**3GPP TSG-SA5 Meeting #133e *S5-205282d1***

**12 to 21 October 2020, E-meeting**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **28.552** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.0.0** |  |
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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 | **x** |

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| ***Title:***  | DraftCR for WI ePM\_KPI\_5G |
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| ***Source to WG:*** | Intel |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** | ePM\_KPI\_5G |  | ***Date:*** | 2020-10-21 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | 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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)**Rel-17 (Release 17)* |
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| ***Reason for change:*** | This draftCR incorporates the following agreed contributions under WI ePM\_KPI\_5G:- S5-205306;- S5-205307;- S5-205308;- S5-205309;- S5-205310;- S5-205311.The detailed reasons for change can be found in these contributions. |
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| ***Summary of change:*** | Add Intra/Inter-frequency Handover related measurements;New part related to interruption time interval for 5QI 1 QoS Flow released due to double NG (double UE context) is proposed to be added to A.28;Add the measurements related to NIDD configuration on NEF.Add the measurements related to NIDD service on NEF.Add the measurements related to AF traffic influence on NEF.Add the measurements related to external parameter provisioning on NEF. |
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| ***Consequences if not approved:*** | The measurement of handover-related indicators is incomplete.Customer is not aware about double NG as possible source of degraded quality of 5QI 1 QoS Flow.The performance of NIDD configuration cannot be monitored.The performance of NIDD service cannot be monitored.The performance of AF traffic influence cannot be monitored.The performance of external parameter provisioning cannot be monitored. |
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| ***Clauses affected:*** | 2, 3.3, 5.1.1.6.a (new), 5.9.a (new), 5.9.b (new), 5.9.c (new), 5.9.d (new), A.17, A.28, A.a (new), A.b (new), A.c (new) |
|  |  |
|  | **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:*** |  |

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| **1st modified section** |

# 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 32.401: "Telecommunication management; Performance Management (PM); Concept and requirements".

[3] 3GPP TS 32.404: "Performance Management (PM); Performance measurements - Definitions and template".

[4] 3GPP TS 23.501: "System Architecture for the 5G System".

[5] IETF RFC 5136: "Defining Network Capacity".

[6] 3GPP TS 38.473: "NG-RAN; F1 Application Protocol (F1AP)".

[7] 3GPP TS 23.502: "Procedures for the 5G System".

[8] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

[9] 3GPP TS 32.425: "Performance Management (PM); Performance measurements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN)".

[10] 3GPP TS 32.451: "Key Performance Indicators (KPI) for Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Requirements".

[11] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[12] Void.

[13] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".[14] 3GPP TS 29.502: "5G System; Session Management Services; Stage 3".

[15] Void.

[16] 3GPP TS 29.244: "Technical Specification Group Core Network and Terminals; Interface between the Control Plane and the User Plane Nodes; Stage 3".

[17] ETSI GS NFV-IFA027 v2.4.1: "Network Functions Virtualisation (NFV); Management and Orchestration; Performance Measurements Specification".

[18] Void.

[19] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[20] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[21] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[22] 3GPP TS 29.413: "Application of the NG Application Protocol (NGAP) to non-3GPP access".

[23] 3GPP TS 29.122: "Technical Specification Group Core Network and Terminals; T8 reference point for Northbound APIs".

[24] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[25] ETSI ES 202 336-12 V1.2.1: "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".

[26] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[27] 3GPP TS 29.274: "Evolved General Packet Radio Service (GPRS); Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[28] 3GPP TS 29.510: "5G System; Network function repository services; Stage 3".

[29] 3GPP TS 38.314: "NR; layer 2 measurements".

[30] 3GPP TS 38.313: "Self-Organizing Networks (SON) for 5G networks".

[31] 3GPP TS 38.415: "NG-RAN; PDU session user plane protocol".

[32] 3GPP TS 38.321: "NR MAC protocol specification".

[33] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[34] 3GPP TS 38.215: "NR; Physical layer measurements".

[35] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[36] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[37] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[38] 3GPP TS 28.530: "Management and orchestration; Concepts, use cases and requirements".

[39] 3GPP TS 29.507: "5G System; Access and Mobility Policy Control Service; Stage 3".

