ETSI TS 137 320 V10.1.0 (2011-04)

Technical Specification

Universal Mobile Telecommunications System (UMTS);
LTE;
Universal Terrestrial Radio Access (UTRA)
and Evolved Universal Terrestrial Radio Access (E-UTRA);
Radio measurement collection for Minimization of Drive Tests (MDT);
Overall description;
Stage 2
(3GPP TS 37.320 version 10.1.0 Release 10)

Reference
DTS/TSGR-0237320va10

Keywords
LTE, UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

Using drive tests for network optimization purposes is costly and causes also additional CO2 emissions, so it is desirable to develop automated solutions, including involving UEs in the field, in 3GPP to reduce the operator costs for network deployment and operation. The studies done as part of the study item phase have shown that it is beneficial to collect UE measurements to enable a more efficient network optimisation and it is feasible to use control plane solutions to acquire the information from devices. This information, together with information available in the radio access network can be used for Coverage Optimization purposes.

1 Scope

The present document provides an overview and overall description of the minimization of drive tests functionality.

The document describes functions and procedures to support autonomous collection of UE measurements using Control Plane architecture for both UTRAN and E-UTRAN. Details of the signalling procedures for single-RAT operation are specified in the appropriate radio interface protocol specification.

NOTE: The focus in on conventional macro cellular network deployments. It is presently not envisioned that H(e)NB deployments and MBMS will be supported by the MDT functionality.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 25.133: 'Requirements for support of radio resource management (FDD)'

[3] 3GPP TS 36.133: 'Requirements for support of radio resource management (FDD)'

[4] 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol specification"

[5] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[6] 3GPP TS 32.422: 'Subscriber and equipment trace; Trace control and configuration management'

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] apply.

Immediate MDT: MDT functionality involving measurement performance by UE in CONNECTED state and reporting of the measurements to eNB/RNC available at the time of reporting condition.

Logged MDT: MDT functionality involving measurement performance by UE in IDLE mode, CELL_PCH and URA_PCH states (when UE is in UTRA) at points in time when configured conditions are satisfied, its storage in measurement log for reporting to eNB/RNC at a later point in time.

MDT measurements: Measurements determined for MDT.

MDT PLMN: A PLMN that is the RPLMN for the UE at the point of receiving MDT measurement configuration.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

MDT Minimization of Drive-Tests

4 Main concept and requirements

4.1 General

The general principles and requirements guiding the definition of functions for Minimization of drive tests are the following:

1. **MDT Reporting mode**
   There are two modes of reporting for the MDT measurements: non-real-time or immediate reporting.
   A UE in IDLE mode of operation is configured with Logged MDT. I.e. after having initiated Logged MDT the UE will not support immediate reporting but instead will apply specific non-real time reporting triggers.
   A UE in CONNECTED mode is configured with Immediate MDT that implies immediate reporting.

2. **UE measurement configuration**
   It shall be able to configure MDT measurements for the UE logging purpose independently from the network configurations for normal RRM purposes.

3. **UE measurement collection and reporting**
   It should be possible for MDT measurement reports to consist of multiple events and measurements taken over time. The time interval for measurement collection and reporting shall be decoupled in order to limit the impact on the UE battery consumption and network signalling load. It shall be possible to collect measurements logs preceding a particular event (e.g. radio link failure).

4. **Geographical scope of measurement logging**
   It shall be possible to configure the geographical area where the defined set of measurements shall be collected. Some measurements might run independent of any geographically defined area.

5. **Location information**
   The measurements shall be linked to available location information and/or other information or measurements that can be used to derive location information.

6. **Time information**
   The measurements in measurement logs shall be linked to a time stamp.

7. **Device type information**
   The terminal used for MDT shall be able to indicate a set of terminal capabilities which allows the network to carefully select the right terminals for specific MDT measurements.

