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Technical Specification

**3rd Generation Partnership Project;
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Key Performance Indicators (KPI) for the
Evolved Packet Core (EPC); Definitions
(Release 11)**

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3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

http://www.3gpp.org

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.

1 Scope

The present document specifies Key Performance Indicators (KPIs) for the EPC.

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 32.426: "Telecommunication management; Performance Management (PM); Performance measurements Evolved Packet Core (EPC) network".

[3]   3GPP TS 32.410: "Telecommunication management; Key Performance Indicators (KPI) for UMTS and GSM".

3 Abbreviations

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

EPC   Evolved Packet Core network

4 KPI definitions template

KPI definitions template refers to 3GPP TS 32.410 [3].

5 EPC KPI definitions

5.1 Accessibility KPI

5.1.1 EPS Attach Success Rate

a) EPS attach success rate

b) This KPI describes the ratio of the number of successfully performed EPS attach procedures to the number of attempted EPS attach procedures for EPC network and is used to evaluate accessibility provided by EPS and network performance.

c) This KPI is obtained by successful EPS attach procedures divided by attempted EPS attach procedures.

d) $$EASR = \frac{\sum_{Type} MM.EpsAttachSucc.Type}{\sum_{Type} MM.EpsAttachAtt.Type} *100\%$$

e) MM.EpsAttachAtt.*Type*
MM.EpsAttachSucc.*Type*
Note: above measurements with subcounter .*Type* should be defined in 3GPP TS 32.426 [2].

f) EPC

g) Accessibility

h) Percentage

i) RATIO

5.1.2 Dedicated EPS Bearer Creation Success Rate

a) Dedicated EPS bearer creation success rate.

b) This KPI describes the ratio of the number of successfully performed dedicated EPS bearer creation procedures by PGW to the number of attempted dedicated EPS bearer creation procedures by PGW and is used to evaluate service availability provided by EPS and network performance.

c) This KPI is obtained by successful dedicated EPS bearer creation procedures divided by attempted dedicated EPS bearer creation procedures.

d) $$DEBCSR = \frac{SM.CreationPGWIniBearerSucc}{SM.CreationPGWIniBearerAtt} *100\%$$

e) SM.CreationPGWInitBearerAtt
SM.CreatationPGWInitBearerSucc
(See in 3GPP TS 32.426 [2])

f) EPC

g) Accessibility

h) Percentage

i) RATIO

5.1.3 Dedicated Bearer Set-up Time by MME (Mean)

a) Mean dedicated bearer set-up time by MME

b) This KPI describes the valid time per dedicated bearer set-up procedure by MME and is used to evaluate service accessibility provided by EPS and network performance.

c) This KPI is obtained by the valid time per dedicated bearer set-up procedure by MME

d) DBSTM= SM.EstabActDedicatedEpsBearerTimeMean

e) SM.EstabActDedicatedEpsBearerTimeMean (See in 3GPP TS 32.426 [2]).

f) EPC

g) Accessibility

h) Second

i) MEAN

5.1.4 Service Request Success Rate

a) Service request success rate.

b) This KPI describes the ratio of the number of successfully performed service request procedures by UE to the number of attempted service request procedures by UE and is used to evaluate service accessibility provided by EPS and network performance.

c) This KPI is obtained by successful service request procedures divided by attempted service request procedures.

d) $$SRSR = \frac{\sum\limits_{MME} SM.EpsServiceReqSucc}{\sum\limits_{MME} SM.EpsServiceReqAtt} * 100\%$$

e) SM.EpsServiceReqAtt
SM.EpsServiceReqSucc
(See in 3GPP TS 32.426 [2])

f) EPC

g) Accessibility

h) Percentage

i) RATIO

5.2 Mobility KPI

5.2.1 Inter-RAT Outgoing Handover Success Rate (EPS->GSM)

a) Inter-RAT outgoing handover success rate (EPS->GSM)

b) This KPI describes the ratio of the number of successfully performed outgoing handover procedures to the number of attempted outgoing handover procedures to evaluate inter RAT outgoing handover performance.

c) This KPI is obtained by the number of successful outgoing handover procedures divided by total number of attempted outgoing handover procedures from EPS to GSM network.

