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TECHNICAL SPECIFICATION

**Universal Mobile Telecommunications System (UMTS);
LTE;
5G;
Telecommunication management;
Quality of Experience (QoE) measurement collection;
Control and configuration
(3GPP TS 28.405 version 16.0.0 Release 16)**

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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:

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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.

In the present document, modal verbs have the following meanings:

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shall not indicates an interdiction (prohibition) to do something

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The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

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need not indicates permission not to do something

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can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management, as identified below:

TS 28.404: "Quality of Experience (QoE) measurement collection; Concepts, use cases and requirements";

TS 28.405: "Quality of Experience (QoE) measurement collection; Control and configuration";

TS 28.406: "Quality of Experience (QoE) measurement collection; Information definition and transport".

One main motivation of mobile network evolution is to improve the user experience, which is why the evaluation of the user experience at the UE side is vital to network operators. This is especially true when the operators provide high bit rate real-time services like streaming services (typically video services), where even intermittent quality degradation is very annoying. Many of these streaming services are a significant part of the commercial traffic growth rate, therefore the focus is on the end users' experience.

Quality of Experience (QoE) information collection provides detailed information at session level on a number of UEs.

The capability to log information within a UE, and in particular the QoE of an end user service, initiated by an operator, provides the operator with QoE information. The collected information (specified in 3GPP TS 26.247 [6]) cannot be deduced from performance measurements in the mobile network.

The QoE information is information collected by the end user application in the UE.

The QoE information is collected by the management system for analysis and/or KPI calculations.

1 Scope

The present document addresses the mechanisms used for the function Quality of Experience (QoE) measurement collection in UMTS and LTE. The measurements that are collected are DASH [6] and MTSI [7] measurements.

The function includes collecting QoE information from UEs frequenting a specified area or an individual UE for a specified end user service/end user service type. The document describes the activation and deactivation of a network request session, UE request session and recording session and also the reporting of recorded information [2].

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 28.404: "Telecommunication management;Quality of Experience (QoE) measurement collection; Concepts, use cases and requirements".

[3]   3GPP TS 28.308: "Management of Quality of Experience (QoE) measurement collection Integration Reference Point (IRP); Information Service (IS)".

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

[5]   3GPP TS 27.007: "AT command set for User Equipment (UE)".

[6]   3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

[7]   3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction".

[8]   3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".

[9]   3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[10]   3GPP TS 25.413: "UTRAN Iu interface Radio Access Network Application Part (RANAP) signalling".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

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

3.2 Symbols

Void.

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].

DM   Domain Manager
MCE   Measurement Collector Entity
NB   Node B
QMC   QoE Measurement Collection
QoE   Quality of Experience

4 Quality of Experience (QoE) measurement collection

4.1 Management based activation in UTRAN

4.1.1 Activation of measurement collection job and reporting of collected information in UTRAN

The parameters for the network request session are sent from the management system to the RNCs that host the cells that are included in the collection job request in the `activateAreaQMCJob` operation [3]. The RNC starts a network request session, with the `Network request session id` [3] given in `activateAreaQMCJob` operation [3]. For the duration of the network request session, the RNC(s) checks for connections where the UE has the `UE Application Layer Measurement Capability` [10]. The `UE Application Layer Measurement Capability` is sent from the UE to RNC (via the core network) in message `INITIAL UE MESSAGE` [10].

When a session is found that has a UE with the `UE Application Layer Measurement Capability`, the RNC starts a UE request session by sending a `MEASUREMENT CONTROL` message [4] to the UE via the NB.