8. **Dependency on SON**
   The solutions for MDT shall be able to work independently from SON support in the network. Relation between measurements/solution for MDT and UE side SON functions shall be established in a way that re-use of functions is achieved where possible.

9. **Dependency on TRACE**
   The existing subscriber/cell trace functionality will be reused and extended to support MDT. If the MDT is

initiated toward to a specific UE (e.g. based on IMSI, IMEI-SV, etc.), the signalling based trace procedure is used, otherwise the management based trace procedure (or cell traffic trace procedure) will be used.

The solutions for MDT shall take into account the following constraints:

1. **UE measurements**
   The UE measurement logging mechanism is an optional feature. In order to limit the impact on UE power consumption and processing, the UE measurement logging should as much as possible rely on the measurements that are available in the UE according to radio resource management enforced by the access network.

2. **Location information**
   The availability of location information is subject to UE capability and/or UE implementation. Solutions requiring location information shall take into account power consumption of the UE due to the need to run its positioning components.

5 Functions and procedures

5.1 General procedures

5.1.1 Logged MDT procedures

Support of Logged MDT complies with the principles for idle mode measurements in the UE specified in TS 25.133[2] and TS 36.133 [3].

NOTE: It should be noted the established principles may result in different logged information in different UEs and less information about neighbour cells.

Further, measurement logging is differentiated based on UE states in idle mode i.e. camped normally, any cell selection or camped on any cell. The UE shall perform measurement logging in "camped normally" state. In "any cell selection" and "camped on any cell" state the UE is not required to perform MDT measurement logging (including time and location information).

For Logged MDT, configuration, measurement collection and reporting of the concerning measurement will always be done in cells of the same RAT type.

There is no need to align the specification of procedural aspects of idle mode measurements with those of the connected mode measurements.

5.1.1.1 Measurement configuration

Logged MDT measurements are configured with a separate MDT Measurement Configuration procedure, as shown in Figure 5.1.1.1-1.

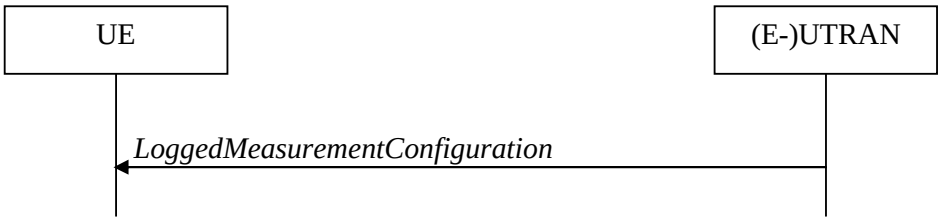

Figure 5.1.1.1-1: MDT measurement configuration for Logged MDT

Network initiates the procedure to UE in RRC Connected by sending *LoggedMeasurementConfiguration* message, which is used to transfer configuration parameters for Logged MDT. This is unidirectional procedure. A release operation for Logged MDT configuration is realized only by configuration replacement in case the other node overwrites the configuration or by configuration clearance in case a duration timer stopping or expiration condition is met.

5.1.1.1.1 Configuration parameters

The MDT measurement configuration consists of:

- configuration of the triggering of logging events. Only periodic downlink pilot strength measurement trigger is supported, for which the logging interval is configurable. The parameter specifies the periodicity for storing MDT measurement results. It should be configured in seconds in multiples of the applied IDLE mode DRX, i.e. multiples of 1.28s which is either a factor or multiple of the IDLE mode DRX. The UE behaviour is unspecified when the UE is configured with a DRX cycle larger than the logging interval.
- configuration of the logging duration. This configuration parameter defines a timer activated at the moment of configuration, that continues independent of state changes, RAT or RPLMN change. When the timer expires the logging is stopped and the configuration is cleared (except for the parameters that are required for further reporting e.g.network absolute time stamp, trace reference, trace recording session reference).
- network absolute time stamp to be used as a time reference to UE
- Trace Reference parameter as indicated by the OAM configuration as specified in TS 32.422 [6]
- Trace Recording Session Reference as indicated by the OAM configuration as specified in TS 32.422 [6]
- (optionally) configuration of a logging area. A UE will log measurements as long as it is within the configured logging area. The scope of the logging area may consist of one of:
  - a list of 32 global cell identities. If this list is configured, the UE will only log measurements when camping in any of these cells
  - a list of 8 TAs or 8 LAs or 8 RAs. If this list is configured, the UE will only log measurements when camping in any cell belonging to the preconfigured TA/LA/RAs.

