacity Optimization), but without user consent.

Summary of the invention

It is an object of the present invention to improve the prior art.

According to a first aspect of the invention, there is provided an apparatus, comprising detecting means adapted to detect if at least one of a predefined application and a module is started on a first terminal; triggering means adapted to trigger, if it is detected that the respective at least one of the application and the module is started, the first terminal to activate a measurement session in the first terminal.

The apparatus may further comprise requesting means adapted to request, if it is detected that the respective at least one of the application and the module is started, a

configuration parameter of the measurement session; providing means adapted to provide the configuration parameter to the first terminal.

According to a second aspect of the invention, there is provided an apparatus, comprising
5 detecting means adapted to detect if at least one of a predefined application and a module is started on a first terminal; triggering means adapted to trigger a base station device to activate a measurement session in a second terminal if the respective at least one of the application and the module is started, wherein the base station device is identified as serving the first terminal and the second terminal.

10 The apparatus may further comprise requesting means adapted to request, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session; providing means adapted to provide the configuration parameter to the base station device.

15 The triggering means may be additionally adapted to provide an identification of the first terminal to the base station device.

In the apparatus according to any of the first and second aspects, the detecting means
20 may be adapted to detect if the respective at least one of the application and the module is started based on at least one of access point name, an agreed maximum bit rate for the access point name, a bearer identification, a session identifier, a tunnel endpoint identifier, and an information received from the first terminal.

25 In the apparatus according to any of the first and second aspects, the respective one of the application and the module may be adapted to collect position data of the first terminal.

According to a third aspect of the invention, there is provided an apparatus, comprising
30 detecting means adapted to detect if at least one of a predefined application and a module to obtain position data of the apparatus is started; informing means adapted to inform, if it is detected that the at least one of the application and the module is started, a management device that the at least one of the application and the module is started.

The at least one of the application and the module may be adapted to collect position data of the apparatus.

The apparatus may further comprise checking means adapted to check if the at least one of the application and the module is configured to send the position data to a device different from the apparatus; prohibiting means adapted to prohibit, if the at least one of the application and the module is not configured to send the position data, that the informing means informs the management device.

According to a fourth aspect of the invention, there is provided an apparatus, comprising monitoring means adapted to monitor if a command is received to trigger an activation of a respective measurement session in at least one terminal served by the apparatus; checking means adapted to check, if the command is received, if the command comprises an identification of a first terminal; triggering means adapted to trigger, if the command comprises the identification, the activation of the respective measurement session in the first terminal.

According to a fifth aspect of the invention, there is provided an apparatus, comprising detecting circuitry configured to detect if at least one of a predefined application and a module is started on a first terminal; triggering circuitry configured to trigger, if it is detected that the respective at least one of the application and the module is started, the first terminal to activate a measurement session in the first terminal.

The apparatus may further comprise requesting circuitry configured to request, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session; providing circuitry configured to provide the configuration parameter to the first terminal.

According to a sixth aspect of the invention, there is provided an apparatus, comprising detecting circuitry configured to detect if at least one of a predefined application and a module is started on a first terminal; triggering circuitry configured to trigger a base station device to activate a measurement session in a second terminal if the respective at least one of the application and the module is started, wherein the base station device is identified as serving the first terminal and the second terminal.

The apparatus may further comprise requesting circuitry configured to request, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session; providing circuitry configured to provide the configuration parameter to the base station device.

5

The triggering circuitry may be additionally configured to provide an identification of the first terminal to the base station device.

10 In the apparatus according to any of the fifth and sixth aspects, the detecting circuitry may be configured to detect if the respective at least one of the application and the module is started based on at least one of access point name, an agreed maximum bit rate for the access point name, a bearer identification, a session identifier, a tunnel endpoint identifier, and an information received from the first terminal.

15 In the apparatus according to any of the fifth and sixth aspects, the respective one of the application and the module may be configured to collect position data of the first terminal.

20 According to a seventh aspect of the invention, there is provided an apparatus, comprising detecting circuitry configured to detect if at least one of a predefined application and a module to obtain position data of the apparatus is started; informing circuitry configured to inform, if it is detected that the at least one of the application and the module is started, a management device that the at least one of the application and the module is started.

25 The at least one of the application and the module may be configured to collect position data of the apparatus.

30 The apparatus may further comprise checking circuitry configured to check if the at least one of the application and the module is configured to send the position data to a device different from the apparatus; prohibiting circuitry configured to prohibit, if the at least one of the application and the module is not configured to send the position data, that the informing circuitry informs the management device.

35 According to an eighth aspect of the invention, there is provided an apparatus, comprising monitoring circuitry configured to monitor if a command is received to trigger an activation of a respective measurement session in at least one terminal served by the apparatus;

checking circuitry configured to check, if the command is received, if the command comprises an identification of a first terminal; triggering circuitry configured to trigger, if the command comprises the identification, the activation of the respective measurement session in the first terminal.

5

According to a ninth aspect of the invention, there is provided a method, comprising detecting if at least one of a predefined application and a module is started on a first terminal; triggering, if it is detected that the respective at least one of the application and the module is started, the first terminal to activate a measurement session in the first terminal.

10

The method may further comprise requesting, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session; providing the configuration parameter to the first terminal.

15

According to a tenth aspect of the invention, there is provided a method, comprising detecting if at least one of a predefined application and a module is started on a first terminal; triggering a base station device to activate a measurement session in a second terminal if the respective at least one of the application and the module is started, wherein the base station device is identified as serving the first terminal and the second terminal.