[40] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

[41] 3GPP TS 29.531: "5G System; Network Slice Selection Services".

[42] 3GPP TS 29.281: "General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)"

[a] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[b] 3GPP TS 29.541: "5G System; Network Exposure FunctionServices for Non-IP Data Delivery (NIDD); Stage 3".

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## 3.3 Measurement family

The measurement names defined in the present document are all beginning with a prefix containing the measurement family name. This family name identifies all measurements which relate to a given functionality and it may be used for measurement administration.

The list of families currently used in the present document is as follows:

- DRB (measurements related to Data Radio Bearer).

- RRC (measurements related to Radio Resource Control).

- UECNTX (measurements related to UE Context).

- RRU (measurements related to Radio Resource Utilization).

- RM (measurements related to Registration Management).

- SM (measurements related to Session Management).

- GTP (measurements related to GTP Management).

- IP (measurements related to IP Management).

- PA (measurements related to Policy Association).

- MM (measurements related to Mobility Management).

- VR (measurements related to Virtualized Resource).

- CARR (measurements related to Carrier).

- QF (measurements related to QoS Flow).

- AT (measurements related to Application Triggering).

- SMS (measurements related to Short Message Service).

- PEE (measurements related to Power, Energy and Environment).

- NFS (measurements related to NF service).

- PFD (measurements related to Packet Flow Description).

- RACH (measurements related to Random Access Channel)

- MR (measurements related to Measurement Report)

- L1M (measurements related to Layer 1 Measurement)

- NSS (measurements related to Network Slice Selection)

- NIDD (measurements related to Non-IP Data Delivery)- EPP (measurements related to external parameter provisioning)

- TI (measurements related to traffic influence)

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#### 5.1.1.6.a Intra/Inter-frequency Handover related measurements

###### 5.1.1.6.a.1  Number of requested intra-frequency handover executions

a) This measurement provides the number of outgoing intra-frequency handover executions requested by the source NRCellCU.

b) CC.

c) On transmission of *RRC ConnectionReconfiguration* message to the UE triggering the handover from the source NRCellCU to the target NRCellCU, indicating the attempt of an outgoing intra-frequency handover (see 3GPP TS 38.331 [20]), the counter is steped by 1.

d) A single integer value.

e) MM.HoExeIntraFreqReq.

f) NRCellCU

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this performance measurement is for performance assurance.

###### 5.1.1.6.a.2 Number of successful intra-frequency handover executions

a) This measurement provides the number of successful intra-frequency handover executions received by the source NRCellCU.

b) CC.

c) On reception of *RRC ConnectionReconfigurationComplete* message from the UE to the target NRCellCU indicating a successful intra-frequency intra gNB handover (see 3GPP TS 38.331 [20]), or, on reception of UE CONTEXT RELEASE [13] over Xn from the target gNB following a successful intra-frequency inter gNB handover, or, if handover is performed via NG, on reception of UE CONTEXT RELEASE COMMAND [11] from AMF following a successful intra-frequency inter gNB handover, the counter is stepped by 1.

d) A single integer value.

e) MM.HoExeIntraFreqSucc.

f) NRCellCU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this performance measurement is for performance assurance.

###### 5.1.1.6.a.3 Number of requested inter-frequency handover executions

a) This measurement provides the number of outgoing inter-frequency handover executions requested by the source NRCellCU.

b) CC.

c) On transmission of *RRC ConnectionReconfiguration* message to the UE triggering the handover from the source NRCellCU to the target NRCellCU, indicating the attempt of an outgoing inter-frequency handover (see 3GPP TS 38.331 [20]), the counter is steped by 1.

d) A single integer value.

e) MM.HoExeInterFreqReq.

f) NRCellCU

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this performance measurement is for performance assurance.

###### 5.1.1.6.a.4 Number of successful inter-frequency handover executions

a) This measurement provides the number of successful inter-frequency handover executions received by the source NRCellCU.

b) CC.

c) On reception of *RRC ConnectionReconfigurationComplete* message from the UE to the target NRCellCU indicating a successful inter-frequency intra gNB handover (see 3GPP TS 38.331 [20]), or, on reception of UE CONTEXT RELEASE [13] over Xn from the target gNB following a successful inter-frequency inter gNB handover, or, if handover is performed via NG, on reception of UE CONTEXT RELEASE COMMAND [11] from AMF following a successful inter-frequency inter gNB handover, the counter is stepped by 1.

d) A single integer value.

e) MM.HoExeInterFreqSucc.

f) NRCellCU.

g) Valid for packet switched traffic.

h) 5GS.

i) One usage of this performance measurement is for performance assurance.

