ETSI TS 128 558 V18.0.0 (2024-05)



5G; Management and orchestration; UE level measurements for 5G system (3GPP TS 28.558 version 18.0.0 Release 18)

<u>ETSI TS 128 558 V18.0.0 (2024-05)</u>

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Contents

| Intell | Intellectual Property Rights | | | | |
|---------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------|------------------|--|--|
| Legal | Legal Notice | | | | |
| Moda | Modal verbs terminology | | | | |
| Forev | Foreword | | | | |
| 1 | Scope | | 6 | | |
| 2 | References | | | | |
| 3 3.1 3.2 3.3 | Definitions of terms, s Terms Symbols Abbreviations | ymbols and abbreviations | 7 7 7 7 | | |
| 4 | Overview | | 7 | | |
| 5 | UE level measurement | ts collection and reporting | 7 | | |
| 6 | UE level measurement | ts definitions | 7 | | |
| 6.1 | General | nte definitions for 500 | 7 | | |
| 0.2 6.2.1 | General | | 8 8 | | |
| 622 | UE level measure | ments definitions for LIPF | 8 | | |
| 6.2.2. | Packet delay. | | | | |
| 6.2.2. | 1.1 Average D | DL packet delay between PSA UPF and UE for a OoS flow | | | |
| 6.2.2. | 1.2 Average U | L packet delay between PSA UPF and UE for a QoS flow (excluding D1) | 9 | | |
| 6.2.2. | 1.3 Average U | L packet delay between PSA UPF and UE for a QoS flow (including D1) | | | |
| 6.2.2. | 1.4 Average U | L packet delay between PSA UPF and NG-RAN for a QoS flow | 10 | | |
| 6.2.2. | 1.5 Average D | DL packet delay between PSA UPF and NG-RAN for a QoS flow | 11 | | |
| 6.3 | UE level measurement | nts definitions for NG-RAN | 12 | | |
| 6.3.1 | UE level measure | ments definitions for gNB | 12 | | |
| 6.3.1. | Packet delay . | E. T.T.S. SI 1. V2. 18. 8. 5. 05. 8.0. (| 4 | | |
| 6.3.1. | 1.1 Average de | elay DL air-interface | | | |
| 6.3.1. | 1.2 Average d | elay DL in gNB-DU | | | |
| 6.3.1. | 1.3 Average de | elay DL on F1-U | 13 | | |
| 6.3.1. | 1.4 Average de | elay DL in CU-UP | 13 | | |
| 6.3.1. | 1.5 UL PDCP | packet average delay | 14 | | |
| 6.3.1. | 1.6 Average de | elay UL on over-the-air interface | 14 | | |
| 6.3.1. | 1.7 Average R | LC packet delay in the UL | 15 | | |
| 6.3.1. | 1.8 Average P | DCP re-ordering delay in the UL | 15 | | |
| 6.3.1. | 2 Packet Loss fo | or all gNB deployment scenario | | | |
| 6.3.1.2 | 2.1 DL Packet | Loss Rate on Uu | | | |
| 6.3.1. | B Packet loss for | r split gNB deployment scenario | 16 | | |
| 6.3.1. | 3.1 UL PDCP | SDU Loss Rate | 16 | | |
| 6.3.1. | 3.2 UL FI-U F | Packet Loss Rate | 1/ | | |
| 0.3.1. | 0.0 DLFI-UF | Packet Loss Rate | 1/ | | |
| 621 | 4 UE throughput | | 18 | | |
| 621 | +.1 Average D | L UE throughput in gND | 18 | | |
| 0.5.1.4 | +.2 Average U | | | | |
| Anne | x A (normative): | rempiate for definitions of UE level measurements | 20 | | |
| Anne | x B (informative): | Use cases for UE level measurements | 22 | | |
| Annex C (informative): Change history | | | | | |
| Histo | ry | | 24 | | |

Foreword

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 - 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.

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

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

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.

| should | indicates a recommendation to do something |
|--------|--------------------------------------------|
| | |

| should not | indicates a recommendation not to do something |
|------------|------------------------------------------------|
| may | indicates permission to do something |
| need not | indicates permission not to do something |

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

| 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 |

3GPP TS 28.558 version 18.0.0 Release 18

5

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.