The AT command +CAPPLEVMC [5] activates provisioning of measurement reporting from the lower layers to the application within the UE by an unsolicited result code +CAPPLEVMC. When information about a measurement report is received in the UE from the network, the unsolicited result code +CAPPLEVMC contains the relevant parameters (service_type, start_stop-indication and config-file & config-file length if applicable) that are provided from the lower layers in the UE to the application.
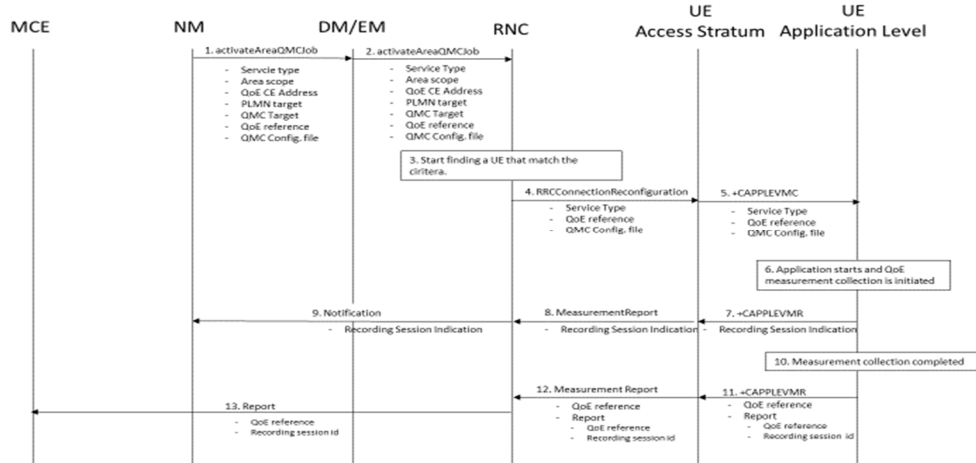

Figure 4.1.1-1: QMC activation and reporting in UTRAN

1. The NM sends `activateAreaQMCJob` to DM/EM that controls the impacted RNC(s), and includes the parameters: `serviceType`, `areaScope`, `qoECollectionEntityAddress`, `pLMNTarget`, `qMCTarget`, `qoEReference` and QMC configuration file.

2. The DM/EM forwards `activateAreaQMCJob` to impacted RNC(s), and includes the parameters: `serviceType`, `areaScope`, `qoECollectionEntityAddress`, `pLMNTarget`, `qMCTarget`, `qoEReference` and QMC configuration file.

3. The RNC checks for connections where the UE has the `UE Application Layer Measurement Capability` [10] that match the criteria for `serviceType` in the `activateAreaQMCJob`.

4. When a connection is found that has the `UE Application Layer Measurement Capability` [10], the RNC start a UE request session and stores the associated `QoECollectionEntityAddress`, sends the message `RRCConnectionReconfiguration` to the UE, and includes the following: `serviceType`, `qoEReference` and QMC configuration file.

5. The access stratum in the UE sends the AT command +CAPPLEVMC to application level and includes the following: `serviceType`, `qoEReference` and QMC configuration file.

6. When the application in the `serviceType` starts, the QMC is initiated.

7. The application layer sends the AT command +CAPPLEVMR including a recording session indication that a session has started to the access stratum.

8. The UE sends the message `MeasurementReport` including the recording session indication to the RNC.

9. The RNC sends a notification including the recording session indication to the NM.

10. When the QMC is completed, the recorded information is collected in a QMC report [6], [7], including `qoEReference` and `recordingSessionId`. The `qoEReference`, Client Id [6], [7] in the reporting container (that represent the UE request session), and `recordingSessionId` are needed in the QMC collection entity for post processing purposes.

11. The application layer sends the AT command +CAPPLEVMR including `qoEReference` and the QMC report to the access stratum.

12. The UE sends the message `MeasurementReport` including `qoEReference` and the QMC report to the RNC.

13. The RNC sends the QMC report to the MCE associated to the `qoEReference`.

4.1.2 Handling of measurement collection at handover in UTRAN

4.1.2.1 Handover between cells within an RNC

When handover is made, the measurement area is checked.

- If the mobile is inside the measurement area after the handover, the RNC sends in an indication that the UE is inside the measurement area in the `RRCConnectionReconfiguration` message [4] to the UE. The UE send the +CAPPLEVMC AT command [5] to the application to inform that recording shall start if the application becomes active (when the UE moves into the measurement area).

- If the mobile has moved outside the measurement area, there is no indication that the UE is inside the measurement area in the `RRCConnectionReconfiguration` message [4] from the RNC to the UE. The UE sends the +CAPPLEVMC AT command [5] to the application to inform that recording shall not be started even if the application becomes active.