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### 5.9.a NIDD configuration related measurements

#### 5.9.a.1 NIDD configuration creation and update

##### 5.9.a.1.1 Number of NIDD configuration creation requests

a) This measurement provides the number of NIDD configuration creation requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_NIDDConfiguration\_Create request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) NIDD.NbrConfigCreatReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.a.1.2 Number of successful NIDD configuration creations

a) This measurement provides the number of successful NIDD configuration creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDDConfiguration\_Create response message to AF indicating a successful NIDD configuration creation (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) NIDD.NbrConfigCreatSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.a.1.3 Number of failed NIDD configuration creations

a) This measurement provides the number of failed NIDD configuration creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDDConfiguration\_Create response message to AF indicating a failed NIDD configuration creation (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) NIDD.NbrConfigCreatFail*.cause*
Where *cause* indicates the failure cause of the NIDD configuration creation.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.a.1.4 Number of NIDD configuration trigger requests

a) This measurement provides the number of requests sent by the NEF to ask AF to create NIDD configuration.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDDConfiguration\_TriggerNotify message to AF (see 3GPP TS 23.502 [7]).

d) Each measurement is an integer value.

e) NIDD.NbrConfigCreatTriggerNotify.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.a.1.5 Number of NIDD configuration update notifications

a) This measurement provides the number of NIDD configuration update notifications sent by the NEF to AF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDDConfiguration\_UpdateNotify message to AF (see 3GPP TS 23.502 [7]).

d) Each measurement is an integer value.

e) NIDD.NbrConfigUpdateNotify.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.a.2 NIDD configuration deletion

##### 5.9.a.2.1 Number of NIDD configuration deletion requests

a) This measurement provides the number of NIDD configuration deletion requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_NIDDConfiguration\_Delete request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) NIDD.NbrConfigDelReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.a.2.2 Number of successful NIDD configuration deletions

a) This measurement provides the number of NIDD configuration deletions by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDDConfiguration\_Delete response message to AF indicating a successful NIDD configuration deletion (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) NIDD.NbrConfigDelSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.a.2.3 Number of failed NIDD configuration deletions

a) This measurement provides the number of failed NIDD configuration deletions by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDDConfiguration\_Delete response message to AF indicating a failed NIDD configuration deletion (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) NIDD.NbrConfigDelFail*.cause*
Where *cause* indicates the failure cause of the NIDD configuration deletion.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

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### 5.9.b NIDD service related measurements

#### 5.9.b.1 Mobile originated NIDD delivery

##### 5.9.b.1.1 Number of mobile originated NIDD delivery requests

a) This measurement provides the number of mobile originated NIDD delivery requests received by the NEF from SMF.

b) CC.

c) Receipt by the NEF of an Nnef\_NIDD\_Delivery request message from SMF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) NIDD.NbrMODeliveryReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.b.1.2 Number of successful mobile originated NIDD deliveries

a) This measurement provides the number of successful mobile originated NIDD deliveries by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDD\_Delivery response message to SMF indicating a successful mobile originated NIDD delivery (see 3GPP TS 29.541 [b]).

d) A single integer value.

e) NIDD.NbrMODeliverySucc.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.b.1.3 Number of failed mobile originated NIDD deliveries

a) This measurement provides the number of failed mobile originated NIDD deliveries by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDD\_Delivery response message to SMF indicating a indicating a failed mobile originated NIDD delivery (see 3GPP TS 29.541 [b]), each message increments the relevant subcounter per failure cause by 1.

d) A single integer value.

e) NIDD.NbrMODeliveryFail.*cause*
Where *cause* indicates the failure cause of the NIDD delivery.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.b.2 Mobile terminated NIDD delivery