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1 Scope

The present document specifies the UE level measurements for 5G system, and the corresponding collection and reporting mechanisms.

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 23.501: "System Architecture for the 5G System".
- [3] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".
- [4] 3GPP TS 23.503: "Policy and charging control framework for the 5G System (5GS); Stage 2".
- [5] 3GPP TS 38.415: "NG-RAN; PDU session user plane protocol".
- [6] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".
- [7] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

https://standa[8]s.iteh.ai/cata3GPP TS 38.314: "NR; Layer 2 Measurements". 216-cf5cef7fd8eb/etsi-ts-128-558-v18-0-0-2024-05

- [9] 3GPP TS 37.320: "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".
- [10] 3GPP TS 28.532: "Management and orchestration; Generic management services".
- [11] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".
- [12] 3GPP TS 28.623: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".
- [13] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace: Trace control and configuration management".
- [14] 3GPP TS 32.423: "Telecommunication management; Subscriber and equipment trace: Trace data definition and management".
- [15] 3GPP TS 29.281: "General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)"

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms 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 Symbols

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

Void

3.3 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].

4 Overview

The UE level measurements, i.e., the measurements per UE, in addition to the traditional performance measurements which are aggregated for the UEs to a measured object (e.g., a cell), are required to support intelligent features, e.g., analytics conducted by NWDAF, and ML model training for RAN intelligence functions.

The UE level measurement is produced by 5GC Network Function or NG-RAN node for a particular UE, and provided by the MnS producer to the authorized consumer(s).

5 UE level measurements collection and reporting

The UE level measurements are collected by the MnS consumer from MnS producer via the Provisioning MnS (see TS 28.532 [10]) through managing the MOI of TraceJob (see TS 28.622 [11], and TS 28.623 [12]) with the specific job type(s).

In 5G system, the 5GC UE level measurements collection and reporting are supported by extending the Trace mechanisms for both signalling and management based activation; the NG-RAN UE level measurements collection and reporting is supported by MDT mechanisms for both signalling and management based activation. The Trace Session activation/deactivation, Trace Recording Session start/stop, and 5GC UE level measurements specific configuration parameters, and MDT specific configuration parameters, and 5GC UE level measurements and MDT measurements reporting are specified in TS 32.422 [13]. The Trace Record content, and Trace Report file and streaming format for 5GC UE level measurements and MDT measurements are specified in TS 32.423 [14].

6 UE level measurements definitions

6.1 General

The UE level measurements defined in clause may be collected by management based activation and signalling based activation of Trace job with the extended job type(s), as described in clause 5.

For the management based activation, when the MnS consumer does not specify the specific UE to measure, it is up to the NFs or NG-RAN node to decide the number of UEs and select the UEs to measure.

6.2 UE level measurements definitions for 5GC

6.2.1 General

This clause defines the UE level measurements for 5GC NFs, including UPF.

6.2.2 UE level measurements definitions for UPF

6.2.2.1 Packet delay

6.2.2.1.1 Average DL packet delay between PSA UPF and UE for a QoS flow

- a) This measurement provides the average DL packet delay between PSA UPF and UE for a QoS flow. This measurement is only applicable to the case the PSA UPF and NG-RAN are time synchronised.
- b) DER (n=1).
- c) The measurement is obtained by the following method:

The UPF performs the per QoS Flow per UE QoS monitoring according to the QoS monitoring request received from SMF during PDU Session Establishment or Modification procedure (see TS 23.501 [2]). The QoS monitoring can be initiated on SMF by management system via QFQoSMonitoringControl MOI (see TS 28.541 [3]), or by PCF via QoS Monitoring policy included in the PCC rule provisioning (see TS 23.503 [4]). PSA UPF creates and sends the monitoring packets to the RAN according to QoS monitoring request received from the SMF.