20

The method may further comprise requesting, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session; providing the configuration parameter to the base station device.

25

The triggering may comprise providing an identification of the first terminal to the base station device.

30

In the method according to any of the ninth and tenth aspects, the detecting may comprise detecting if the respective at least one of the application and the module is started based on at least one of access point name, an agreed maximum bit rate for the access point name, a bearer identification, a session identifier, a tunnel endpoint identifier, and an information received from the first terminal.

In the method according to any of the ninth and tenth aspects, the respective one of the application and the module may be adapted to collect position data of the first terminal.

According to an eleventh aspect of the invention, there is provided a method, comprising
5 detecting if at least one of a predefined application and a module to obtain position data of an apparatus performing the method is started; informing, if it is detected that the at least one of the application and the module is started, a management device that the at least one of the application and the module is started.

10 The at least one of the application and the module may be adapted to collect position data of the apparatus.

The method may further comprise checking if the at least one of the application and the module is configured to send the position data to a device different from the apparatus;
15 prohibiting, if the at least one of the application and the module is not configured to send the position data, that the management device is informed.

According to a twelfth aspect of the invention, there is provided a method, comprising
20 monitoring if a command is received to trigger an activation of a respective measurement session in at least one terminal served by an apparatus performing the method; checking, if the command is received, if the command comprises an identification of a first terminal; triggering, if the command comprises the identification, the activation of the respective measurement session in the first terminal.

25 Each of the methods of the ninth to twelfth aspect may be a method of minimization of drive tests data collection.

According to a thirteenth aspect of the invention, there is provided a computer program product comprising a set of instructions which, when executed on an apparatus, is
30 configured to cause the apparatus to carry out the method according to any of the ninth to twelfth aspects. The computer program product may be embodied as a computer-readable medium or directly loadable into a computer.

According to some embodiments of the invention, at least one of the following advantages is provided:

- higher quality of MDT data because of included location information;
- presence of location information is guaranteed at least in some MDT reports;
- 5 and
- nevertheless, user's privacy is respected.

It is to be understood that any of the above modifications can be applied singly or in combination to the respective aspects to which they refer, unless they are explicitly stated
10 as excluding alternatives.

Brief description of the drawings

Further details, features, objects, and advantages are apparent from the following
15 detailed description of the preferred embodiments of the present invention which is to be taken in conjunction with the appended drawings, wherein

Fig. 1 shows sample screenshots of the Runtastic application;

Fig. 2 shows a message flow according to an embodiment of the invention;

20 Fig. 3 shows an apparatus according to an embodiment of the invention;

Fig. 4 shows a method according to an embodiment of the invention;

Fig. 5 shows an apparatus according to an embodiment of the invention;

Fig. 6 shows a method according to an embodiment of the invention;

Fig. 7 shows an apparatus according to an embodiment of the invention;

25 Fig. 8 shows a method according to an embodiment of the invention;

Fig. 9 shows an apparatus according to an embodiment of the invention;

Fig. 10 shows a method according to an embodiment of the invention; and

Fig. 11 shows an apparatus according to an embodiment of the invention.

Detailed description of certain embodiments

5 Herein below, certain embodiments of the present invention are described in detail with reference to the accompanying drawings, wherein the features of the embodiments can be freely combined with each other unless otherwise described. However, it is to be expressly understood that the description of certain embodiments is given for by way of example only, and that it is by no way intended to be understood as limiting the invention
10 to the disclosed details.

Moreover, it is to be understood that the apparatus is configured to perform the corresponding method, although in some cases only the apparatus or only the method are described.

15

Even though the user decides to turn on e.g. a GPS based application or the GPS module of his terminal, it is not a trigger for MDT. GPS data for MDT are collected by chance. Similarly, there is no link between MDT and applications that intend to generate data potentially useful for MDT and to publish the data elsewhere. MDT itself is unaware of
20 running applications in the UE.

GPS-based applications are in interest of MDT, since strength of radio network measure provided by a UE is most valuable for MDT if delivered with location data, e.g. GNSS data. Based on such MDT data, operator can get very detailed maps of network
25 service/coverage/strength, i.e. accordingly to MDT purpose.

However, currently MDT does not allow launching active user's application by triggering an MDT session.

30 This means that, many times MDT sessions are lacking location data because MDT is not permitted to activate a GPS module. On the other side, even if the user activated the

GNSS module, MDT may not take advantage of data tagged with GNSS information that are published and voluntarily shared by a user.

The enhancement of Rel-11 MDT still does not guarantee MDT records will provide GNSS information since checking GNSS data availability does not imply turning on the GNSS module. Even though the relation between MDT reports and GPS was clearly in interest, the capability of providing GNSS data by UE does not imply that the UE has GNSS activated.

According to some embodiments of the invention, an MDT session is activated when the GNSS module is activated, e.g. based on a 3rd party user's application. In particular, according to some embodiments of the invention, activating the MDT session is coupled with the user being willing to share his recorded data including location information for other purposes than MDT. It is assumed that a user, who runs his GPS-based application to record data including location information and is about to publish this data including location information (or just the location information), agrees to share the location information for MDT, too.

According to some embodiments of the invention, activation of MDT data collection relies on a device application that records user's data (in particular location data such as GPS data). A typical (but not limiting) use case is a running user, who starts his tracking application and agrees to share his data.