4.1.2.2 Handover between RNCs

The figure 4.1.2.2-1 and the text below describes the handling at handover between RNCs.
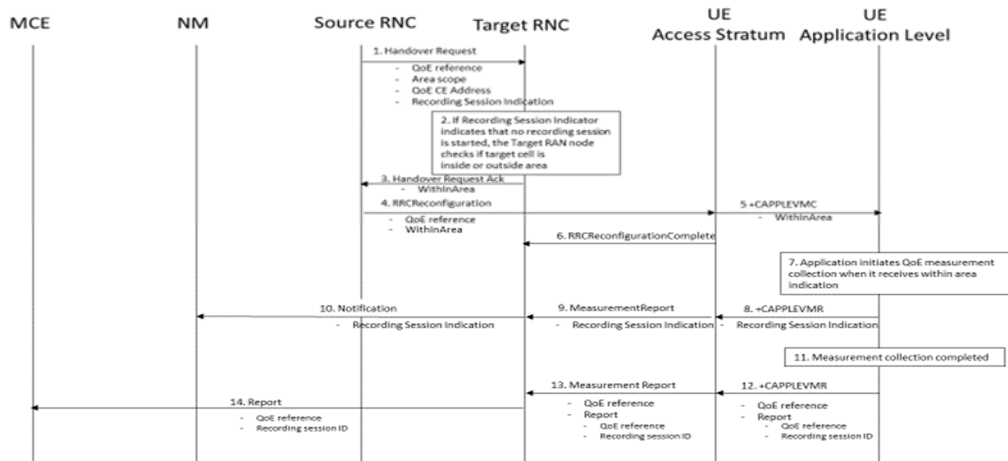
Figure 4.1.2.2-1: Handling of QMC activation in case of handover in UTRAN

1. Source RNC sends the message `HandoverRequest` to Target RNC and includes `areaScope`, `qoECollectionEntityAddress` and a recording session indication indicating whether a recording session has started.

2. If a recording session has not started, the target RNC checks if the target cell is inside the `areaScope` or not.

3. The target RNC sends the message Handover Request Ack to the source RNC and indicates if the target cell is inside or outside the `areaScope` in the `WithinArea` IE.

4. The source RNC sends the message `RRCReconfiguration` to the UE indicating if the target cell is inside or outside the `AreaScope` in the `WithinArea` IE.

5. The access stratum in the UE sends the AT command +CAPPLEVMC to application level indicating if the target cell is inside or outside the `areaScope` in the `WithinArea` IE.

6. The UE sends the message `RRCReconfigurationComplete` to the RNC.

7. When the application becomes active, QMC is initiated if the UE is inside the `areaScope` as indicated in the `WithinArea` IE.

8. The application layer sends the AT command +CAPPLEVMR including a recording session indication to the access stratum.

9. The UE sends the message MeasurementReport including the recording session indication to the RNC.

10. The RNC sends a notification including the recording session indication to the NM.

11. When the QMC is completed, the recorded information is collected in a QMC report [6] and [7]. including `qoEReference` and `recordingSessionId`. The `qoEReference`, Client Id [6] and [7] in the reporting container (that represent the UE request session) and `recordingSessionId` are needed in the QoE collection entity for post processing purposes.

12. The application layer sends the AT command +CAPPLEVMR including `qoEReference` and the QMC report to the access stratum.

13. The UE sends the message `MeasurementReport` including `qoEReference` and the QMC report to the RNC.

14. The RNC sends the QMC report to the MCE associated to the `qoEReference`.

4.1.3 Deactivation of measurement collection job in UTRAN

4.1.3.1 Forced deactivation in UTRAN

If the operator technician or the management application wants to deactivate a measurement collection job before the pre-set time has expired, the management system sends the `deactivateQMCJob` operation [3] to the RNC. The RNC sets the network request session to ended, but does not delete the `UE request session id` and the `Collection Entity Address` parameters [3], as the UE still may send reports which shall be send to the collection centre. For UE request sessions which have reported that a recording session is started, the RNC sends the `MeasurementControl` message [4] with the `DeactivateJob` request to relevant UEs. The Access stratum sends +CAPPLEVMC AT command [5] to the application with the `DeactivateJob` request. The application stops the recording session and stops recording of the requested information. The `UE request session id` and the `Collection Entity Address` parameters [3] in the RNC are deleted when the UE request session is ended.

4.1.3.2 Deactivation of recording session in UTRAN

Regardless of whether the pre-set time has elapsed or not, the recording session continues to be active until the session for the application is ended.

