**3GPP TSG- Meeting # *rev2***

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *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)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  |  |
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| ***Source to WG:*** | , Intel |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | KPIs for the UL packet delays in NG-RAN is missing in TS 28.554. |
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| ***Summary of change:*** | Three KPIs has been added for gNB-DUThree KPIs has been added for gNB-CU-UPTwo KPIs has been added for “Integrated uplink delay in RAN”.  |
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| ***Consequences if not approved:*** | There will not be any KPI for UL packet delay performance in NG-RAN. |
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| ***Clauses affected:*** | 6.3.1.a (new), 6.3.1.a.1 (new), 6.3.1.a.2 (new), 6.3.1.a.3 (new), 6.3.1.b (new), 6.3.1.b.1 (new), 6.3.1.b.2 (new), 6.3.1.b.3 (new), 6.3.1.c (new) 6.3.1.c.1 (new), 6.3.1.c.2 (new) |
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|  | **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 ...  |
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| ***Other comments:*** | Merged with S5-203054 into this S5-203276 |
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| ***This CR's revision history:*** |  |

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| **1st modified section** |

#### 6.3.1.a Uplink delay in gNB-DU

##### 6.3.1.a.1 Uplink delay in gNB-DU for a NR cell

a) ULDelay\_gNBDU\_Cell.

b) This KPI describes the average packet transmission delay through the gNB-DU part from the UE in a NR cell. It is used to evaluate delay performance of gNB-DU in uplink. It is the average packet delay from when an UL RLC SDU was scheduled, as per the scheduling grant provided, until time when the RLC SDU is sent to PDCP or CU for split gNB. It is a time interval (0.1 ms). The KPI type is MEAN. This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) Below is the equation for average UL delay in gNB-DU for a NRCellDU:

and optionally: where *QOS* identifies the target quality of service class.

and optionally: where *SNSSAI* identifies the S-NSSAI.

d) NRCellDU

##### 6.3.1.a.2 Uplink delay in gNB-DU for a sub-network

a) ULDelay\_gNBDU\_SNw.

b) This KPI describes the average packet transmission delay through the gNB-DU part from the UE for a sub-network. It is used to evaluate delay performance of gNB-DU in uplink for a sub-network. It is the weighted average packet delay from when an UL RLC SDU was scheduled, as per the scheduling grant provided, until time when the RLC SDU is sent to PDCP or CU for split gNB. It is a time interval (0.1 ms). The KPI type is MEAN. This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) Below is the equation for average UL delay in gNB-DU for a sub-network, where

- W is the measurement for the weighted average, one of the following:

- the UL data volume of the NR cell;

- the number of UL user data packets of the NR cell;

- any other types of weight defined by the consumer of KPI

- the #NRCellDU is the number of NRCellDU’s in the SubNetwork.

and optionally KPI on SubNetwork level per QoS and per S-NSSAI:

d) SubNetwork

##### 6.3.1.a.3 Uplink delay in gNB-DU for a network slice subnet

a) ULDelay\_gNBDU\_Nss.

b) This KPI describes the average packet transmission delay through the gNB-DU part from the UE for a network slice subnet. It is used to evaluate delay performance of gNB-DU in uplink for a network slice subnet. It is the weighted average packet delay from when an UL RLC SDU was scheduled, as per the scheduling grant provided, until time when the RLC SDU is sent to PDCP or CU for split gNB. It is a time interval (0.1 ms). The KPI type is MEAN.

c) Below is the equation for average UL delay in gNB-DU for a network slice subnet, where

- W is the measurement for the weighted average, one of the following:

- the UL data volume of the NR cell;

- the number of UL user data packets of the NR cell;

- any other types of weight requested by the consumer of KPI;

- the #NRCellDU is the number of NRCellDU’s associated with the NetworkSliceSubnet.

d) NetworkSliceSubnet

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| **Next modified section** |

### 6.3.1.b Uplink delay in gNB-CU-UP

##### 6.3.1.b.1 Uplink delay in gNB-CU-UP

a) ULDelay\_gNBCUUP.

b) This KPI describes the average packet transmission delay through the gNB-CU-UP from gNB-DU. It is used to evaluate delay performance of gNB-CU-UP in uplink. It is the average packet delay from when the RLC SDU is sent to PDCP or CU for split gNB, until time when the corresponding PDCP SDU was sent to the core network from gNB-CU-UP. It is a time interval (0.1 ms). The KPI type is MEAN. This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) Below the equation for average UL delay in a gNB-CU-CP:

and optionally: where *QOS* identifies the target quality of service class.

and optionally: where *SNSSAI* identifies the S-NSSAI.

d) GNBCUUPFunction

e) It is assumed that the F1 uplink delay is the same as the F1 downlink delay. In non-split gNB scenario, the value of DRB.PdcpF1Delay (optionally DRB.PdcpF1Delay.*QOS,* and optionally *DRB.PdcpF*1Delay.*SNSSAI)* is set to zero because there are no F1-interfaces in this scenario.