  If no area scope is configured, the configuration is valid in the entire MDT PLMN of the UE, i.e. the UE will log measurements throughout the MDT PLMN.

NOTE: There is no need to introduce a measurement identity for Logged MDT.

NOTE: Additional measurement object parameter such as cell specific offset is not necessary for Logged MDT

5.1.1.1.2 Configuration effectiveness

The configuration is provided in a cell by dedicated control while UE is in CONNECTED and implies:

- measurement configuration is valid:
  - in IDLE UE state in E-UTRAN, or
  - in IDLE mode, CELL_PCH and URA_PCH states in UTRAN
  - until logging duration timer expires or stops
- measurement configuration and logs are maintained when the UE is in IDLE, i.e. during multiple IDLE periods interrupted by IDLE->CONNECTED->IDLE state transitions
- measurement configuration and logs are maintained when the UE is in IDLE in that RAT, i.e. during multiple IDLE periods interrupted by UE presence in another RAT

There is only one RAT-specific configuration for Logged MDT in the UE. When the network provides a configuration, any previously configured MDT measurements configuration will be entirely replaced by the new one. Moreover,

logged measurements corresponding to the previous configuration will be cleared at the same time. It is left up to the network to retrieve any relevant data before providing a new configuration.

NOTE: The network may have to do inter-RAT coordination

MDT configuration is valid only in the MDT PLMN. Logged MDT measurements are performed as long as the RPLMN is the MDT PLMN. At PLMN change which results in a new RPLMN (RPLMN≠MDT PLMN), the logging is suspended, i.e. the MDT configuration and MDT log are kept but measurement results are not logged.

NOTE: The logging duration timer continues.

In case the new RPLMN provides a configuration any previously configured MDT measurements configuration and corresponding MDT log are cleared and overwritten without being retrieved.

5.1.1.2 Measurement collection

In "camp normally" state, a UE shall perform logging as per the configuration. This state includes a period between cell selection criteria not being met and UE entering 'any cell selection' state, i.e. 10 s for E-UTRA (See TS 36.133 [3]) or 12 s for UTRA (See TS 25.133 [2]). In "any cell selection" or "camped on any cell" state, the periodic logging stops. However, it should be noted that time stamp information and duration timer continue normally. When the UE re-enters 'camped normally' state and the duration timer has not expired, the periodic logging is restarted based on new DRX and logging resumes automatically (with a leap in time stamp).

The measurement quantity is fixed for Logged MDT (i.e. not configurable) and consists of both RSRP and RSRQ for EUTRA, both RSCP and Ec/No for UTRA, P-CCPCH RSCP for UTRA 1.28 TDD, and Rxlev for GERAN.

UE collects MDT measurements and continues logging according to Logged MDT configuration until UE memory reserved for MDT is exceeded. Once log volume exceeds the suitable UE memory, the UE stops logging, stops the duration timer and starts the 48 hour timer.