Assuming the user accepts the application's conditions of agreement for forwarding data (at least for forwarding location data), the location data generated by the application may also be used for MDT purposes.

There are several options how a start of such an application may be recognized by MME which is responsible for signaling based MDT (i.e. activation of MDT in a particular UE). E.g., MME may recognize a particular connection initiation (e.g. through session or bearer identifiers) which is related to the application. As an alternative, UE may recognize the start of the application and inform MME thereabout, e.g. by NAS signaling and/or RRC/S1AP.

Fig. 2 shows a message flow according to an embodiment of the invention:

1. In the mobile terminal, the activation of a certain application and/or of the GPS module is recognized and identified to be tied with an MDT activation.
2. By NAS layer interaction, UE informs MME on the activation of the certain application and/or the GPS module (if UE NAS determines that the triggering GNSS application (to be associated with MDT session start request), UE may inform MME to trigger new signaling S1AP; alternatively NAS interacts with RRC layer to start communication with eNB on the MDT initiation);
3. As an alternative to actions 1 and 2, or in addition to actions 1 and 2, MME recognizes itself that the certain application is started. For example, recognition by MME can be based on identifiers pertaining to the session/bearer establishment (and/or their combination). Parameters allowing the identification of the application may be e.g. subscribed APN-AMBR for the APN of application, APN in use, EPS bearer ID, DRB ID, E-RAB ID, S1 TEID, etc. Session creation and EPS bearer establishment between the application and P-GW and some related parameters are shown between actions 2 and 3 in Fig. 2.
4. In some embodiments (see action 4 in Fig. 2), MME takes care of exchange information with HSS on user consent (store/update user consent in subscriber profile at HSS). For example, if required by law or for other reasons, MME may inquire at HSS if the user generally gave consent to MDT activation. If such general consent is not given, MME will not trigger MDT in the terminal. Updating of user consent may be useful e.g. for mobility scenarios when UE moves and/or roams to different networks, so that the newly serving network is carefully checked in terms of MDT initiation options. The UE may be (e.g. due to legal or local regulations) a subject of tracing in one network while not in the other. Updating and checking user consent also helps in avoidance of „spying“ UE: if one network scheduled the tracing it may not be desired to pass the information to the network that has not scheduled it.
5. The MME manages MDT configuration for tracing radio measurements to be taken after the application was activated. Since the application is activated, location information is available and for the MDT tracing.
 - a. MME retrieves MDT configuration from OAM. Alternatively, MDT configuration may be stored in MME such that action 5a may be omitted.
 - b. MME activates MDT measurement in UE (See action 5b in Fig. 2).
6. The MDT reporting is performed between UE and OAM. The MDT reporting may be according to a conventional standard or different from a conventional standard.

In Fig. 2, an embodiment is shown where signaling based MDT is triggered. This has a large re-usage of existing MDT mechanism. Since the path of configuration matches signaling based MDT, it is simpler and straightforward to tie the trigger with signaling based MDT.

Alternatively, or in addition, in some embodiments of the invention, MME may trigger the eNB serving the UE to start area based MDT. In area based MDT, some or all of the UEs in a certain area (coverage area of the eNB) are triggered to activate an MDT session. If only some of the UEs are triggered, it might happen that the UE on which the application providing location data is started, is not triggered to activate a MDT session. Therefore, in some embodiments, MME may inform eNB additionally on the UE on which the application providing location data is started. Then eNB may activate an MDT session in this particular UE (and in other UEs in its coverage area).

Fig. 3 shows an apparatus according to an embodiment of the invention. The apparatus may be a management device such as a MME or an element thereof. Fig. 4 shows a method according to an embodiment of the invention. The apparatus according to Fig. 3 may perform the method of Fig. 4 but is not limited to this method. The method of Fig. 4 may be performed by the apparatus of Fig. 3 but is not limited to being performed by this apparatus.

The apparatus comprises detecting means 10 and triggering means 20. The detecting means 10 and triggering means 20 may be a detecting circuitry and a triggering circuitry, respectively.

In detail, in some embodiments of the invention, the detecting means 10 triggers NAS signaling to MME that further signals towards a terminal to force MDT configuration. In particular, two procedures may be applicable: RRCConnectionReconfiguration (to initiate real time MDT measurement reporting) or LoggedMeasurementConfiguration (to initiate non-real time measurement collection and reporting). Both involve increased effectiveness of MDT configuration by means of signalling based MDT.

The detecting means 10 detects if a predefined application is started on a terminal (S10). If the detecting means 10 detects that the application is started (S10 = "yes"), the

triggering means 20 triggers the terminal to activate a measurement session in the terminal (S20). More in detail, according to some embodiments, the apparatus triggers signaling based MDT in the UE.

5 Fig. 5 shows an apparatus according to an embodiment of the invention. The apparatus may be a management device such as a MME or an element thereof. Fig. 6 shows a method according to an embodiment of the invention. The apparatus according to Fig. 5 may perform the method of Fig. 6 but is not limited to this method. The method of Fig. 6 may be performed by the apparatus of Fig. 5 but is not limited to being performed by this
10 apparatus.

The apparatus comprises detecting means 50 and triggering means 60. The detecting means 50 and triggering means 60 may be a detecting circuitry and a triggering circuitry, respectively.