##### 6.3.1.b.2 Uplink delay in gNB-CU-UP for a sub-network

a) ULDelay\_gNBCUUP\_SNw.

b) This KPI describes the average packet transmission delay through the gNB-CU-UP part from the gNB-DU for a sub-network. It is used to evaluate delay performance of gNB-CU-UP in uplink for a sub-network. It is the weighted average packet delay from when the RLC SDU is sent to PDCP or CU for split gNB, until time when the corresponding PDCP SDU was sent to the core network from gNB-CU-UP. It is a time interval (0.1 ms). The KPI type is MEAN. This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) Below is the equation for average UL delay in gNB-CU-UP for a sub-network, where

- W is the measurement for the weighted average, one of the following:

- the UL data volume in gNB-CU-UP ;

- the number of UL user data packets in gNB-CU-UP ;

- any other types of weight requested by the consumer of KPI;

- the # GNBCUUPFunctions is the number of GNBCUUPFunctions’s in the SubNetwork.

and optionally KPI on SubNetwork level per QoS and per S-NSSAI:

d) SubNetwork

e) It is assumed that the F1 uplink delay is the same as the F1 downlink delay. In non-split gNB scenario, the value of DRB.PdcpF1Delay (optionally DRB.PdcpF1Delay.*QOS,* and optionallyDRB.PdcpF1Delay.*SNSSAI)* is set to zero because there are no F1-interfaces in this scenario.

##### 6.3.1.b.3 Uplink delay in gNB-CU-UP for a network slice subnet

a) ULDelay\_gNBCUUP\_Nss.

b) This KPI describes the average packet transmission delay through the gNB-CU-UP part from the gNB-DU for a network slice subnet. It is used to evaluate delay performance of gNB-CU-UP in uplink for a network slice subnet. It is the weighted average packet delay from when the RLC SDU is sent to PDCP or CU for split gNB, until time when the corresponding PDCP SDU was sent to the core network from gNB-CU-UP. It is a time interval (0.1 ms). The KPI type is MEAN. This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) Below is the equation for average UL delay in gNB-CU-UP for a network slice subnet, where

- W is the measurement for the weighted average, one of the following:

- the UL data volume in gNB-CU-UP;

- the number of UL user data packets in gNB-CU-UP;

- any other types of weight requested by the consumer of KPI;

- the # GNBCUUPFunctions is the number of GNBCUUPFunctions’s associated with the NetworkSliceSubnet.

d) NetworkSliceSubnet

e) It is assumed that the F1 uplink delay is the same as the F1 downlink delay. In non-split gNB scenario, the value of DRB.PdcpF1Delay.*SNSSAI* is set to zero because there are no F1-interfaces in this scenario.

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#### 6.3.1.c Integrated uplink delay in RAN

##### 6.3.1.c.1 Uplink delay in NG-RAN for a sub-network

a) ULDelay\_NR\_SNw.

b) This KPI describes the average packet transmission delay through the RAN part from the UE for a sub-network. It is used to evaluate delay performance of NG-RAN in uplink. It is the weighted average packet delay from when an UL RLC SDU was scheduled, as per the scheduling grant provided, until time when the corresponding PDCP SDU was sent to the core network from gNB-CU-UP. It is a time interval (0.1 ms). The KPI type is MEAN. This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) Below are the equations for average “Integrated uplink delay in RAN” for this KPI on SubNetwork level. The “Integrated uplink delay in RAN” is the sum of average UL delay in gNB-CU-UP of the sub-network (ULDelay\_gNBCUUP\_SNw) and the average UL delay in gNB-DU of the sub-network (ULDelay\_gNBDU\_SNw):

ULDelay\_NR\_SNw = ULDelay\_gNBCUUP\_SNw + ULDelay\_gNBDU\_SNw

or optionally ULDelay\_ NR\_SNw.*QOS* = ULDelay\_gNBCUUP\_SNw.*QOS* + ULDelay\_gNBDU\_SNw.*QOS* where *QOS* identifies the target quality of service class.

or optionally ULDelay\_NR\_SNw.*SNSSAI* = ULDelay\_gNBCUUP\_SNw.*SNSSAI* + ULDelay\_gNBDU\_SNw.*SNSSAI* where *SNSSAI* identifies the S-NSSAI.

d) SubNetwork

##### 6.3.1.c.2 Uplink delay in NG-RAN for a network slice subnet

a) ULDelay\_NR\_Nss.

b) This KPI describes the average packet transmission delay through the RAN part from the UE for a network slice subnet. It is used to evaluate delay performance of NG-RAN in uplink. It is the weighted average packet delay from when an UL RLC SDU was scheduled, as per the scheduling grant provided, until time when the corresponding PDCP SDU was sent to the core network from gNB-CU-UP. It is a time interval (0.1 ms). The KPI type is MEAN. This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) Below is the equation for average “Integrated uplink delay in RAN” for this KPI on NetworkSliceSubNet level. The “Integrated uplink delay in RAN” for network slice subnet is the sum of average UL delay in gNB-CU-UP of the network slice subnet (ULDelay\_gNBCUUP\_Nss) and the average UL delay in gNB-DU of the network slice subnet (ULDelay\_gNBDU\_Nss):

ULDelay\_NR\_Nss.*SNSSAI* = ULDelay\_gNBCUUP\_Nss.*SNSSAI* + ULDelay\_gNBDU\_Nss.*SNSSAI* where *SNSSAI* identifies the S-NSSAI that the network slice subnet supports.

d) NetworkSliceSubnet

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| **End of modified section** |