**3GPP TSG-SA5 Meeting #156 *S5-244762***

Maastricht, , 19 – 23 August 2024

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **28.552** | **CR** | **0580** | **rev** | **1** | **Current version:** | **19.0.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | Rel-19 CR TS 28.552 Packet delay measurements Correction  |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** | PM\_KPI\_5G\_Ph4 |  | ***Date:*** | 2024-08-05 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-19 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | The description of the packet delay measurements is not accurate. It is very confusing if the filter is optional or not. According to filter definaition in section 4.2, filters are optional: “Performance measurements may be sub-divided by use of applicable filters to form new Performance measurements (or sub counters). Any applicable *Filter(s)* are identified in each performance measurements definition. Performance measurements may also be defined without any applied *Filter*.” |
|  |  |
| ***Summary of change:*** | Clairifcations on the description that filter is optional |
|  |  |
| ***Consequences if not approved:*** | The description of the measurements is misleading. |
|  |  |
| ***Clauses affected:*** | 5.1.1.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

|  |
| --- |
| **1st Change** |

#### 5.1.1.1 Packet Delay

##### 5.1.1.1.1 Average delay DL air-interface

a) This measurement provides the average (arithmetic mean) time it takes for packet transmission over the air-interface in the downlink direction. The measurement is filterable per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

b) DER (n=1)

c) This measurement is obtained as: sum of (point in time when the last part of an RLC SDU packet was sent to the UE which was consequently confirmed by reception of HARQ ACK from UE for UM mode or point in time when the last part of an RLC SDU packet was sent to the UE which was consequently confirmed by reception of RLC ACK for AM mode, minus time when corresponding RLC SDU part arriving at MAC layer) divided by total number of RLC SDUs transmitted to UE successfully. The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.AirIfDelayDl or DRB.AirIfDelayDl\_Filters,

Where filter is a combination of PLMN ID and QoS level and S-NSSAI.Where PLMN ID represents the PLMN ID, QoS representes the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU

g) Valid for packet switched traffic

h) 5GS

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality).

NOTE: If the HARQ process is configured with disabled HARQ feedback for NTN (refer to 38.321 [61]), this measurement is not available for UM mode.

##### 5.1.1.1.2 Distribution of delay DL air-interface

a) This measurement provides the distribution of the time it takes for packet transmission over the air-interface in the downlink direction. The measurement is filterable per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

b) DER (n=1)

c) This measurement is obtained by 1) calculating the DL delay for an RLC SDU packet by: point in the time when the last part of an RLC SDU packet was sent to the UE which was consequently confirmed by reception of HARQ ACK for UM mode or point in time when the last part of an RLC SDU packet was sent to the UE which was consequently confirmed by reception of RLC ACK for AM mode, minus the time when corresponding RLC SDU part arriving at MAC layer; and 2) incrementing the corresponding bin with the delay range where the result of 1) falls into by 1 for the counters. If the RLC SDU needs retransmission (for Acknowledged Mode) the delay will still include only one contribution (the original one) to this measurement. The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer representing the number of RLC SDU packets measured with the delay within the range of the bin. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) DRB.AirIfDelayDist, or
DRB.AirIfDelayDist\_Bin\_Filters;

Where Bin indicates a delay range which is vendor specific;
Where filter is a combination of PLMN ID and QoS level and S-NSSAI.
Where PLMN ID represents the PLMN ID, QoS represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU

g) Valid for packet switched traffic

h) 5GS

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality).

NOTE: If the HARQ process is configured with disabled HARQ feedback for NTN (refer to 38.321 [61]),this measurement is not available for UM mode.

##### 5.1.1.1.3 Average delay UL on over-the-air interface

a) This measurement provides the average (arithmetic mean) over-the-air packet delay on the uplink. The measurement is filterable per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

b) DER (n=1)

c) This measurement is obtained according to the definition in TS 38.314 [29], named "Average over-the-air interface packet delay in the UL per DRB per UE". The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in 0.1 millisecond. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.AirIfDelayUl or DRB.AirIfDelayUl\_Filters,

Where filter is a combination of PLMN ID and QoS level and S-NSSAI.

