

ETSI TS 128 554 V15.6.0 (2023-04)



**5G;
Management and orchestration;
5G end to end Key Performance Indicators (KPI)
(3GPP TS 28.554 version 15.6.0 Release 15)**

[ETSI TS 128 554 V15.6.0 \(2023-04\)](#)

<https://standards.iteh.ai/catalog/standards/sist/802e5c72-e5af-4c54-9a1b-382ee06be1ff/etsi-ts-128-554-v15-6-0-2023-04>



Reference

RTS/TSGS-0528554vf60

Keywords

5G

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 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from:
<https://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at
<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://standards.iteh.aitec.org/standards/committee.aspx?b-382ee06be1ff/etsi>

If you find a security vulnerability in the present document, please report it through our
Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are 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 (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, 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.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, PLUGTESTS™, UMTS™ and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the **GSM** logo are trademarks registered and owned by the **GSM Association**.

Legal Notice

(standards.iteh.ai)

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. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <https://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

| | |
|--|-----------|
| Intellectual Property Rights | 2 |
| Legal Notice | 2 |
| Modal verbs terminology..... | 2 |
| Foreword..... | 4 |
| 1 Scope | 5 |
| 2 References | 5 |
| 3 Definitions and abbreviations..... | 5 |
| 3.1 Definitions | 5 |
| 3.2 Abbreviations | 5 |
| 4 End to end KPI concept and overview | 5 |
| 5 KPI definitions template..... | 6 |
| 6 End to end KPI definitions | 7 |
| 6.1 KPI Overview..... | 7 |
| 6.2 Accessibility KPI..... | 7 |
| 6.2.1 Registered Subscribers of Network and Network Slice Instance through AMF | 7 |
| 6.2.2 Registered Subscribers of Network through UDM | 7 |
| 6.2.3 Registration success rate of one single network slice instance..... | 8 |
| 6.3 Integrity KPI..... | 8 |
| 6.3.1 Latency of 5G Network | 8 |
| 6.3.1.0 KPI categories | 8 |
| 6.3.1.1 Downlink latency in gNB-DU..... | 8 |
| 6.3.2 Upstream throughput for network and Network Slice Instance | 9 |
| 6.3.3 Downstream Throughput for Single Network Slice Instance | 9 |
| 6.3.4 Upstream Throughput at N3 interface | 10 |
| 6.3.5 Downstream Throughput at N3 interface..... | 10 |
| 6.3.6 RAN UE Throughput..... | 10 |
| 6.3.6.1 Definition | 10 |
| 6.3.6.2 Extended definition | 11 |
| 6.4 Utilization KPI | 11 |
| 6.4.1 Mean number of PDU sessions of network and network Slice Instance..... | 11 |
| 6.4.2 Virtualised Resource Utilization of Network Slice Instance | 12 |
| Annex A (informative): Use cases for end to end KPIs..... | 13 |
| A.1 Use case for end-to-end latency measurements of 5G Network related KPI | 13 |
| A.2 Use case for number of registered subscribers of single network slice instance related KPI..... | 13 |
| A.3 Use case for upstream/downstream throughput for one single network slice instance related KPI..... | 13 |
| A.4 Use case for mean PDU sessions number in Network Slice instance | 13 |
| A.5 Use case for virtualised resource utilization of Network Slice instance related KPI | 14 |
| A.6 Use case for 5GS registration success rate of one single network slice instance related KPI..... | 14 |
| A.7 Use case for RAN UE throughput related KPI..... | 14 |
| Annex B (informative): Change history | 15 |
| History | 16 |

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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ETSI TS 128 554 V15.6.0 \(2023-04\)](#)

<https://standards.iteh.ai/catalog/standards/sist/802e5c72-e5af-4c54-9a1b-382ee06be1ff/etsi-ts-128-554-v15-6-0-2023-04>

1 Scope

The present document specifies end-to-end Key Performance Indicators (KPIs) for the 5G network and network slicing.

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] Void.
- [3] ITU-T Recommendation E.800: "Definitions of terms related to quality of service".
- [4] 3GPP TS 24.501: " Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [5] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP 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 3GPP TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

| | |
|------|---------------------|
| kbit | kilobit (1000 bits) |
| RTT | Round Trip Time |

4 End to end KPI concept and overview

The following KPI categories are included in the present document:

- Accessibility (see the definition in [3]).
- Integrity (see the definition in [3]).
- Utilization

For future update of the document it will also include:

- Retainability (see the definition in [3]).
- Availability.
- Mobility.

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 28.552 [5]).
- e) Measurement names used for the KPI (Optional):
This clause should list the measurement names used for the KPI.
This clause 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 clause shall describe the object of the KPI. The object of the KPI is one or some of the following:
 - 5GC
 - 5GS
- g) KPI category (mandatory)
This clause contains the classification of the KPI into one of the KPI categories listed in clause 4.
- h) Unit of the KPI (mandatory)
This clause describes the unit of the KPI. The unit can be one of the following:
 - percentage;
 - time interval (second or millisecond or microsecond);
 - Erlang;
 - kbit/s.
- i) Type of the KPI (Mandatory)
This clause 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 End to end KPI definitions

6.1 KPI Overview

The KPI categories defined in [2] will be reused by the present document.