d) $IRATOHOSR = \dfrac{IRATHO.OutMMESucc.G}{IRATHO.OutMMEAtt.G} * 100\%$

e) IRATHO.OutMMEAtt.G
    IRATHO.OutMMESucc.G
    (See in 3GPP TS 32.426 [2])

f) EPC

g) Mobility

h) Percentage

i) RATIO

5.2.2 Inter-RAT Outgoing Handover Success Rate (EPS->UMTS)

a) Inter-RAT outgoing handover success rate (EPS->UMTS)

b) This KPI describes the ratio of the number of successfully performed outgoing handover procedures to the number of attempted outgoing handover procedures to evaluate inter RAT outgoing handover performance.

c) This KPI is obtained by the number of successful outgoing handover procedures divided by total number of attempted outgoing handover procedures from EPS to UMTS network.

d) $IRATOHOSR = \dfrac{IRATHO.OutMMESucc.U}{IRATHO.OutMMEAtt.U} * 100\%$

e) IRATHO.OutMMEAtt.U
    IRATHO.OutMMESucc.U
    (See in 3GPP TS 32.426 [2])

f) EPC

g) Mobility

h) Percentage

i) RATIO

5.2.3 Inter-RAT Outgoing Handover Success Rate (EPS->CDMA2000)

a)   Inter-RAT outgoing handover success rate (EPS->CDMA2000)

b)   This KPI describes the ratio of the number of successfully performed outgoing handover procedures to the number of attempted outgoing handover procedures to evaluate inter RAT outgoing handover performance.

c)   This KPI is obtained by the number of successful outgoing handover procedures divided by total number of attempted outgoing handover procedures from EPS to CDMA2000 network.

d) $\text{IRATOHOSR} = \dfrac{\text{IRATHO.OutMMESucc.C}}{\text{IRATHO.OutMMEAtt.C}} * 100\%$

e)   IRATHO.OutMMEAtt.C
     IRATHO.OutMMESucc.C
     (See in 3GPP TS 32.426 [2])

f)   EPC

g)   Mobility

h)   Percentage

i)   RATIO

5.2.4 Inter-RAT Incoming Handover Success Rate (GSM->EPS)

a)   Inter-RAT incoming handover success rate (GSM->EPS)

b)   This KPI describes the ratio of the number of successfully performed incoming handover procedures to the number of attempted incoming handover procedures to evaluate inter RAT incoming handover performance.

c)   This KPI is obtained by total number of successful incoming handover procedures divided by total number of attempted incoming handover procedures from GSM network to EPS

d) $\text{IRATIHOSR} = \dfrac{\text{IRATHO.IncMMESucc.G}}{\text{IRATHO.IncMMEAtt.G}} * 100\%$

e)   IRATHO.IncMMEAtt.G
     IRATHO.IncMMESucc.G
     (See in 3GPP TS 32.426 [2])

f)   EPC

g)   Mobility

h)   Percentage

i)   RATIO

5.2.5   Inter-RAT Incoming Handover Success Rate (UMTS ->EPS)

a)   Inter-RAT incoming handover success rate (UMTS ->EPS)

b)   This KPI describes the ratio of the number of successfully performed incoming handover procedures to the number of attempted incoming handover procedures to evaluate inter RAT incoming handover performance.

c)   This KPI is obtained by total number of successful incoming handover procedures divided by total number of attempted incoming handover procedures from UMTS network to EPS

d) $IRATIHOSR = \dfrac{IRATHO.IncMMESucc.U}{IRATHO.IncMMEAtt.U} * 100\%$

e)   IRATHO.IncMMEAtt.U
IRATHO.IncMMESucc.U
(See in 3GPP TS 32.426 [2])

f)   EPC

g)   Mobility

h)   Percentage

i)   RATIO

5.2.6   Inter-RAT Incoming Handover Success Rate (CDMA2000->EPS)

a)   Inter-RAT incoming handover success rate (CDMA2000->EPS)

b)   This KPI describes the ratio of the number of successfully performed incoming handover procedures to the number of attempted incoming handover procedures to evaluate inter RAT incoming handover performance.

c)   This KPI is obtained by total number of successful incoming handover procedures divided by total number of attempted incoming handover procedures from CDMA2000 network to EPS

d) $IRATIHOSR = \dfrac{IRATHO.IncMMESucc.C}{IRATHO.IncMMEAtt.C} * 100\%$

e)   IRATHO.IncMMEAtt.C
IRATHO.IncMMESucc.C
(See in 3GPP TS 32.426 [2])

f)   EPC

g)   Mobility

h)   Percentage

i)   RATIO

5.2.7   Tracking Area Update Success Rate

a)   Tracking area update success rate.

b)   This KPI describes the ratio of the number of successfully performed tracking area update procedures to the number of attempted tracking area update procedures and is used to evaluate mobility provided by EPS and network performance.