15

The detecting means 50 detects if a predefined application is started on a first terminal (S50). If the detecting means 50 detects that the application is started (S50 = "yes"), the triggering means 60 triggers a base station device to activate a measurement session in a second terminal served by the base station device (S60). The base station device serves
20 the first terminal. That is, in the apparatus, the base station is identified as serving the first terminal. More in detail, according to some embodiments, the triggering means triggers the base station device to activate area based MDT. The second terminal may be the same as the first terminal or different from the first terminal.

25 For example, according to some embodiments of the invention, the detecting means 50 triggers AS signaling of a base station towards devices via RRC means to force MDT configuration. In particular, two procedures may be applicable: RRCConnectionReconfiguration (to initiate real time MDT measurement reporting) or LoggedMeasurementConfiguration (to initiate non-real time measurement collection and
30 reporting). Both involve increased effectiveness of MDT configuration by means of area based MDT.

Fig. 7 shows an apparatus according to an embodiment of the invention. The apparatus may be a base station such as an eNB or an element thereof. Fig. 8 shows a method
35 according to an embodiment of the invention. The apparatus according to Fig. 7 may

perform the method of Fig. 8 but is not limited to this method. The method of Fig. 8 may be performed by the apparatus of Fig. 7 but is not limited to being performed by this apparatus.

- 5 The apparatus comprises detecting means 110 and informing means 120. The detecting means 110 and informing means 120 may be a detecting circuitry and informing circuitry, respectively.

10 The detecting means 110 detects if at least one of a predefined application and a module to obtain position data of the apparatus is started (S110). If the detecting means 110 detects that the at least one of the application and the module is started (S110 = "yes"), the informing means 120 informs a management device that the at least one of the application and the module is started (S120). The management device may be a MME.

- 15 Fig. 9 shows an apparatus according to an embodiment of the invention. The apparatus may be a base station such as a eNB or an element thereof. Fig. 10 shows a method according to an embodiment of the invention. The apparatus according to Fig. 9 may perform the method of Fig. 10 but is not limited to this method. The method of Fig. 10 may be performed by the apparatus of Fig. 9 but is not limited to being performed by this
20 apparatus.

The apparatus comprises monitoring means 210, checking means 220, and triggering means 230. The monitoring means 210, checking means 220, and triggering means 230 may be a monitoring circuitry, checking circuitry, and triggering circuitry, respectively.

- 25 The monitoring means 210 monitors if a command is received to trigger an activation of a respective measurement session in at least one terminal served by the apparatus (S210). More in detail, according to some embodiments of the invention, the monitoring means 210 monitors if the apparatus (eNB) is instructed to perform area based MDT.

- 30 If the command is received (S210 = "yes"), the checking means 220 checks if the command comprises an identification of a terminal (S220). If the command comprises the identification (S220 = "yes"), the triggering means 230 triggers the activation of the respective measurement session in the terminal (S230).

Fig. 11 shows an apparatus according to an embodiment of the invention. The apparatus comprises at least one processor 610, at least one memory 620 including computer program code, and the at least one processor 610, with the at least one memory 620 and the computer program code, being arranged to cause the apparatus to at least perform at least one of the methods according to Figs. 4, 6, 8, and 10 and related description.

Some embodiments of the invention may be employed in a 3GPP network. They may be employed also in other 3GPP and non-3GPP mobile networks such as CDMA, EDGE, LTE, LTE-A, UTRAN, WiFi, WLAN networks, etc., if a functionality corresponding to MDT (i.e., where measurement data of a terminal are transferred to the network, e.g. for optimization purposes) is implemented.

GPS is an example of a GNSS. However, the invention is not restricted to GPS. As further examples, the invention may be employed for at least one of Russian GLONASS, European Galileo, Indian Regional Navigation Satellite System, and the Chinese BeiDou Navigation Satellite System.

Furthermore, the invention is not restricted to GNSS. If the terminal may obtain its position by other means (e.g. terrestrial or maritime based positioning systems), the same may be used as location data instead of or in addition to data from GNSS, and activation of the respective module or of an application using location data of the respective positioning system may trigger an MDT session, as described hereinabove. Examples of terrestrial based positioning systems involve determining cell ids (e.g. WLAN AP Id), wherein the location information is obtained from a stored relationship of cell id and location, and/or comparing features of a photographed image of the surroundings, wherein the location information is obtained from a stored relationship of features and location.

A terminal may be a user equipment (UE) or another equipment which may attach to the radio access network of the respective technology. For example, a terminal may be a laptop, a PDA, a tablet, a machine-to-machine communication device, etc.

A base station may be a base station according to the respective radio access technology. E.g., it may be a NodeB, an eNodeB, a BTS, or a WiFi AP.

- 5 Some embodiments of the invention are described related to MDT. However, the invention is not restricted to MDT. For example, other measurement sessions (such as a trace session) which are performed in the terminal may be established when a respective application and/or a module to obtain location information are activated.
- 10 Some embodiments of the invention are described for a use case of running/jogging/biking etc. of users, who use applications to track their trainings. These users may actually provide interesting input in terms of MDT (e.g. users with other speed than a driving car or a pedestrian; also, these users may use new routes that are otherwise not easily covered by statistical MDT sessions). However, coupling MDT activation with an application based
- 15 trigger might be extended to other applications which provide (use) location data (e.g. a route guidance system, or an audioguide application for sight-seeing).

One piece of information may be transmitted in one or plural messages from one entity to another entity. Each of these messages may comprise further (different) pieces of

20 information.