4.2 Management based activation in LTE

4.2.1 Activation of measurement collection job and reporting of collected information in LTE

The parameters for the network request session are sent from the management system to the eNBs that host the cells that are included in the collection job request in the `activateAreaQMCJob` operation [3]. The eNB starts a network request session, with the `Network request session id` [3] given in `activateAreaQMCJob` operation [3]. For the duration of the network request session, the eNB(s) checks for connections where the UE has the `QoE-MeasReport` capability [8] for collection of streaming services or the `QoE-MTSI-MeasReport` capability [8] for collection of MTSI services. The UE capability is sent from the UE to eNB via the core network in message `UE CAPABILITY INFO INDICATION` [9].

When a session is found that has a UE with the wanted UE capability, the eNB starts a UE request session and sends a `RRCConnectionReconfiguration` [8] to the UE.

The AT command +CAPPLEVMC [5] activates provisioning of measurement reporting from the lower layers to the application within the UE by an unsolicited result code +CAPPLEVMC. When information about a measurement report is received in the UE from the network, the unsolicited result code +CAPPLEVMC contains the relevant parameters (service_type, start_stop-indication and config-file & config-file length if applicable) that are provided from the lower layers in the UE to the application.
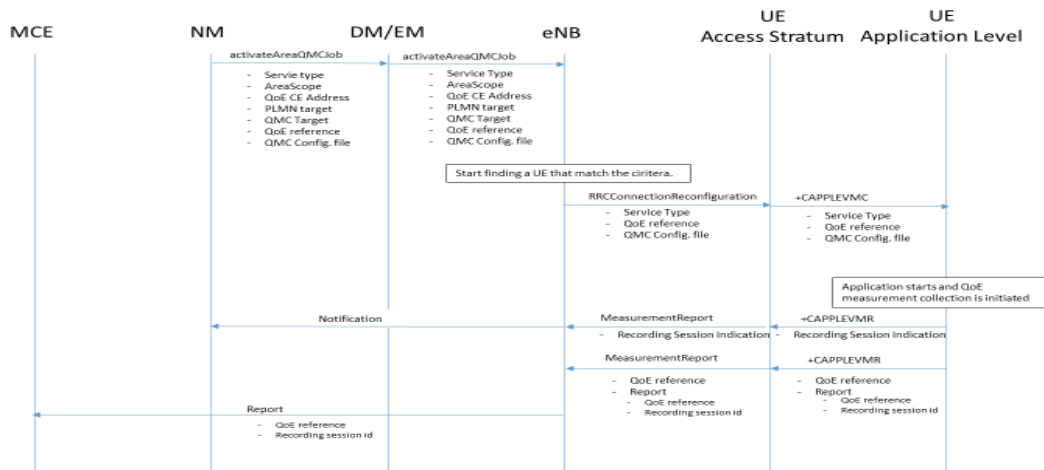
Figure 4.2.1-1: QMC activation and reporting in LTE

1. The NM sends `activateAreaQMCJob` to DM/EM that controls the impacted eNB(s), and includes the parameters: `serviceType`, `areaScope`, `qoECollectionEntityAddress`, `pLMNTarget`, `qoETarget`, `qoEReference` and QMC configuration file.

2. The DM/EM forwards `activateAreaQMCJob` to impacted eNB(s), and includes the parameters: `serviceType`, `areaScope`, `qoECollectionEntityAddress`, `pLMNTarget`, `qoETarget`, `qoEReference` and QMC configuration file.

3. The eNB checks for connections where the UE has the UE capability [9] that match the criteria for `serviceType` in the `activateAreaQMCJob`.

4. When a connection is found that has the wanted UE capability [9], the eNB starts a UE request session and stores the associated `QoECollectionEntityAddress`, sends the message RRCConnectionReconfiguration to the UE, and includes the following: `serviceType`, `qoEReference` and QMC configuration file.

5. The access stratum in the UE sends the AT command +CAPPLEVMC to application level and includes the following: `serviceType`, `qoEReference` and QMC configuration file.

6. When the application in the serviceType starts, the QMC is initiated.

7. The application layer sends the AT command +CAPPLEVMR including a recording session indication that indicates that a session is started to the access stratum.