5.1.1.3 Measurement reporting

5.1.1.3.1 Availability Indicator

A UE configured to perform Logged MDT measurements indicates the availability of Logged MDT measurements, by means of a one bit indicator, in *RRCConnectionSetupComplete* message during connection establishment. Furthermore, the indicator (possibly updated) shall be provided within E-UTRAN handover and re-establishment, and UTRAN procedures involving the change of SRNC (SRNC relocation), CELL UPDATE and URA UPDATE messages. The UE includes the indication in one of these messages at every transition to RRC Connected mode even though the logging period has not ended, upon connection to RAT which configured the UE to perform Logged MDT measurements and RPLMN which is equal to MDT PLMN.
The indicator shall be also provided in *UEInformationResponse* message during MDT report retrieval in case the UE has not transferred the total log in one RRC message in order to indicate the remaining data availability.

The UE will not indicate the availability of MDT measurements in another RAT or in another RPLMN.

The network may decide to retrieve the logged measurements based on this indication. In case Logged MDT measurements are retrieved before the completion of the pre-defined logging duration, the reported measurement results are deleted, but MDT measurement logging will continue according to ongoing Logged MDT configuration.
In case the network will not retrieve Logged MDT measurements, UE should store non-retrieved measurements for 48 hours from the moment the duration timer for logging expired. There is no requirement to store non-retrieved data beyond 48 hours. In addition, all related MDT configuration and logging shall be removed by the UE at switch off or detach.

5.1.1.3.2 Report retrieval

For Logged MDT the measurement reporting is triggered by on-demand mechanism, i.e. the UE is asked by the network to send the collected measurement logs via RRC signalling. UE Information procedure defined in TS 25.331 [4] and TS 36.331 [5] is used to request UE to send the collected measurement logs. The reporting may occur in different cells than which the measurement configuration is signalled.

Transport of Logged MDT reports in multiple RRC messages is supported. With every request, the network may receive a part of the total UE log. To indicate the reported data is a segment, the UE should include data availability indicator as specified in 5.1.1.3.1. In multiple RRC transmissions for segmented Logged MDT reporting, FIFO order is followed, i.e. the UE should provide oldest available measurement entries in earliest message. There is no requirement specified on the size of particular reporting parts. However, each reported part should be 'self-decodable', i.e. interpretable even in case all the other parts are lost.

Logged MDT measurements can be retrieved only if RPLMN is MDT PLMN. The UE shall send an empty report when retrieval is attempted in other cases.

5.1.1.3.3 Reporting parameters

The logged measurement report consists of measurement results for the serving cell (the measurement quantity), available UE measurements performed in idle for intra-frequency/inter-frequency/inter-RAT, time stamp and location information.

The number of neighbouring cells to be logged is limited by a fixed upper limit per frequency for each category below. The UE should log the measurement results for the neighbouring cells, if available, up to:

- 6 for intra-frequency neighbouring cells
- 3 for inter-frequency neighbouring cells
- 3 for GERAN neighbouring cells
- 3 for UTRAN (if non-serving) neighbouring cells
- 3 for E-UTRAN (if non-serving) neighbouring cells
- 3 for CDMA2000 (if serving is E-UTRA) neighbouring cells

The measurement reports for neighbour cells consist of:

- Physical cell identity of the logged cell
- Carrier frequency
- RSRP and RSRQ for EUTRA
- RSCP and Ec/No for UTRA,
- P-CCPCH RSCP for UTRA 1.28 TDD, and
- Rxlev for GERAN
- Pilot Pn Phase and Pilot Strength for CDMA2000

For any logged cell (serving or neighbour), latest available measurement made for cell reselection purposes is included in the log only once, while measurements are performed in accordance with requirements defined in TS 25.133 [2] and TS 36.133 [3].

While logging neighbour cells measurements, the UE shall determine a fixed number of best cells based on the measurement quantity used for ranking during cell reselection per frequency or RAT.

The measurement report is self contained, i.e. the RAN node is able to interpret the Logged MDT reporting results even if it does not have access to the Logged MDT measurement configuration.