Names of network elements, protocols, and methods are based on current standards. In other versions or other technologies, the names of these network elements and/or protocols and/or methods may be different, as long as they provide a corresponding

25 functionality.

If not otherwise stated or otherwise made clear from the context, the statement that two entities are different means that they perform different functions. It does not necessarily mean that they are based on different hardware. That is, each of the entities described in

30 the present description may be based on a different hardware, or some or all of the

entities may be based on the same hardware. It does not necessarily mean that they are based on different software. That is, each of the entities described in the present description may be based on different software, or some or all of the entities may be based on the same software.

5

According to the above description, it should thus be apparent that example embodiments of the present invention provide, for example a management apparatus such as a MME, or a component thereof, an apparatus embodying the same, a method for controlling and/or operating the same, and computer program(s) controlling and/or operating the same as well as mediums carrying such computer program(s) and forming computer program product(s). According to the above description, it should thus be apparent that example embodiments of the present invention provide, for example a terminal such as a UE, or a component thereof, an apparatus embodying the same, a method for controlling and/or operating the same, and computer program(s) controlling and/or operating the same as well as mediums carrying such computer program(s) and forming computer program product(s). According to the above description, it should thus be apparent that example embodiments of the present invention provide, for example a base station such as an eNB, or a component thereof, an apparatus embodying the same, a method for controlling and/or operating the same, and computer program(s) controlling and/or operating the same as well as mediums carrying such computer program(s) and forming computer program product(s).

Implementations of any of the above described blocks, apparatuses, systems, techniques, means, entities, units, devices, or methods include, as non-limiting examples, implementations as hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, a virtual machine, or some combination thereof.

It is to be understood that what is described above is what is presently considered the preferred embodiments of the present invention. However, it should be noted that the description of the preferred embodiments is given by way of example only and that various modifications may be made without departing from the scope of the invention as defined by the appended claims.

Claims:

1. Apparatus, comprising

5 detecting means adapted to detect if at least one of a predefined application and a module is started on a first terminal;

triggering means adapted to trigger, if it is detected that the respective at least one of the application and the module is started, the first terminal to activate a measurement session in the first terminal.

10

2. The apparatus according to claim 1, further comprising

requesting means adapted to request, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session;

15

providing means adapted to provide the configuration parameter to the first terminal.

3. Apparatus, comprising

20 detecting means adapted to detect if at least one of a predefined application and a module is started on a first terminal;

20

triggering means adapted to trigger a base station device to activate a measurement session in a second terminal if the respective at least one of the application and the module is started, wherein the base station device is identified as serving the first terminal and the second terminal.

25

4. The apparatus according to claim 3, further comprising

requesting means adapted to request, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session;

30

providing means adapted to provide the configuration parameter to the base station device.

5. The apparatus according to any of claims 3 to 4, wherein

35 the triggering means is additionally adapted to provide an identification of the first terminal to the base station device.

6. The apparatus according to any of claims 1 to 5, wherein

the detecting means is adapted to detect if the respective at least one of the application and the module is started based on at least one of access point name, an agreed maximum bit rate for the access point name, a bearer identification, a session identifier, a tunnel endpoint identifier, and an information received from the first terminal.

7. The apparatus according to any of claims 1 to 6, wherein the respective one of the application and the module is adapted to collect position data of the first terminal.

8. Apparatus, comprising

detecting means adapted to detect if at least one of a predefined application and a module to obtain position data of the apparatus is started;

informing means adapted to inform, if it is detected that the at least one of the application and the module is started, a management device that the at least one of the application and the module is started.

9. The apparatus according to claim 8, wherein the at least one of the application and the module is adapted to collect position data of the apparatus.

10. The apparatus according to any of claims 8 and 9, further comprising

checking means adapted to check if the at least one of the application and the module is configured to send the position data to a device different from the apparatus;

prohibiting means adapted to prohibit, if the at least one of the application and the module is not configured to send the position data, that the informing means informs the management device.

11. Apparatus, comprising

monitoring means adapted to monitor if a command is received to trigger an activation of a respective measurement session in at least one terminal served by the apparatus;

checking means adapted to check, if the command is received, if the command comprises an identification of a first terminal;

triggering means adapted to trigger, if the command comprises the identification, the activation of the respective measurement session in the first terminal.

12. Method, comprising

detecting if at least one of a predefined application and a module is started on a first terminal;

triggering, if it is detected that the respective at least one of the application and the module is started, the first terminal to activate a measurement session in the first terminal.

5

13. The method according to claim 12, further comprising

requesting, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session;

providing the configuration parameter to the first terminal.

10

14. Method, comprising

detecting if at least one of a predefined application and a module is started on a first terminal;

triggering a base station device to activate a measurement session in a second terminal if the respective at least one of the application and the module is started, wherein the base station device is identified as serving the first terminal and the second terminal.

15

15. The method according to claim 14, further comprising

requesting, if it is detected that the respective at least one of the application and the module is started, a configuration parameter of the measurement session;

20

providing the configuration parameter to the base station device.

16. The method according to any of claims 14 to 15, wherein

the triggering comprises providing an identification of the first terminal to the base station device.

25

17. The method according to any of claims 12 to 16, wherein

the detecting comprises detecting if the respective at least one of the application and the module is started based on at least one of access point name, an agreed maximum bit rate for the access point name, a bearer identification, a session identifier, a tunnel endpoint identifier, and an information received from the first terminal.