8. The UE sends the message `MeasReportAppLayer` including the recording session indication to the eNB.

9. The eNB sends a notification including the recording session indication to the NM.

10. When the QMC is completed, the recorded information is collected in a QMC report [6], [7], including `qoEReference` and `recordingSessionId`. The `qoEReference`, Client Id [6] and [7] in the reporting container (that represent the UE request session), and `recordingSessionId` are needed in the QMC collection entity for post processing purposes.

11. The application layer sends the AT command +CAPPLEVMR including `qoEReference` and the QMC report to the access stratum.

12. The UE sends the message `MeasReportAppLayer` including `qoEReference` and the QMC report to the eNB.

13. The eNB sends the QMC report to the MCE associated to the `qoEReference`.

## 4.2.2 Handling of measurement collection at handover in LTE

4.2.2.1 Handover between cells within an eNB

When handover is made and no `Recording session id` is provided, the measurement area is checked.

- If the mobile is inside the measurement area after the handover, the eNB sends in an indication that the UE is inside the measurement area in the `RRCConnectionReconfiguration` message [8] to the UE. The UE send the +CAPPLEVMC AT command [5] to the application to inform that recording shall start if the application becomes active (when the UE moves into the measurement area).

- If the mobile has moved outside the measurement area, there is no indication that the UE is inside the measurement area in the `RRCConnectionReconfiguration` message [8] from the eNB to the UE. The UE sends the +CAPPLEVMC AT command [5] to the application to inform that recording shall not be started even if the application becomes active.

4.2.2.2 Handover between eNBs

The figure 4.2.2.2-1 and the text below describes the handling at handover between eNBs.
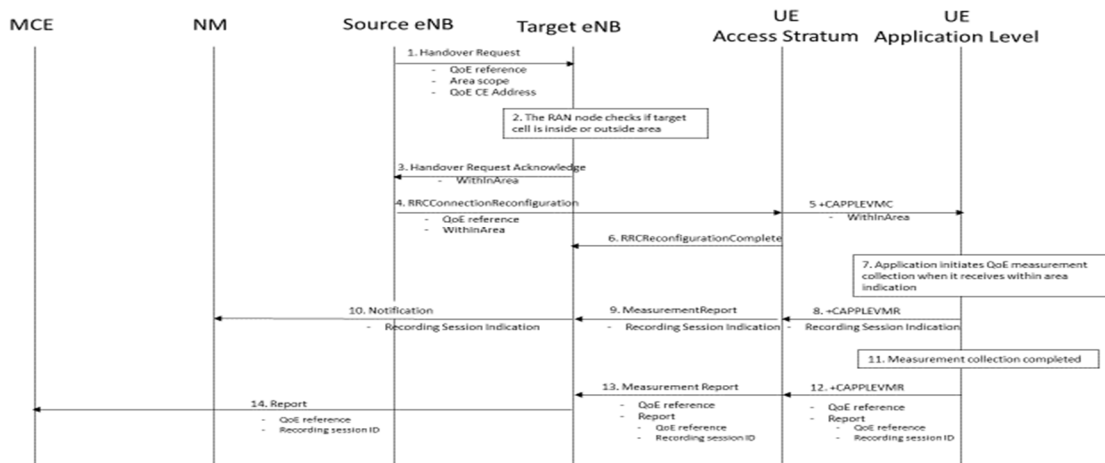
Figure 4.2.2.2-1: Handling of QMC activation in case of handover in LTE

1. Source eNB sends the message `HandoverRequest` to Target eNB and includes `areaScope` and `qoECollectionEntityAddress`.

2. The target eNB checks if the target cell is inside the `areaScope` or not.

3. The target eNB sends the message `HandoverRequestAcknowledge` to the source eNB and indicates if the target cell is inside or outside the `areaScope` in the `WithinArea` IE.

4. The source eNB sends the message `RRCConnectionReconfiguration` to the UE indicating if the target cell is inside or outside the Area in the `WithinArea` IE.

5. The access stratum in the UE sends the AT command +CAPPLEVMC to application level indicating if the target cell is inside or outside the `areaScope` in the `WithinArea` IE.

6. The UE sends the message `RRCConnectionReconfigurationComplete` to the eNB.

7. When the application becomes active, QMC is initiated if the UE is inside the `areaScope` as indicated in the `WithinArea` IE.

8. The application layer sends the AT command +CAPPLEVMR including a recording session indication indicating that a session has started to the access stratum.