For each MDT measurement the UE includes a relative time stamp. The base unit for time information in the Logged MDT reports is the second. In the log, the time stamp indicates the point in time when periodic logging timer expires. The time stamp is counted in seconds from the moment the MDT configuration is received at the UE, relative to the absolute time stamp received within the configuration. The absolute time stamp is the current network time at the point when Logged MDT is configured to the UE. The UE echoes back this absolute reference time. The time format for Logged MDT report is: *YY-MM-DD HH:MM:SS*.

Location information is based on available location information in the UE. Thus, the Logged MDT measurements are tagged by the UE with location data in the following manner:

- ECGI or Cell-Id of the serving cell when the measurement was taken is always included in E-UTRAN or UTRAN respectively

- Detailed location information (e.g. GNSS location information) is included if available in the UE when the measurement was taken. If detailed location information is available the reporting shall consist of latitude and longitude. Depending on availability, altitude may be also additionally included. UE tags available detailed location information only once with upcoming measurement sample, and then the detailed location information is discarded, i.e. the validity of detailed location information is implicitly assumed to be one logging interval.

NOTE: The neighbour cell measurement information that is provided by the UE may be used to determine the UE location (RF fingerprint).

Depending on location information, measurement log/report consists of:

- time information, RF measurements, RF fingerprints, or

- time information, RF measurements, detailed location information (e.g. GNSS location information)

5.1.1.4 MDT context handling during handover

For Logged MDT in IDLE, CELL_PCH and URA_PCH, no need is identified to transfer an MDT context (any related configuration information about measurement and reporting) between (e)NBs/RNCs. In addition, MDT context is assumed to be released in the RAN nodes when the UE is in IDLE.

5.1.2 Immediate MDT procedures

5.1.2.1 Measurement configuration

For Immediate MDT, the configuration is based on the existing RRC measurement procedures for configuration and reporting with some extensions for location information.

NOTE: No extensions related to time stamp are expected for Immediate MDT i.e. time stamp is expected to be provided by eNB/RNC.

With respect to positioning configuration, the network is not able to force UE to provide accurate location information.

5.1.2.2 Measurement reporting

For Immediate MDT, measurement results should provide available location information in the same way as for Logged MDT in Idle mode specified in 5.1.1.3.3, i.e. location information is based on available location information in the UE. Since ECGI or Cell-Id of the serving cell when the measurement was taken is always known in E-UTRAN or UTRAN respectively, thus, the Immediate MDT measurements are tagged by the UE with location data in the following manner:

- Detailed location information (e.g. GNSS location information) is included if available in the UE when the measurement was taken. If detailed location information is available the reporting shall consist of latitude and longitude. Depending on availability, altitude may be also additionally included. The UE should include the available detailed location information only once. If the detailed location information is obtained by GNSS positioning method, GNSS time information shall be included. For both event based and periodic reporting (see 5.2.1.1), the detailed location information isincluded if the report is transmitted within the validity time after the detailed location information was obtained. The validity evaluation of detailed location information is left to UE implementation.

NOTE: The neighbour cell measurement information that is provided by the UE may be used to determine the UE location (RF fingerprint).

Normal RRC signalling in (E-)UTRA procedures are enhanced to support this.

5.1.2.3 MDT context handling during handover

The measurements configured in the UE for Immediate MDT should fully comply with the transferring and reconfiguration principles for the current measurements configured in the UE for RRM purpose during handover (including conformance with Rel-8 and Rel-9).

In addition, MDT configuration handling during handover depends on MDT initiation from OAM defined in section 5.1.3:

- The MDT configuration configured by management based trace function will not propagate during handover.
- The MDT configuration received by signalling based trace messages for a specific UE will propagate during handover.

5.1.3 MDT Initiation

There are two cases that RAN should initiate a MDT measurements collection task. One is that the MDT task is initiated towards a PLMN or a limited region within a PLMN (limited by a cell list, a TA list, a LA list or a RA list) without targeting a specific UE by the cell traffic trace, i.e. management based trace function from OAM. The other is that the MDT task is initiated towards a specific UE and a PLMN or a limited region within a PLMN (limited by cell list, a TA list, a LA list or a RA list) by the signaling trace activation messages from CN nodes, i.e. the Initial Context Setup message and the Trace Start message in E-UTRAN, the CN Invoke Trace message in UTRAN. The detailed procedures to transfer the MDT configurations to RAN are specified in [6].