Where PLMN ID represents the PLMN ID, QoS represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality).

##### 5.1.1.1.4 Average RLC packet delay in the UL

a) This measurement provides the average (arithmetic mean) RLC packet delay on the uplink, ie the delay within the gNB-DU. The measurement is filterable per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

b) DER (n=1)

c) This measurement is obtained according to the definition in TS 38.314 [29], named "Average RLC packet delay in the UL per DRB per UE". The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in the unit 0.1 milliseconds. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.RlcDelayUl or DRB.RlcDelayUl\_Filters,

Where filter is a combination of PLMN ID and QoS level and S-NSSAI.

Where PLMN ID represents the PLMN ID, QoS representes the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellDU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality).

##### 5.1.1.1.5 Average PDCP re-ordering delay in the UL

a) This measurement provides the average (arithmetic mean) PDCP re-ordering delay on the uplink, which is the delay within the gNB-CU-UP. The measurement is filterable per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

b) DER (n=1)

c) This measurement is obtained according to the definition in TS 38.314 [29], named "Average PDCP re-ordering delay in the UL per DRB per UE. The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is a real representing the mean delay in the unit 0.1 milliseconds. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.

[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) The measurement name has the form DRB.PdcpReordDelayUl or DRB.PdcpReordDelayUl\_*Filters*,

Where *Filter* is a combination of PLMN ID and QoS level and S-NSSAI.

Where PLMN ID represents the PLMN ID, QoS representes the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) GNBCUUPFunction

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality).

##### 5.1.1.1.6 Distribution of DL delay between NG-RAN and UE

a) This measurement provides the distribution of DL packet delay between NG-RAN and UE, which is 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. This measurement is filterable per PLMN ID and per 5QI and per supported S-NSSAI.

b) DER (n=1).

c) The measurement is obtained by the following method:

 The gNB performs the GTP PDU packet delay measurement for QoS monitoring per the GTP PDU monitoring packets received from UPF, and records the following time stamps and information included in the GTP-U header of each GTP PDU monitoring response packet (packet i) sent to UPF (see 23.501 [4] and 38.415 [31]):

- 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 38.415 [31], and the DL Delay Result is denoted by$ DRdl$ in the present document);

- The 5QI and S-NSSAI associated to the GTP PDU monitoring response packet.

 The gNB increments the corresponding bin with the delay range where the $DRdl$ falls into by 1 for the counters.

 The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer representing the number of GTP PDUs measured with the delay within the range of the bin. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.
[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) DRB.DelayDlNgranUeDist\_*Bin*, or
DRB.DelayDlNgranUeDist\_*Bin*\_*Filters*;

Where *Bin* indicates a delay range which is vendor specific

Where *Filter* is a combination of PLMN ID and QoS level and S-NSSAI.

Where PLMN ID represents the PLMN ID, QoS representes the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

f) NRCellCU (for non-split and 2-split scenario);
GNBCUUPFunction (for 3-split scenario).

g) Valid for packet switched traffic.

h) 5GS.

##### 5.1.1.1.7 Distribution of UL delay between NG-RAN and UE

###### 5.1.1.1.7.1 Distribution of UL delay between NG-RAN and UE (excluding D1)

a) This measurement provides the distribution of UL packet delay between NG-RAN and UE, which includes the delay occurred 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). This measurement is filterable per PLMN ID and per 5QI and per supported S-NSSAI.

b) DER (n=1).

c) The measurement is obtained by the following method:

 The gNB performs the GTP PDU packet delay measurement for QoS monitoring for the GTP PDU monitoring packets received from UPF, and records the following time stamps and information included in the GTP-U header of each GTP PDU monitoring response packet (packet i,sent to UPF) for which the D1 UL PDCP Delay measurement is not included (see 23.501 [4] and 38.415 [31]):

- 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 (see 38.415 [31], and the UL Delay Result is denoted by$ DRul$ in the present document);

- The 5QI and S-NSSAI associated to the GTP PDU monitoring response packet.

 The gNB increments the corresponding bin with the delay range where the $DRul $falls into by 1 for the counters.