9. The UE sends the message `MeasReportAppLayer` including the recording session indication to the eNB.

10. The eNB sends a notification including the recording session indication to the NM.

11. When the QMC is completed, the recorded information is collected in a QMC report [6], [7]. including `qoEReference` and `recordingSessionId`. The `qoEReference`, Client Id [6] and [7] in the reporting container (that represent the UE request session) and `recordingSessionId` are needed in the QoE collection entity for post processing purposes.

12. The application layer sends the AT command +CAPPLEVMR including `qoEReference` and the QMC report to the access stratum.

13. The UE sends the message `MeasReportAppLayer` including `qoEReference` and the QMC report to the eNB.

14. The eNB sends the QMC report to the MCE associated to the `qoEReference`.

4.2.3 Deactivation of measurement collection job in LTE

4.2.3.1 Forced deactivation

When the operator technician or the management application wants to deactivate a measurement collection job, the management system sends the `deactivateQMCJob` operation [3] to the eNB. The eNB sets the network request session to ended, but does not delete the `UE request session id` and the `Collection Entity Address` parameters [3], as the UE still may send reports which shall be send to the collection centre. For UE request sessions which have reported that a recording session is started, the eNB sends the `RRCConnectionReconfiguration` message [8] to relevant UEs. The `RRCConnectionReconfiguration` message is including *measConfigAppLayer* set to discard application layer measurement report information in *otherConfig* [8]. The Access stratum sends +CAPPLEVMC AT command [5] to the application with the discard request. The application stops the recording session and stops recording of the requested information. The `UE request session id` and the `Collection Entity Address` parameters [3] in the eNB are deleted when the UE request session is ended.

4.2.3.2 Deactivation of recording session

Regardless of whether the pre-set time has elapsed or not, the recording session continues to be active until the session for the application is ended.

4.2.4 Temporary stop and restart of QoE information reporting during RAN overload in LTE

In case of overload in RAN, the eNB may temporarily stop the reporting from the UE by send the `RRCConnectionReconfiguration` message [8] to relevant UEs. The `RRCConnectionReconfiguration` message is including *measConfigAppLayer* set to temporarily stop application layer measurement reporting in *otherConfig* [8]. The Access stratum sends +CAPPLEVMC AT command [5] to the application with the temporary stop request. The application stops the reporting and stops recording further information when the data in the reporting container is used. Then the recorded data is kept until it is reported or when the UE request session is ended.

When the overload situation in RAN is ended the eNB restart the reporting from the UE by send the `RRCConnectionReconfiguration` message [8] to relevant UEs. The `RRCConnectionReconfiguration` message is including *measConfigAppLayer* set to restart application layer measurement reporting in *otherConfig* [8]. The Access stratum sends +CAPPLEVMC AT command [5] to the application with the restart request. The application restarts the reporting and recording if it was stopped.

5 Quality of Experience (QoE) measurement management parameters

5.1 QoE collection entity address (M)

This is a parameter which defines the IP address to which the QMC records shall be transferred. Ipv4 or Ipv6 address(es) may be used.

5.2 QoE reference (M)

The QoE reference parameter specify the network request session. The QoE reference shall be globally unique therefore it is composed as follows:

MCC+MNC+QMC ID, where the MCC and MNC are coming with the trace activation request from the management system to identify one PLMN containing the management system, and QMC ID is a 3 byte Octet String.

The QMC ID is generated by the management system or the operator.

It is used to identify the QoE measurement collection job in the traffic nodes and in the measurement collection centre.

5.3 PLMN target (CM)

This parameter defines the PLMN for which sessions shall be selected in the network request session in case of area based QMC when several PLMNs are supported in the RAN (this means that shared cells and not shared cells are allowed for the specified PLMN. Furthermore, several PLMNs can be used for not shared RAN cases as well as for shared RAN cases.). Only the sessions may be selected where the PLMN that the UE reports as selected PLMN is the same as the PLMN Target.

Note that the PLMN Target might differ from the PLMN specified in the Network Request Session Id, as that specifies the PLMN that is containing the management system requesting the Trace Session from the NE.

The parameter is mandatory if network sharing is deployed.

5.4 Area scope (CM)

The area scope parameter defines the area in terms or cells or Tracking Area/Routing Area/Location Area where the QMC shall take place. If the parameter is not present the QMC shall be done throughout the PLMN specified in PLMN target.