5.1.4 UE capabilities

MDT relevant UE capabilities are component of radio access UE capabilities. Thus the procedures used for handling UE radio capabilities over (E-)UTRAN apply.

The UE indicates one capability bit for MDT support, which indicates support for Logged MDT. The UE may also indicate capability for stand-alone GNSS positioning.

5.1.5 UE measurements

5.2 E-UTRAN solutions

5.2.1 RRC_CONNECTED

UE in RRC Connected does not support Logged MDT in this release of the specification. In order to support Immediate MDT, the existing RRC measurement configuration and reporting procedures apply. Some extensions are used to carry location information.

5.2.1.1 Measurements and reporting triggers for Immediate MDT

Measurements to be performed for Immediate MDT purposes involve E-UTRAN reporting triggers and criteria utilized for RRM. In particular, the following measurements shall be supported for Immediate MDT performance:

Measurements:

- M1: RSRP and RSRQ measurement by UE
- M2: Power Headroom (PH) measurement by UE
- M3: Uplink signal strength/SINR measurement by eNB

RRC reporting triggers:

- For M1:
  - Periodic

- Serving cell becomes worse than threshold; event A2
- Radio Link Failure

- For M2:
  - N/A

NOTE: PHR is carried by MAC signalling. Thus, the existing mechanism of PHR transmission applies.

- For M3:
  - N/A

5.2.1.2 Enhancement to Radio Link Failure report

Upon Radio Link Failure detection in the UE, *RLFreport* defined in [4] also includes available location information on where RLF occurred, i.e. if detailed location information (e.g. GNSS location information) is available the reported location information in *RLFreport* consist of:

- Latitude, longitude (mandatory)
- Altitude (conditional on availability)
- Velocity (conditional on availability)
- Direction (conditional on availability).

The UE shall store the RLF information when going to RRC IDLE due to RRC Connection Re-establishment failure. Upon transition to RRC_CONNECTED, the UE shall report the RLF information to the network. The *rlf-InfoAvailable* indicator defined in TS 36.331 [5] is used to indicate RLF report availability. The indicator is only set in one LTE connection establishment message following RLF and if the RLF happened in LTE.

Editor"s note: FFS if the information would survive connection establishment in other RATs.

In this case, the *RLFReport* contains also the last cell identity where UE was successfully connected before the failure.

5.2.2 RRC_IDLE

For UE in RRC idle state Logged MDT procedures as described in 5.1.1 apply.

Logged MDT measurements retrieval is carried on Signalling Radio Bearer SRB2.

5.3 UTRAN solutions

5.3.1 UTRA RRC Connected

In CELL_PCH and URA_PCH states UE supports Logged MDT. In CELL_DCH state UE supports Immediate MDT. In CELL_FACH state MDT is not supported in the current release.

5.3.1.1 Measurements and reporting events for Immediate MDT

The solutions for Immediate MDT in UTRAN are only applicable for UEs in CELL_DCH state. Measurements to be performed for Immediate MDT purposes involve normal UTRAN reporting triggers and criteria utilized for controlling the RRC connection. In particular, the following measurements shall be supported for Immediate MDT performance:

Measurements:

- M1: CPICH RSCP and CPICH Ec/No measurement by UE
- M2: P-CCPCH RSCP and Timeslot ISCP for UTRA 1.28 TDD,
- M3: Uplink signal strength/SINR measurement by NodeB

RRC reporting triggers:

- For M1:
  - Periodic
  - Primary CPICH becomes worse than an absolute threshold; event 1F
- For M2:
  - Timeslot ISCP above a certain threshold (TDD); event 1I
- For M3:
  - N/A

5.3.2 UTRA Idle

For UEs in UTRA Idle mode Logged MDT procedures as described in 5.1.1 apply.