 The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer representing the number of GTP PDUs measured with the delay within the range of the bin. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.
[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) DRB.DelayUlNgranUeDist\_*Bin*, or
DRB.DelayUlNgranUeDist\_*Bin*\_*Filters*.

Where *Bin* indicates a delay range which is vendor specific, and *Filter* is a combination of PLMN ID and QoS level and S-NSSAI.
The QoS level represents the mapped 5QI or QCI.

f) NRCellCU (for non-split and 2-split scenario);
GNBCUUPFunction (for 3-split scenario).

g) Valid for packet switched traffic.

h) 5GS.

###### 5.1.1.1.7.2 Distribution of UL delay between NG-RAN and UE (including D1)

a) This measurement provides the distribution of UL packet delay between NG-RAN and UE, which includes the delay occurred in NG-RAN (including the delay at gNB-CU-UP, on F1-U and on gNB-DU), the delay over Uu interface and the D1 UL PDCP delay occurred in the UE. This measurement is filterable per PLMN ID and per 5QI and per supported S-NSSAI.

b) DER (n=1).

c) The measurement is obtained by the following method:

 The gNB performs the GTP PDU packet delay measurement for QoS monitoring for the GTP PDU monitoring packets received from UPF, and records the following time stamps and information included in the GTP-U header of each GTP PDU monitoring response packet (packet i, sent to UPF) for which the D1 UL PDCP Delay measurement is included (see 23.501 [4] and 38.415 [31]):

- 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), the delay over Uu interface and the D1 UL PDCP delay occurred in the UE (see 38.415 [31], and the UL Delay Result is denoted by$ DRul$ in the present document);

- The 5QI and S-NSSAI associated to the GTP PDU monitoring response packet.

 The gNB increments the corresponding bin with the delay range where the $DRul $falls into by 1 for the counters.

 The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer representing the number of GTP PDUs measured with the delay within the range of the bin. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.
[Total No. of measurement instances] x [No. of filter values for all measurements] (DL and UL) ≤ 100.

e) DRB.DelayUlNgranUeIncD1Dist\_*Bin*; or
DRB.DelayUlNgranUeIncD1Dist\_*Bin\_Filters*

Where *Bin* indicates a delay range which is vendor specific, and *Filter* is a combination of PLMN ID and QoS level and S-NSSAI.
The QoS level represents the mapped 5QI or QCI.

f) NRCellCU (for non-split and 2-split scenario);
GNBCUUPFunction (for 3-split scenario).

g) Valid for packet switched traffic.

h) 5GS.

##### 5.1.1.1.8 DL packet delay between NG-RAN and PSA UPF

5.1.1.1.8.1 Average DL GTP packet delay between PSA UPF and NG-RAN

a) This measurement provides the average DL GTP packet delay between PSA UPF and NG-RAN. This measurement is filterable per 5QI or per S-NSSAI. 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 samples the GTP packets for QoS monitoring based on the policy provided by OAM or SMF.

NOTE: The sampling rate may vary for different S-NSSAI and different 5QIs, and the specific sampling rate is up to implementation unless given by the QoS monitoring policy.

 For each DL GTP PDU (packet i) encapsulated with QFI, TEID, and QMP indicator for QoS monitoring, the gNB records the following time stamps and information (see 23.501 [4] and 38.415 [31]):

- T1 received in the GTP-U header indicating the local time that the DL GTP PDU was sent by the PSA UPF;

- T2 that the DL GTP PDU was received by NG-RAN;

- The 5QI and S-NSSAI associated to the DL GTP PDU.

 The gNB counts the number (N) of DL GTP PDUs encapsulated with QFI, TEID, and QMP indicator for each 5QI and each S-NSSAI respectively, and takes the following calculation for each 5QI and each S-NSSAI:

$$\frac{\sum\_{i=1}^{N}(T2\_{i}-T1\_{i})}{N}$$

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

e) GTP.DelayDlPsaUpfNgranMean;
GTP.DelayDlPsaUpfNgranMean\_*5QI,*; or
GTP.DelayDlPsaUpfNgranMean\_*SNSSAI*.