30

18. The method according to any of claims 12 to 17, wherein the respective one of the application and the module is adapted to collect position data of the first terminal.

35

19. Method, comprising

detecting if at least one of a predefined application and a module to obtain position data of an apparatus performing the method is started;

informing, if it is detected that the at least one of the application and the module is started, a management device that the at least one of the application and the module is started.

20. The method according to claim 19, wherein the at least one of the application and the module is adapted to collect position data of the apparatus.

21. The method according to any of claims 19 and 20, further comprising

checking if the at least one of the application and the module is configured to send the position data to a device different from the apparatus;

prohibiting, if the at least one of the application and the module is not configured to send the position data, that the management device is informed.

22. Method, comprising

monitoring if a command is received to trigger an activation of a respective measurement session in at least one terminal served by an apparatus performing the method;

checking, if the command is received, if the command comprises an identification of a first terminal;

triggering, if the command comprises the identification, the activation of the respective measurement session in the first terminal.

23. A computer program product comprising a set of instructions which, when executed on an apparatus, is configured to cause the apparatus to carry out the method according to any of claims 12 to 22.

24. The computer program product according to claim 23, embodied as a computer-readable medium or directly loadable into a computer.

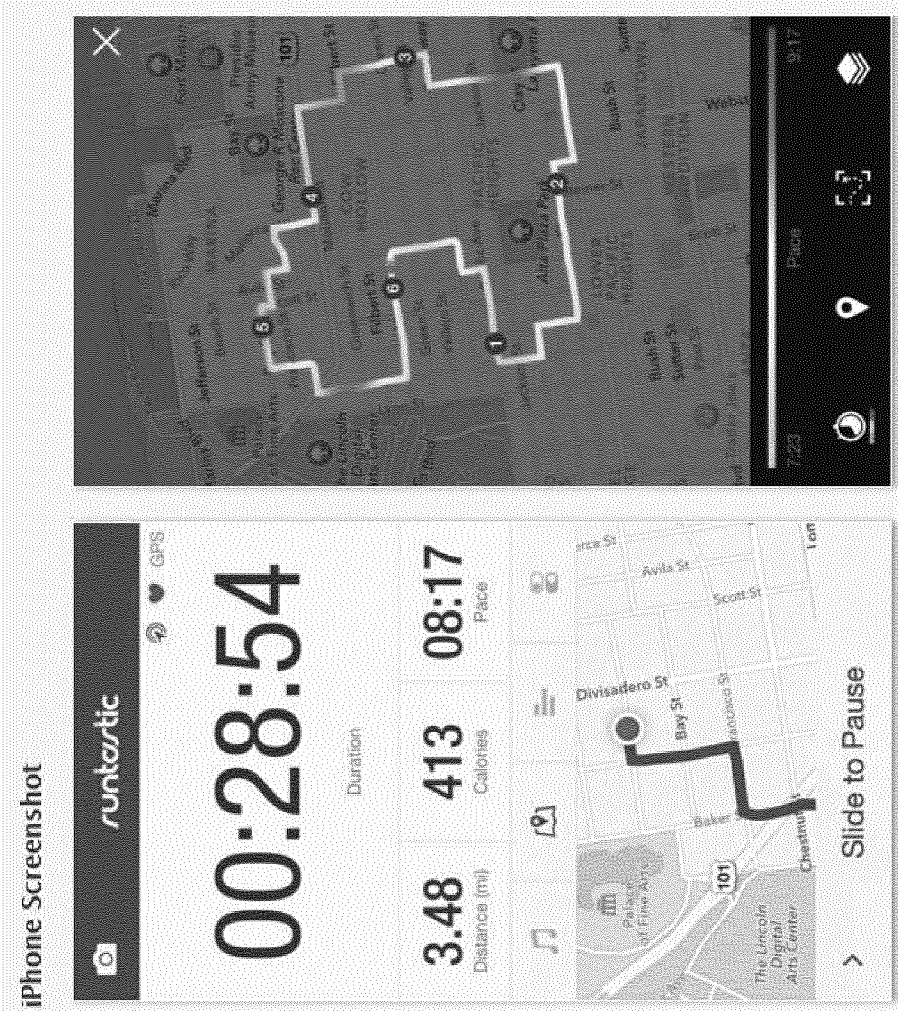
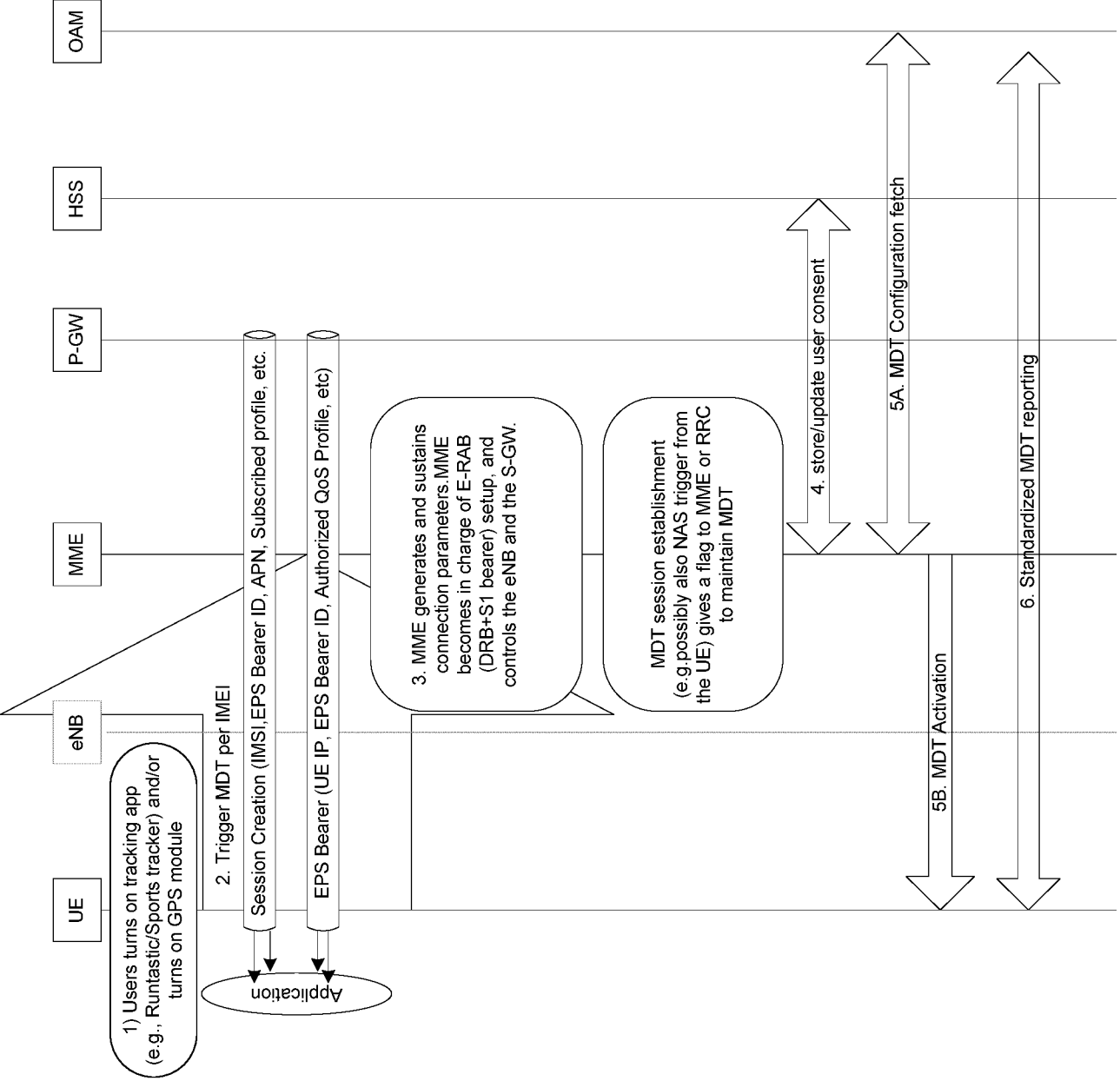