6.2 Accessibility KPI

6.2.1 Registered Subscribers of Network and Network Slice Instance through AMF

- a) Registered Subscribers of Single Network Slice Instance through AMF.
- b) This KPI describe the total number of subscribers that are registered to a network slice instance.
- c) This KPI is obtained by counting the subscribers in AMF that are registered to a network slice instance.
- d) $RSSNSI = \sum_{AMF} RegisteredSubNbrMean$
- e) RegisteredAMFSubNbrMean
- f) 5GS
- g) Accessibility
- h) Integer
- i) CUM

ETSI TS 128 554 V15.6.0 (2023-04)

<https://standards.iteh.ai/catalog/standards/sist/802e5c72-e5af-4c54-9a1b-382ee06be1ff/etsi-ts-128-554-v15-6-0-2023-04>

6.2.2 Registered Subscribers of Network through UDM

- a) Registered Subscribers of Network through UDM
- b) This KPI describes the total number of subscribers that are registered to a network through UDM.
- c) This KPI is corresponding to the measurement RM.RegisteredSubUDMNbrMean that counts subscribers registered in UDM..
- d) $RSSNSI = RegisteredSubUDMNbrMean$
- e) RegisteredSubUDMNbrMean
- f) 5GS
- g) Accessibility
- h) Integer
- i) CUM

6.2.3 Registration success rate of one single network slice instance

- a) Registration success rate of one single network slice instance.
- b) This KPI describes the ratio of the number of successfully performed registration procedures to the number of attempted registration procedures for the AMF set which related to one single network slice instance and is used to evaluate accessibility provided by the end-to-end network slice instance and network performance.
- c) This KPI is obtained by successful registration procedures divided by attempted registration procedures.
- d)

$$\text{RSR} = \frac{\sum_{\text{Type}} \text{AMF.5GSRegisSucc.Type}}{\sum_{\text{Type}} \text{AMF.5GSRegisAtt.Type}} * 100\%$$

- e) $\text{AMF.5GSRegisAtt.Type}$
- AMF.5GSRegisAttachSucc.Type

NOTE: Above measurements with subcounter *.Type* should be defined in 3GPP TS 24.501 [4].

- f) 5GS
- g) Accessibility
- h) Percentage
- i) RATIO

iTeh STANDARD PREVIEW
(standards.iteh.ai)

6.3 Integrity KPI

ETSI TS 128 554 V15.6.0 (2023-04)

6.3.1 Latency of 5G Network

https://standards.iteh.ai/catalog/standards/sist/802e5c72-e5af-4c54-9a1b-382ee06be1ff/etsi-ts-128-554-v15-6-0-2023-04

6.3.1.0 KPI categories

- a) End-to-end latency of 5G network.
- b) This KPI describes the end to end packet transmission latency through the RAN, CN, and TN part of 5G network and is used to evaluate utilization performance of the end-to-end network.
- c) This KPI is the RTT end to end latency of UE IP packets transmitted from UE to the N6 interface in the 5G network. The N6 interface is the reference point between UPF and DN.
- d) E2ELatency
- e) End-to-end latency
- f) 5GS
- g) Integrity
- h) Time interval (millisecond)
- i) MEAN

6.3.1.1 Downlink latency in gNB-DU

- a) Downlink latency for IP packets through gNB in split scenario.

- b) This KPI describes the gNB-DU part of the packet transmission latency experienced by an end-user. It is used to evaluate the gNB latency contribution to the total packet latency.
- c) This KPI is the average (arithmetic mean) of the time from reception of IP packet to gNB-DU until transmission of first part of that packet over the air interface, for a packet arriving when there is no previous data in queue for transmission to the UE.
- d) DownlinkLat = DRB.RlcSduLatencyDl or optionally DownlinkLat.QoSx = DRB.RlcSduLatencyDl.QoSx where QoS identifies the target quality of service class.
- e) DRB.RlcSduLatencyDl, DRB.RlcSduLatencyDl.QoS,
- f) NG-RAN
- g) Integrity
- h) Time interval (microsecond)
- i) MEAN

6.3.2 Upstream throughput for network and Network Slice Instance

- a) Upstream throughput for network and network slice instance.
- b) This KPI describes the upstream throughput of one single network slice instance by computing the packet size for each successfully transmitted UL IP packet through the network slice instance during each observing granularity period and is used to evaluate integrity performance of the end-to-end network slice instance.
- c) This KPI is obtained by measuring the total number of upstream octets provided by N3 interface from NG-RAN to all UPFs, related to the single network slice instance, divided by the granularity period (in milliseconds).
- d)
$$UTSNSI = \frac{\sum_{UPF} GTP.InDataOctN3UPF.SNSSAI}{GranularityPeriod} \times 8$$
- e) GTP.InDataOctN3UPF. <https://standards.iteh.ai/catalog/standards/sist/802e5c72-e5af-4c54-9a1b-382ee06be1ff/etsi-ts-128-554-v15-6-0-2023-04>
- f) 5GS.
- g) Integrity.
- h) kbit/s.
- i) MEAN.

6.3.3 Downstream Throughput for Single Network Slice Instance

- a) Downstream throughput for network and network slice instance.
- b) This KPI describes the downstream throughput of one single network slice instance by computing the packet size for each successfully transmitted DL IP packet through the network slice instance during each observing granularity period and is used to evaluate integrity performance of the end-to-end network slice instance.
- c) This KPI is obtained by downstream throughput provided by N3 interface from all UPFs to NG-RAN which are related to the single network slice instance.
- d)
$$UTSNSI = \sum_{UPF} GTP.OutDataOctN3UPF$$
- e) GTP.OutDataOctN3UPF.
- f) 5GS.
- g) Integrity.
- h) kbit/s.