**3GPP TSG-SA5 Meeting #141-e *S5-221452rev3*e-meeting, 17th Jan 2022 - 26th Jan 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **28.554** | **CR** | **0362** | **rev** | **-** | **Current version:** | **17.5.0** |  |
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| *For* [***HELP***](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 | **X** |

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| ***Title:***  | Rel-17 CR TS 28.554 Define Reliability KPI in 5G Network |
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| ***Source to WG:*** | Harman GmbH |
| ***Source to TSG:*** | SA5 |
|  |  |
| ***Work item code:*** | ePM\_KPI\_5G |  | ***Date:*** | 2022-01-07 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *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)* |
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| ***Reason for change:*** | In addition to increased flexibility and optimization, a 5G system needs to support stringent KPIs for latency, **reliability**, throughput, etc. These KPIs are driven by support for both commercial and public safety services. On the commercial side, industrial control, industrial automation, UAV control, and AR are examples of those services. The 5G system also aims to enhance its capability to meet KPIs that emerging V2X applications require. For such advanced applications, the requirements, such as data rate, **reliability**, latency, communication range and speed, are made more stringent. If something can affect the customer’s experience, it has to be monitored. So like latency and throughput , in 5G and advanced cellular systems **“Reliability”** is also very important performance factor that should be monitored for number of such advanced services some of which are mentioned above.Furthermore, in TS 28.541, **reliability** is defined as an attribute of ServiceProfile, which means a NS consumer can request some particular reliability to be offered by the network slice provider. Hence reliability has to be monitored and for this a KPI has to be defined. One of it’s prominent usage and requirement is in URLLC use cases where an operator network’s slices particularly cater to such service requirements. Furthermore,TS 22.261 & TS 22.289 already define Reliability as “in the context of network layer packet transmissions, percentage value of the amount of sent network layer packets successfully delivered to a given system entity within the time constraint required by the targeted service, divided by the total number of sent network layer packets”. Same principle is considered in current proposal to define Reliability KPI |
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| ***Summary of change:*** | Reliability KPI is introduced in a 5G network in both downlink and uplink and is defined for RAN domain i.e. for Uu interface and for Core domain i.e. N3 interface. Annex explains how E2E reliability can be derived in a network |
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| ***Consequences if not approved:*** | Insufficent and limited set of KPIs continue for a 5G network as far as reliability is considered which is a very important performance factor in 5G and future networks with advanced use cases. Reliability as performance cannot be monitored in an operator’s network and any deragadation in end user experience due to poor reliability in network can not be checked and improvised. |
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| ***Clauses affected:*** | 6.X (new), 2, 4 |
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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 28.552 CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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| **1st change** |

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 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[6] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[7] 3GPP TS 23.501: " System Architecture for the 5G System; Stage 2".

[8] ETSI ES 203 228 V1.2.1 (2017-04): "Environmental Engineering (EE); Assessment of mobile network energy efficiency".

[9] 3GPP TS 28.310: "Management and orchestration; Energy efficiency of 5G".

[10] ETSI 202 336-12 V1.2.1 (2019-02): "Environmental Engineering (EE); Monitoring and control interface for infrastructure equipment (power, cooling and building environment systems used in telecommunication networks); Part 12: ICT equipment power, energy and environmental parameters monitoring information model".

[11] ETSI GS NFV-IFA 027 V4.0.2 (2020-11): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Performance Measurements Specification".

 [12] 3GPP TS 38.314: "NR; layer 2 measurements".

 [13] 3GPP TS 22.261: "Service requirements for the 5G system"

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| **Next change** |

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.

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

- Mobility.

- Energy Efficiency.

 - Reliability (See the definition in [13]).

 Editor's note: For future update of the document it will also include:

 - Availability.

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| **Next change** |

## 6.X Reliability KPI

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### 6.X.1 Definition

Reliability is defined (see TS 22.261 [13] clause 3.1) in the context of network layer packet transmissions, as the percentage value of the packets successfully delivered to a given system entity within the time constraint required by the targeted service out of all the packets transmitted.

#### 6.X.1.1 Packet transmission reliability KPI in DL on Uu

a) DLRelPSR\_Uu

b) This KPI describes the Reliability based on Packet Success Rate(PSR) Percentage between gNB and UE. It is used to evaluate the Uu interface reliability contribution to the total network downlink reliability. It is the percentage of RLC SDU packets which are successfully received in UE out of the total RLC SDU packets transmitted by gNB. It is a measure of the DL packet delivery success i.e. PSR% over Uu interface. It is a percentage value (%). 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 downlink Reliability in RAN based on PSR percentage between gNB and UE.