c)   This KPI is obtained by successful tracking area update procedures divided by attempted tracking area update procedures.

d) $\text{TAUSR} = \dfrac{\sum_{TA}(\text{MM.TauInterSgwSucc} + \text{MM.TauIntraSgwSucc})}{\sum_{TA}(\text{MM.TauInterSgwAtt} + \text{MM.TauIntraSgwAtt})} *100\%$

e)   MM.TauIntraSgwAtt
      MM.TauInterSgwAtt
      MM.TauIntraSgwSucc
      MM.TauInterSgwSucc
      (See in 3GPP TS 32.426 [2])

f)   EPC

g)   Mobility

h)   Percentage

i)   RATIO

5.3 Utilization KPI

5.3.1 Mean Active Dedicated EPS Bearer Utilization

a) Mean active dedicated EPS bearer utilization

b) This KPI describes the ratio of the mean number of active dedicated EPS bearer to the maximum number of active dedicated EPS bearers provided by EPC network, and it is used to evaluate utilization performance of EPC network.

c) This KPI is obtained by the mean number of dedicated EPS bearers in active mode divided by the system capacity.

d) $$\text{MADEBU} = \frac{\text{SM.MeanNbrActDedicatedBearer}}{\text{Capacity}} * 100\%$$

e) SM.MeanNbrActDedicatedBearer   (See in 3GPP TS 32.426 [2])
Capacity indicates maximum number of active dedicated EPS bearers provided by EPC node.

   Editor notes: Capacity definition is FFS.

f) EPC

g) Utilization

h) Percentage

i) RATIO

Annex A (informative):
Use case for KPIs

A.1 Use case for EPS attach success rate related KPI

It is necessary to evaluate accessibility performance provided by EPS. EPS attachment for a UE/user is important when they access network. If users or subscribers cannot attach to the PS network of EPS, they cannot access EPS. This KPI is focusing on network and user view.

A.2 Use case for inter-RAT handover related KPIs

Inter RAT handover success rate is used to evaluate stability and reliability performance of handover between EPS and GSM or UMTS or CDMA2000. If the KPI value is too low, call drop rate may be increased. This KPI is focusing on network and user view.

A.3 Use case for mean active dedicated EPS bearer utilization related KPI

Mean active dedicated EPS bearer utilization can be used to indicate system load level. If the value of this KPI is very high, it indicates system capacity is not enough, and needs to be increased. So it is an important indicator for EPC network optimization.

This KPI is focusing on network view.

A.4 Use case for dedicated EPS bearer creation success rate related KPI

If PGW can not create the dedicated bearer, then users cannot use the services provided by EPS successfully, which will influence the users' satisfactory to the network. So it is necessary to define dedicated EPS bearer creation success rate to evaluate accessibility performance provided by EPS and network performance, user behaviour is included.

This KPI is focusing on network and user view.

A.5 Use case for mean dedicated bearer set-up time by MME related KPI

Mean dedicated bearer set-up time by MME can be used to describe the duration between a UE requests a service and the service is successfully established, it can reflect the user satisfactory of high data rate service and network performance of dedicated bearer set-up. So it is useful to evaluate accessibility performance provided by EPS and network performance.

This KPI is focusing on network and user view.

A.6 Use case for service request success rate related KPI

Service Request procedure is one of the important NAS procedures which is triggered by the UE when it is in idle state and has some data to send or receive (after the paging procedure). If the service request success rate is lower than predefined threshold, the user experience of sending / receiving the data will be affected. So it is necessary to define service request success rate, the user behaviour is included.

This KPI is focusing on network and user view.

A.7 Use case for tracking area update success rate related KPI

Tracking area update success rate is useful to evaluate mobility provided by EPS. If a user fails to update the tracking area, the user may not be paged by network because the target tracking area can not be attached. If the tracking area update success rate is lower than a predefined threshold, the tracking areas maybe need to be re-planed. So it is necessary to define the tracking area update success rate, the user behaviour is included.

This KPI is focusing on network and user view.

Annex B (informative):
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Dec 2010	SP-50	SP-100766			Submitted to SA#50 for Information	0.4.1	1.0.0
Mar 2011	SP-51	SP-110117			Submitted to SA#50 for Approval	1.1.0	2.0.0
Mar 2011	--	--	--	--	Publication	2.0.0	10.0.0
2012-09	-	-	-	-	Update to Rel-11 version (MCC)	10.0.0	**11.0.0**