For each received GTP PDU monitoring response packet (packet i) for QoS monitoring, the PSA UPF records the following time stamps and information included in the GTP-U header (see TS 23.501 [2] and TS 38.415 [5]):

- T1 indicating the local time the DL GTP PDU monitoring packet was sent by the PSA UPF;

https://standards.iteh T2 indicating the local time that the DL GTP PDU monitoring packet was received by NG-RAN;

- The DL Delay Result from NG-RAN to UE indicating the downlink delay measurement result which is the sum of the delay incurred in NG-RAN (including the delay at gNB-CU-UP, on F1-U and on gNB-DU) and the delay over Uu interface (see TS 38.415 [5], and the DL Delay Result is denoted by *DRdl* in the present document);

The PSA UPF counts the number (N) of GTP PDU monitoring response packets for the S-NSSAI and the QoS flow received in the granularity period, and takes the following calculation:

$$\frac{\sum_{i=1}^{N} (T2_i - T1_i + DRdl_i)}{N}$$

- d) Each measurement is a real representing the average delay in 0.1ms.
- e) GTP.DelayDlPsaUpfUeMean.SNSSAI.QFI.

Where SNSSAI identifies the S-NSSAI, and QFI identifies the QoS flow.

- f) UPFFunction.
- g) N4 Session Identifier.
- h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS 23.288 [7]).

6.2.2.1.2 Average UL packet delay between PSA UPF and UE for a QoS flow (excluding D1)

- a) This measurement provides the average UL packet delay between PSA UPF and UE for a QoS flow, excluding the D1 UL PDCP delay occurred in the UE. This measurement is only applicable to the case the PSA UPF and NG-RAN are time synchronised.
- b) DER (n=1).
- c) The measurement is obtained by the following method:

The UPF performs the per QoS Flow per UE QoS monitoring according to the QoS monitoring request received from SMF during PDU Session Establishment or Modification procedure (see TS 23.501 [2]). The QoS monitoring can be initiated on SMF by management system via QFQoSMonitoringControl MOI (see TS 28.541 [3]), or by PCF via QoS Monitoring policy included in the PCC rule provisioning (see TS 23.503 [4]). PSA UPF creates and sends the monitoring packets to the RAN according to QoS monitoring request received from the SMF.

For each received GTP PDU monitoring response packet (packet i) for QoS monitoring, the PSA UPF records the following time stamps and information (see TS 23.501 [2] and TS 38.415 [5]):

- T3 received in the GTP-U header of the monitoring response packet indicating the local time that the monitoring response packet was sent by the NG-RAN;
- T4 that the monitoring response packet was received by the PSA UPF;
- The UL Delay Result from UE to NG-RAN indicating the uplink delay measurement result which is the sum of the delay incurred in NG-RAN (including the delay at gNB-CU-UP, on F1-U and on gNB-DU) and the delay over Uu interface (excluding the D1 UL PDCP delay occurred in the UE) (see TS 38.415 [5]. The UL Delay Result is denoted by *DRul* in the present document);

The PSA UPF counts the number (N) of GTP PDU monitoring response packets for the S-NSSAI and QoS flow received in the granularity period, and takes the following calculation:

$$\frac{\sum_{i=1}^{N} (T4_i - T3_i + DRul_i)}{N}$$

d) Each measurement is a real representing the average delay in 0.1 ms.

e) GTP.DelayUlPsaUpfUeMeanExcD1.SNSSAI.QFI.

Where SNSSAI identifies the S-NSSAI, and QFI identifies the QoS flow.

- f) UPFFunction.
- g) N4 Session Identifier.
- h) One usage of this measurement is to support the end-to-end data volume transfer time analytics conducted by NWDAF (see TS 23.288 [7]).

6.2.2.1.3 Average UL packet delay between PSA UPF and UE for a QoS flow (including D1)

- a) This measurement provides the average UL packet delay between PSA UPF and UE for a QoS flow, including the D1 UL PDCP delay occurred in the UE. This measurement is only applicable to the case the PSA UPF and NG-RAN are time synchronised.
- b) DER (n=1).
- c) The measurement is obtained by the following method:

The UPF performs the per QoS Flow per UE QoS monitoring according to the QoS monitoring request received from SMF during PDU Session Establishment or Modification procedure (see TS 23.501 [2]). The QoS monitoring can be initiated on SMF by management system via QFQoSMonitoringControl MOI (see TS 28.541 [3]), or by PCF via QoS Monitoring policy included in the PCC rule provisioning (see TS 23.503 [4]).