 DLRelPSR\_Uu = × 100 , where N(T1,drbid) & Dloss(T1,drbid) are as defined in TS 38.314.

 or optionally DLRelPSR\_Uu.QoS = × 100, where QoS identifies the target QoS quality of service class.

 or optionally DLRelPSR\_Uu.SNSSAI = × 100,

 where SNSSAI identifies the S-NSSAI.

 d) NRCellDU

#### 6.X.1.2 Packet transmission reliability KPI in UL on Uu

a) ULRelPSR\_Uu

b) This KPI describes the Reliability based on Packet Success Rate Percentage between UE and gNB. It is used to evaluate the Uu interface reliability contribution to the total network uplink reliability. It is the percentage of PDCP SDU packets which are successfully received in gNB out of the total PDCP SDU packets transmitted by UE. It is a measure of the UL packet delivery success i.e. PSR% over Uu interface. It is a percentage value (%). This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) ULRelPSR\_Uu = DRB.PacketSuccessRateUlgNBUu × 100 , where DRB\_PacketSuccessRateUlgNBUu is as defined in TS 28.552

 or optionally ULRelPSR\_Uu.QoS = DRB.PacketSuccessRateUlgNBUu.QOS × 100, where QoS identifies the target QoS quality of service class.

 or optionally ULRelPSR\_Uu.SNSSAI = DRB.PacketSuccessRateUlgNBUu.SNSSAI × 100, where SNSSAI identifies the S-NSSAI.

d) NRCellCU

#### 6.X.1.3 Packet transmission reliability KPI in DL on N3

a) DLRelPSR\_N3

b) This KPI describes the Reliability based on Packet Success Rate(PSR) Percentage between UPF and gNB. It is used to evaluate the N3 interface reliability contribution to the total network downlink reliability. It is the percentage of GTP data PDUs which are successfully received by gNB out of the total GTP data PDUs transmitted by UPF over N3 interface. It is a measure of the DL packet delivery success i.e. PSR% over N3 interface. It is a percentage value (%). This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) DLRelPSR\_N3 =

 where GTP.OutDataPktN3UPF , GTP.InDataPktPacketLossN3gNB are as defined in TS 28.552

 or optionally,

 DLRelPSR\_N3.QoS =

 where QoS identifies the target QoS quality of service class.

 or optionally,

 DLRelPSR\_N3.SNSSAI =

 where SNSSAI identifies the S-NSSAI.

d) UPFFunction, NRCellCU

#### 6.X.1.4 Packet transmission reliability KPI in UL on N3

a) ULRelPSR\_N3

b) This KPI describes the Reliability based on Packet Success Rate(PSR) Percentage between gNB and UPF. It is used to evaluate the N3 interface reliability contribution to the total network uplink reliability. It is the percentage of GTP data PDUs which are successfully received by UPF out of the total GTP data PDUs transmitted by gNB over N3 interface. It is a measure of the UL packet delivery success i.e. PSR% over N3 interface. It is a percentage value (%). This KPI can optionally be split into KPIs per QoS level (mapped 5QI or QCI in NR option 3) and per S-NSSAI.

c) ULRelPSR\_N3 =

 where GTP.InDataPktN3UPF , GTP.InDataPktPacketLossN3UPF are as defined in TS 28.552

 or optionally,

 ULRelPSR\_N3.QoS =

 where QoS identifies the target QoS quality of service class.

 or optionally,



 ULRelPSR\_N3.SNSSAI =

 where SNSSAI identifies the S-NSSAI.

d) UPFFunction

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| **Next change** |

# A.X Use case for end-to-end Reliability measurements of 5G network-related KPI

The end-to-end reliability is an important performance parameter for operating 5G network. In some scenarios (e.g. uRLLC), if end-to-end reliability is insufficient, the 5G network customer cannot obtain guaranteed network performance provided by the network operator. So it is necessary to assess end-to-end reliability of network utilizing the packet delivery success rate measurements defined in clauses 6.X.2,6.X.3,6.X.4 and 6.X.5.The same can be used to determine the end to end reliability of a slice.

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| **End of change** |