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**Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Key Performance Indicators (KPI) for Evolved Universal
Terrestrial Radio Access Network (E-UTRAN): Definitions
(3GPP TS 32.450 version 15.2.0 Release 15)**



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Foreword

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

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Introduction

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

- 32.451: Key Performance Indicators (KPI) for E-UTRAN; Requirements;
- 32.450: Key Performance Indicators (KPI) for E-UTRAN; Definitions. Key Performance Indicators (KPI).

1 Scope

The present document specifies definitions of Key Performance Indicators (KPIs) for E-UTRAN.

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] ITU-T Recommendation E.800: "Terms and Definitions related to Quality of Service and Network Performance including Dependability".
- [2] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [3] 3GPP TS 32.404: "Telecommunication management; Performance Management (PM); Performance measurements - Definitions and template".
- [4] 3GPP TS 32.405: "Telecommunication management; Performance Management (PM); Performance measurements Universal Terrestrial Radio Access Network (UTRAN) ".
- [5] 3GPP TS 32.406: "Telecommunication management; Performance Management (PM); Performance measurements Core Network (CN) Packet Switched (PS) domain".
- [6] 3GPP TS 32.407: "Telecommunication management; Performance Management (PM); Performance measurements Core Network (CN) Circuit Switched (CS) domain".
- [7] 3GPP TS 32.408: "Telecommunication management; Performance Management (PM); Performance measurements Teleservice".
- [8] 3GPP TS 32.409: "Telecommunication management; Performance Management (PM); Performance measurements IP Multimedia Subsystem (IMS)".
- [9] 3GPP TS 52.402: "Telecommunication management; Performance Management (PM); Performance measurements - GSM".
- [10] 3GPP TS 32.425: "Telecommunication management; Performance Management (PM); Performance measurements Evolved Universal Terrestrial Radio Access Network (E-UTRAN)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [2] 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 [2].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [2] 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 [2].

eNB	E-UTRAN Node B
EE	Energy Efficiency
EPS	Evolved Packet System
E-RAB	E-UTRAN Radio Access Bearer
E-UTRAN	Evolved UTRAN
kbit	kilobit (1000 bits)
KPI	Key Performance Indicator
KQI	Key Quality Indicator
LTE	Long Term Evolution
QoS	Quality of Service
RAT	Radio Access Technology
TTI	Transmission Time Interval
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Radio Access Network

4 KPI Overview

The following KPI categories are covered by the present document:

- Accessibility (see the definition in [1]).
- Retainability (see the definition in [1]).
- Integrity (see the definition in [1]).
- Availability
- Mobility
- Energy Efficiency

5 KPI Definitions Template

- a) Long name (Mandatory): This field shall contain the long and descriptive name of the KPI.
- b) Description (Mandatory): This field shall contain the description of the KPI. Within this field it should be given if the KPI is focusing on network or user view.
- c) Logical formula definition (Mandatory):
The logical formula should describe what the KPI formula is in logical way. The description of the formula is given in a written textual format without any measurement or counter names. E.g. a success rate KPI's logical formula is the successful event divided by all event.

- d) Physical formula definition (Optional):
This field should contain the KPI formula description using the 3GPP defined counter names.
This field can be used only if the counters needed for the KPI formula is defined in any of the 3GPP TS for performance measurements (TS 32.404 [3], TS 32.405 [4], TS 32.406 [5], TS 32.407 [6], TS 32.408 [7], TS 32.409 [8], TS 52.402 [9], TS 32.425 [10])
- e) Measurement names used for the KPI (Optional):
This section should list the measurement names used for the KPI.
This section can be filled out only when the underlying measurements for the KPI formula can be defined, i.e. physical formula definition is available.

- f) KPI Object (mandatory)
This section shall describe the object of the KPI. The object of the KPI is one or some of the following:

- UTRAN;
- GERAN;
- CS core;
- PS core;
- IMS;
- E-UTRAN.

The field can have multiple selection, e.g. for a network level end to end KPI the selection can be UTRAN+PS core network.

- g) KPI category (mandatory)
This section contains the classification of the KPI into one of the KPI categories listed in section 4

- h) Unit of the KPI (mandatory)
This section describes the unit of the KPI. The unit can be one of the following:

- percentage;
- time interval (second or millisecond);
- Erlang;
- bit/J;
- kbit/s.

- i) Type of the KPI (Mandatory)
This section describes the type of the KPI. The KPI type can be one of the following:

- MEAN: This KPI is produced to reflect a mean measurement value based on a number of sample results.
- RATIO: KPI is produced to reflect the percentage of a specific case occurrence to all the cases.
- CUM: This KPI is produced to reflect a cumulative measurement which is always increasing.

- j) Remark: (Optional)
This field is for any further information that is needed for the KPI definition.
Here it is proposed to define any additional information that would be needed for the KPI definition; e.g. the definition of a call in UTRAN.

6 E-UTRAN KPI Definitions

6.1 KPI Category "Accessibility"

6.1.1 E-RAB Accessibility

6.1.1.1 Definition

- E-RAB Accessibility.
- A KPI that shows probability for an end-user to be provided with an E-RAB at request.
- Probability success rate for E-RABs establishment. Successful attempts compared with total number of attempts for the different parts of the E-RAB establishment.

$$A1 = \text{InitialEPSBEstabSR} = \frac{\sum_{\text{cause}} \text{RRC.ConnEstabSucc.[Cause]}}{\sum_{\text{cause}} \text{RRC.ConnEstabAtt.[Cause]}} \times \frac{\sum \text{S1SIG.ConnEstabSucc}}{\sum \text{S1SIG.ConnEstabAtt}} \times \frac{\sum_{\text{QCI}} \text{ERAB.EstabInitSuccNbr.[QCI]}}{\sum_{\text{QCI}} \text{ERAB.EstabInitAttNbr.[QCI]}} \times 100$$

$$A2 = \text{AddedEPSBEstabSR} = \frac{\sum_{\text{QCI}} \text{ERAB.EstabAddSuccNbr.[QCI]}}{\sum_{\text{QCI}} \text{ERAB.EstabAddAttNbr.[QCI]}} \times 100$$

- RRC.ConnEstabAtt.Cause
RRC.ConnEstabSucc.Cause
S1SIG.ConnEstabAtt
S1SIG.ConnEstabSucc
ERAB.EstabInitAttNbr.QCI
ERAB.EstabInitSuccNbr.QCI
ERAB.EstabAddAttNbr.QCI
ERAB.EstabAddSuccNbr.QCI
- E-UTRAN
- Accessibility
- Percentage
- RATIO
- The definition of the service provided by E-UTRAN is E-RABs.

6.1.1.2 Extended definition

Mapping of end-user applications towards E-RABs can be different depending on operator strategy; hence the measurement shall be adjustable depending on operator E-RAB mapping strategy.

Table 1 Example of service mapping towards E-RABs

<i>Operator</i>	<i>Service</i>	<i>E-RAB mapping</i>
A	X	Initial E-RAB