Where *5QI* identifies the 5QI, *SNSSAI* identifies the S-NSSAI.

f) EP\_N3 (contained by GNBCUUPFunction).

g) Valid for packet switched traffic.

h) 5GS.

5.1.1.1.8.2 Distribution of DL GTP packet delay between PSA UPF and NG-RAN

a) This measurement provides the distribution of DL GTP packet delay between PSA UPF and NG-RAN. This measurement is filterable per 5QI or per S-NSSAI. 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 samples the GTP packets for QoS monitoring based on the policy provided by OAM or SMF.

NOTE: The sampling rate may vary for different S-NSSAI and different 5QIs, and the specific sampling rate is up to implementation unless given by the QoS monitoring policy.

 For each DL GTP PDU (packet i) encapsulated with QFI, TEID, and QMP indicator for QoS monitoring, the gNB records the following time stamps and information (see 23.501 [4] and 38.415 [31]):

- T1 received in the GTP-U header indicating the local time that the DL GTP PDU was sent by the PSA UPF;

- T2 that the DL GTP PDU was received by NG-RAN;

- The 5QI and S-NSSAI associated to the DL GTP PDU.

 The gNB 1) takes the following calculation for each DL GTP PDU (packet i) encapsulated with QFI, TEID, and QMP indicator for each 5QI and each S-NSSAI respectively, and 2) increment the corresponding bin with the delay range where the result of 1) falls into by 1 for the subcounters per 5QI and subcounters per S-NSSAI.

$$T2\_{i}-T1\_{i}$$

d) Each measurement is an integer representing the number of GTP PDUs measured with the delay within the range of the bin.

e) GTP.DelayDlPsaUpfNgranDist\_Bin,
GTP.DelayDlPsaUpfNgranDist\_*5QI*\_*Bin,* or
GTP.DelayDlPsaUpfNgranDist\_*SNSSAI\_Bin*.

Where *Bin* indicates a delay range which is vendor specific, *5QI* identifies the 5QI, and *SNSSAI* identifies the S-NSSAI

f) EP\_N3 (contained by GNBCUUPFunction).

g) Valid for packet switched traffic.

h) 5GS.

##### 5.1.1.1.9 Distribution of delay over Uplink air-interface(Uu)

a) This measurement provides the distribution of the time it takes for packet/transport-block transmission over the air-interface in the uplink direction. The measurement is filterable per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

b) DER (n=1)

c) This measurement is obtained by calculating the uplink delay for a MAC SDU packet/transport-block by: calculating the time difference between the point in time when the UL MAC SDU is successfully sent to RLC (i.e. tSucc(i,drbid) as defined in TS 38.314 [29], Table 4.2.1.2.2-2) and the point in time when the UL MAC SDU is scheduled in MAC layer as per the scheduling grant provided (i.e. tSched(i,drbid) as defined in TS 38.314 [29], Table 4.2.1.2.2-2) and then incrementing the corresponding (time constraint/delay threshold) bin by 1 where the result of above subtraction falls into. The measurement is performed per PLMN ID and per QoS level (mapped 5QI or QCI in NR option 3) and per supported S-NSSAI.

d) Each measurement is an integer representing the number of MAC SDU packets/transport-blocks whose measured delay is within the range of the bin. The number of measurements is equal to the number of PLMNs multiplied by the number of QoS levels or multiplied by the number of supported S-NSSAIs.

e) DRB.AirIfDelayDistUL\_Bin or DRB.AirIfDelayDistUL\_*Bin\_Filters*

Where *Bin* indicates a time constraint/delay threshold range.

Where *Filter* is either of PLMN ID, QoS level and S-NSSAI or a combination thereof.

PLMN ID represents the PLMN ID, QoS represents the mapped 5QI or QCI level, and SNSSAI represents S-NSSAI.

NOTE: Number of bins and the range for each bin is left to implementation.

f) NRCellDU

g) Valid for packet switched traffic

h) 5GS

i) One usage of this measurement is for performance assurance within integrity area (user plane connection quality) and for performance assurance for URLLC services.

|  |
| --- |
| **End of Change** |