Logged MDT measurements retrieval is carried on Signalling Radio Bearer SRB4.

Annex A (informative): Coverage use cases

The MDT data reported from UEs may be used to monitor and detect coverage problems in the network. Some examples of use cases of coverage problem monitoring and detection are described in the following:

- **Coverage hole:** A coverage hole is an area where the signal level SNR (or SINR) of both serving and allowed neighbor cells is below the level needed to maintain basic service (SRB & DL common channels), i.e. coverage of PDCCH. Coverage holes are usually caused by physical obstructions such as new buildings, hills, or by unsuitable antenna parameters, or just inadequate RF planning. UE in coverage hole will suffer from call drop and radio link failure. Multi-band and/or Multi-RAT UEs may go to other network layer instead.

- **Weak coverage:** Weak coverage occurs when the signal level SNR (or SINR) of serving cell is below the level needed to maintain a planned performance requirement (e.g. cell edge bit-rate).

- **Pilot Pollution:** In areas where coverage of different cells overlap a lot, interference levels are high, power levels are high, energy consumption is high and cell performance may be low. This problem phenomenon has been called 'pilot pollution', and the problem can be addressed by reducing coverage of cells. Typically in this situation UEs may experience high SNR to more than one cell and high interference levels.

- **Overshoot coverage:** Overshoot occurs when coverage of a cell reaches far beyond what is planned. It can occur as an 'island' of coverage in the interior of another cell, which may not be a direct neighbor. Reasons for overshoot may be reflections in buildings or across open water, lakes etc. UEs in this area may suffer call drops or high interference. Possible actions to improve the situation include changing the coverage of certain cells and mobility blacklisting of certain cells.

- **Coverage mapping:** There should be knowledge about the signal levels in the cell areas in order to get a complete view for the coverage and be able to assess the signal levels that can be provided in the network. This means that there should be measurements collected in all parts of the network, and not just in the areas where there are potential coverage issues.

- **UL coverage:** Poor UL coverage might impact user experience in terms of call setup failure / call drop / poor UL voice quality. Therefore, coverage should be balanced between uplink and downlink connections. Possible UL coverage optimization comprises adapting the cellular coverage by changing the site configuration (antennas) but also about adjusting the UL related parameters in the way that they allow optimized usage of UL powers in different environments.