The area scope parameter in UMTS is either:

- List of cells, identified by CGI. Maximum 32 CGI can be defined.

- List of Routing Area, identified by RAI. Maximum of 8 RAIs can be defined.

- List of Location Area, identified by LAI. Maximum of 8 LAIs can be defined.

The area scope parameter in LTE is either:

- list of cells, identified by E-UTRAN-CGI. Maximum 32 CGI can be defined.

- List of Tracking Area, identified by TAC. Maximum of 8 TAC can be defined.

The parameter is mandatory if area based QMC is requested.

5.5 QMC configuration file (container) (M)

The QMC configuration file is a container that is specified in [6] or [7].

5.6 QMC target (M)

The QMC target parameter specifies it the QMC is area based or individual UE based.

- Area based QMC (0)

NOTE: Individual UE based QMC is not supported in this release.

5.7 Recording session id (M)

This parameter shall be a 2 byte octet string. The recording session id shall be the same for the whole session in the application, while for each different session in the application the recording session id shall be changed. The recording session id is generated by the application in the UE.

It is used in the measurement collection centre to identify which session within a UE has collected information in the application.

5.8 Service type (M)

Which kind of service that shall be recorded.

- DASH (0)

- MTSI (1)

DASH measurements are specified in [6]. MTSI measurements are specific in [7].

Annex A (informative):
Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
						Skeleton	0.0.0
2018-02	SA5#117	S5-181504				Introduction and scope	0.1.0
		S5-181505				Add activation and deactivation for UTRAN	
2018-08	SA5#120	S5-185352				R16 pCR 28405-010 Activation of QoE data collection	0.2.0
		S5-185353				R16 pCR 28405-010 Handling of measurements collection at handover	
		S5-185354				R16 pCR 28405-010 Reporting of collected data	
2018-10	SA5#121	S5-186271				pCR Rel-16 28.405-020 Include MTSI measurements	0.3.0
2018-11	SA5#122	S5-187115				pCR R16 28.405-030 Include QoE parameters	0.4.0
		S5-187117				pCR R16 28.405-030 Add forced deactivation	
2019-03	SA5#124	S5-192188				pCR R16 28405-040 Remove duplicated references	0.5.0
		S5-192189				pCR R16 28405-040 Activating and reporting in UTRAN	
		S5-192340				pCR R16 28405-040 Handover handling in UTRAN	
2019-04	SA5#125	S5-193211				pCR R16 28405-050 Change clause structure	0.6.0
		S5-193212				pCR R16 28405-050 Introduce missing abbreviations	
		S5-193213				Introduction of deactivation of QMC in LTE	
		S5-193215				Introduction of management based activated QMC handling at handover for LTE	
		S5-193216				Introduction of Management based activation QMC for LTE	
2019-07	SA5#125AH	S5-194292				pCR R16 28.405-060 Editor's clean up	0.7.0
		S5-194299				pCR R16 28.405-060 Deactivation of measurement job in UTRAN	
		S5-194300				pCR R16 28.405-060 Handling of handover in Signalling based activation in UTRAN	
		S5-194302				pCR R16 28.405-060 Correction of Management based activation in LTE	
		S5-194427				pCR R16 28.405-060 Correction of Management based activation in UTRAN	
2019-08	SA5#126	S5-195511				Forced deactivation and RAN overload	0.8.0
2019-09	SA#85	SP-190767				Presented for information	1.0.0
2019-10	SA5#127	S5-196365				Editorial revision for Introduction	1.1.0
		S5-196504				Correcting UE request session id	
		S5-196505				Correcting recording session id	
2020-03	SA5#129e	S5-201391				Rapporteur's clean up (using new TS template)	1.2.0
2020-03	SA5#129e						1.2.0
2020-04	SA5#130e	S5-202453				pCR R16 28.405-120 Update of R16	1.3.0
2020-06	SA5#131e	S5-203273				pCR R16 28405-130 Alignment of QMC terminology	1.4.0
2020-06	SA5#131e					EditHelp review (editorial, introduction of explanation of modal verbs, removal of unused reference and renumbering of the references with higher number).	1.4.1
2020-06	SA#88e	SP-200476				Presented for approval	2.0.0
2020-07	SA#88e					Upgrade to version under change control	16.0.0

History

Document history		
V16.0.0	July 2020	Publication