Fig. 1

Fig. 2



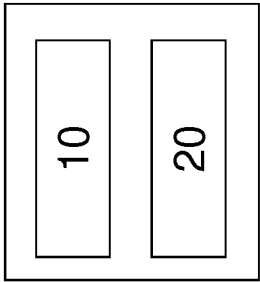


Fig. 3

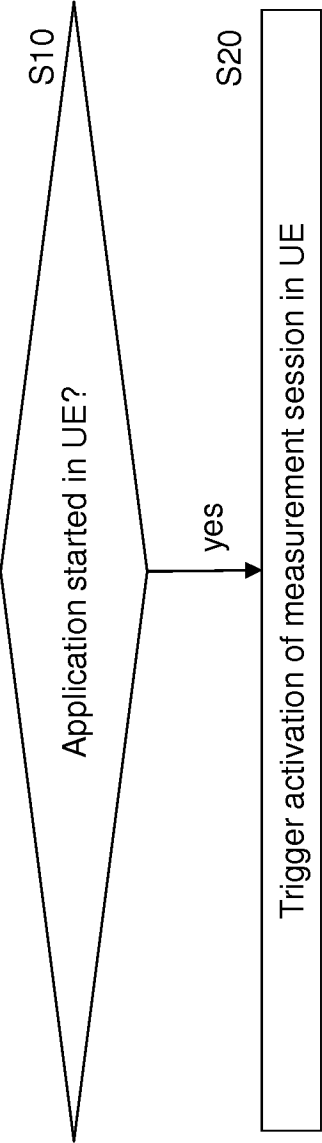


Fig. 4

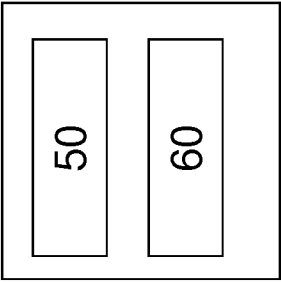


Fig. 5

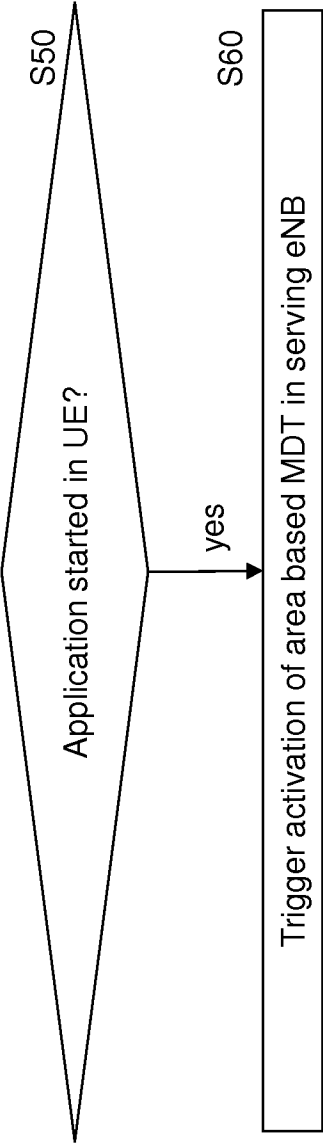


Fig. 6

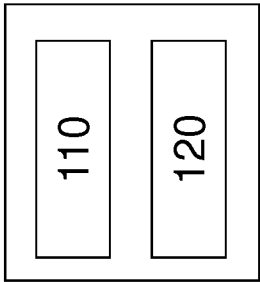


Fig. 7

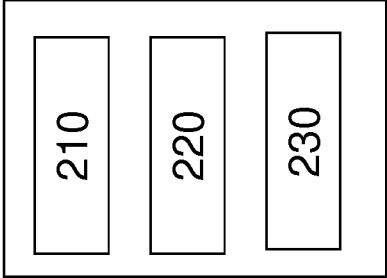


Fig. 9

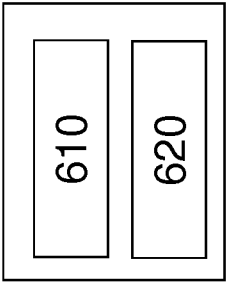


Fig. 11

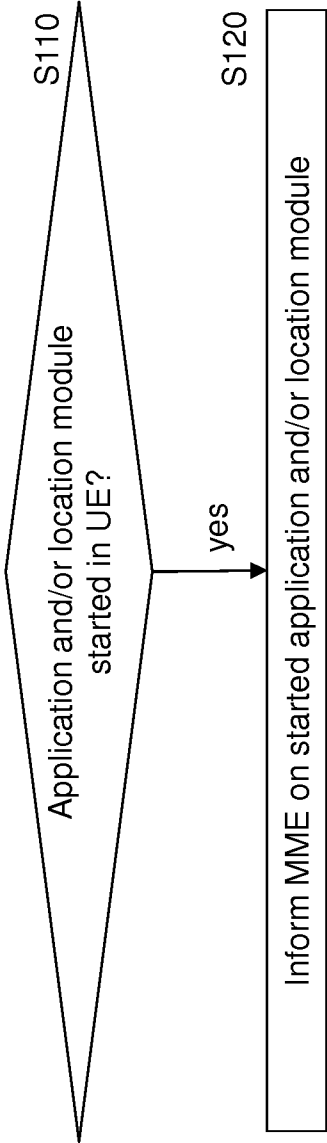


Fig. 8

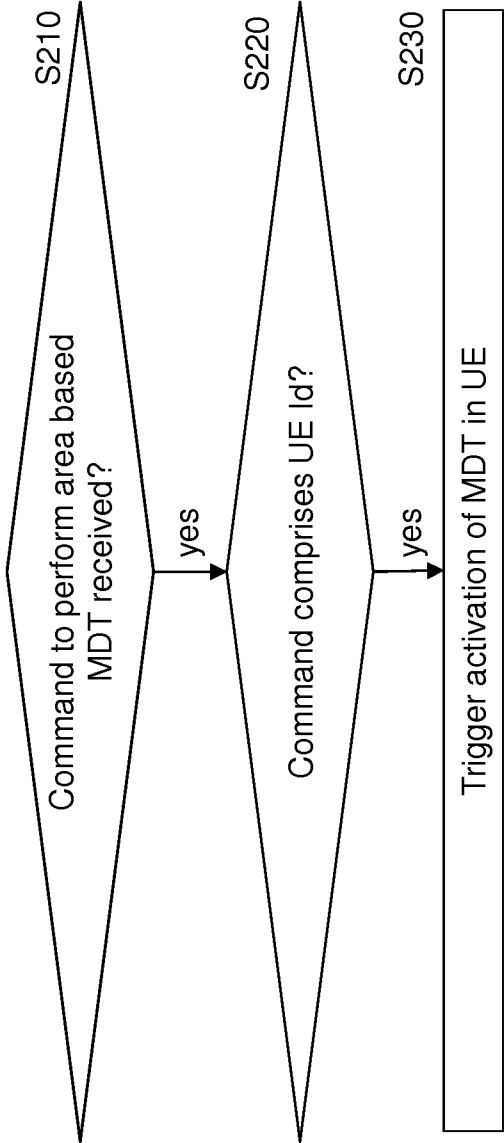


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/059577

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04W24/10

ADD. H04W12/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W

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

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

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	NTT DOCOMO ET AL: "Requirements, Priority and Solution for MDT Location Information Enhancement", 3GPP DRAFT; R2-116135 LOCATION INFO FOR REL-11 MDT, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG2, no. San Francisco, USA; 201111114 - 201111118, 8 November 2011 (2011-11-08), XP050564459, [retrieved on 2011-11-08]	1,3,7-9, 11,12, 14, 18-20, 22,23
Y	page 1, paragraph 2 - page 3, paragraph 3.1 figure 2 ----- -/--	2,4-6, 10,13, 15-17, 21,24



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/059577

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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Information on patent family members

International application No

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