Annex B (informative): Change history

Change history					
Date	**WG #**	**WG Doc.**	**Subject/Comment**	**Old**	**New**
2010/01	R2#68bis	R2-100845	Skeleton TS endorsed	0.0.0	0.1.0
2010/01	R2#68bis	R2-100846	Initial content provided	0.1.0	0.2.0
2010/02	R2#69	R2-101800	Logged and Immediate MDT definitions added Requirements introduced Measurement Configuration/Reporting principles clarified	0.2.0	0.2.1
2010/02	R2#69	R2-101891	RAN2 approved TS v0.3.0	0.2.1	0.3.0
2010/04	R2#69bis	R2-102623	- General principles for support of Logged MDT included - Location Information principles for Logged MDT introduced - MDT Context handling for Logged MDT introduced - Report availability indicator added to 5.1.3 - Annex A	0.3.0	0.3.1
2010/04	R2#69bis	R2-102656	- Editorial changes	0.3.1	0.3.2
2010/04	R2#69bis	R2-102667	RAN2 approved TS v0.4.0	0.3.2	0.4.0
2010/05	R2#70	R2-103400	Logged MDT configuration and reporting principles added Periodical measurement configuration rules for Logged MDT added SRB for Logged MDT identified Measurements and triggers for Immediate MDT identified	0.4.0	0.4.1
2010/05	R2#70	R2-103456	RAN2 approved TS v0.5.0	0.4.1	0.5.0
2010/06	R2#70bis	R2-103991	Editorial changes: - New text organization in 5.1: split in two sections for Logged MDT and Immediate MDT - MDT Reporting mode in 4.1 update to clarify the requirement on feature support - FFS on extension across RAT aligned to RAN#69 agreement - Retrieved data removal requirement aligned to RAN2#70 agreement	0.5.0	0.5.1
2010/06	R2#70bis	R2-104073	RAN2 approved TS v0.6.0	0.5.1	0.6.0
2010/06	R2#70bis	R2-104074	- Logged MDT configuration message sequence added in 5.1.1.1 - Measurement area scope identified - Time stamping principles added - MDT configuration/log handling at PLMN change introduced - Validity timer for non-retrieved data defined - GNSS location information details defined - RLF enhancements on location information defined - MDT applicability for UTRA states added	0.6.0	0.6.1
2010/06	R2#70bis	R2-104206	Clarification on sending availability indicator in another RAT added	0.6.1	0.6.2
2010/06	R2#70bis	R2-104212	RAN2 approved TS v0.7.0	0.6.2	0.7.0
2010/08	R2#71	R2-104950	Agreed text proposal in R2-104303 on clarification on logged MDT data retrieval added MDT applicability for particular UE states clarified in corresponding sections Time stamp details included in 5.1.1.3.3 MDT handling during handover added in 5.1.2.3 Agreed text proposal in R2-104678 to address SA5 progress added in 5.1.3 Assumptions on memory size limit capability added in 5.1.4 Further RLF enhancements listed as FFS in 5.2.1.2	0.7.0	0.7.1
2010/08	R2#71	R2-105238	Clarification on idle logging applicability to 'camped normally' state in 5.1.1.2. added FFS on logged data clearance in shared network scenarios added Submitted to TSG RAN for information	0.7.1	1.0.0
2010/10	R2#71b	R2-105787	Editorial and formatting changes	1.0.0	1.0.1

2010/10	R2#71b	R2-105877	Logged MDT reports details on neighbours details added Accurate location information validity clarified UE memory size reserved for Logged MDT added Transport of MDT logs using multiple RRC messages defined Logging handling at PLMN change clarified	1.0.1	1.0.2
2010/10	R2#71b	R2-106018	RAN2 approved TS v1.1.0	1.0.2	1.1.0
2010/11	R2#72	R2-106682	Requirement on Dependency on Trace added Validity time for accurate location information in Immediate MDT added Introduction of UTRA 1.28 TDD metrics	1.1.0	1.1.1
2010/11	R2#72	R2-106936	RAN2 approved TS v2.0.0	1.1.1	2.0.0

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2010-12	RP-50	RP-101162	-	-	TS 37.320 approved b RAN #50	2.0.0	10.0.0
2011-03	RP-51	RP-110282	0001	-	Clarifications on MDT initiation	10.0.0	10.1.0
	RP-51	RP-110282	0002	-	Clear MDT configuration and logs when the UE is not registered	10.0.0	10.1.0
	RP-51	RP-110282	0003	1	MDT stage 2 clarifications	10.0.0	10.1.0
	RP-51	RP-110282	0004	-	On memory size limitation for Logged MDT	10.0.0	10.1.0
	RP-51	RP-110282	0005	-	UE Capabilities for MDT	10.0.0	10.1.0
	RP-51	RP-110282	0006	-	Validity time for location information in Immediate MDT	10.0.0	10.1.0
	RP-51	RP-110282	0008	-	Correction to include CDMA2000 reporting for neighbouring cells	10.0.0	10.1.0
	RP-51	RP-110282	0012	-	Small Carifications and Corrections to 37.320	10.0.0	10.1.0
	RP-51	RP-110282	0013	-	Trace parameters for MDT configuration	10.0.0	10.1.0

History

Document history		
V10.1.0	April 2011	Publication