##### 5.9.b.2.1 Number of mobile terminated NIDD delivery requests

a) This measurement provides the number of mobile terminated NIDD delivery requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_NIDD\_Delivery request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) NIDD.NbrMTDeliveryReq.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.b.2.2 Number of successful mobile terminated NIDD deliveries

a) This measurement provides the number of successful mobile terminated NIDD deliveries by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDD\_Delivery response message to AF indicating a successful mobile terminated NIDD delivery (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) NIDD.NbrMTDeliverySucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.b.2.3 Number of failed mobile terminated NIDD deliveries

a) This measurement provides the number of failed mobile terminated NIDD deliveries by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_NIDD\_Delivery response message to AF indicating a indicating a failed mobile terminated NIDD delivery (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) A single integer value.

e) NIDD.NbrMTDeliveryFail.*cause*
Where *cause* indicates the failure cause of the NIDD delivery.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

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### 5.9.c AF traffic influence related measurements

#### 5.9.c.1 AF traffic influence creation

##### 5.9.c.1.1 Number of AF traffic influence creation requests

a) This measurement provides the number of traffic influence creation requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_TrafficInfluence\_Create request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) TI.NbrAfCreatReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.c.1.2 Number of successful AF traffic influence creations

a) This measurement provides the number of successful AF traffic influence creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_TrafficInfluence\_Create response message to AF indicating a successful AF traffic influence creation (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) TI.NbrAfCreatSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.c.1.3 Number of failed AF traffic influence creations

a) This measurement provides the number of failed AF traffic influence creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_TrafficInfluence\_Create response message to AF indicating a failed AF traffic influence creation (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) TI.NbrAfCreatFail*.cause*
Where *cause* indicates the failure cause of the AF traffic influence creation.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.c.2 AF traffic influence update

##### 5.9.c.2.1 Number of AF traffic influence update requests

a) This measurement provides the number of traffic influence update requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_TrafficInfluence\_Update request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) TI.NbrAfUpdateReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.c.2.2 Number of successful AF traffic influence updates

a) This measurement provides the number of successful AF traffic influence updates by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_TrafficInfluence\_Update response message to AF indicating a successful AF traffic influence update (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) TI.NbrAfUpdateSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.c.2.3 Number of failed AF traffic influence updates

a) This measurement provides the number of failed AF traffic influence updates by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_TrafficInfluence\_Update response message to AF indicating a failed AF traffic influence update (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) TI.NbrAfUpdateFail*.cause*
Where *cause* indicates the failure cause of the AF traffic influence update.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.c.3 AF traffic influence deletion

##### 5.9.c.3.1 Number of AF traffic influence deletion requests

a) This measurement provides the number of traffic influence deletion requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_TrafficInfluence\_Delete request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) TI.NbrAfDelReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.c.3.2 Number of successful AF traffic influence deletions

a) This measurement provides the number of successful AF traffic influence deletions by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_TrafficInfluence\_Delete response message to AF indicating a successful AF traffic influence deletion (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) TI.NbrAfDelSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.c.3.3 Number of failed AF traffic influence deletions

a) This measurement provides the number of failed AF traffic influence deletions by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_TrafficInfluence\_Delete response message to AF indicating a failed AF traffic influence deletion (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) TI.NbrAfDelFail*.cause*
Where *cause* indicates the failure cause of the AF traffic influence deletion.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

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### 5.9.d External parameter provisioning related measurements

#### 5.9.d.1 External parameter creation

##### 5.9.d.1.1 Number of external parameter creation requests

a) This measurement provides the number of external parameter creation requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_ParameterProvision\_Create request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) EPP.NbrCreatReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.d.1.2 Number of successful external parameter creations

a) This measurement provides the number of successful external parameter creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ParameterProvision\_Create response message to AF indicating a successful external parameter creation (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) EPP.NbrCreatSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.d.1.3 Number of failed external parameter creations

a) This measurement provides the number of failed external parameter creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ParameterProvision\_Create response message to AF indicating a failed AF external parameter creation (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) EPP.NbrCreatFail*.cause*
Where *cause* indicates the failure cause of the external parameter creation.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.d.2 External parameter update

##### 5.9..2.1 Number of external parameter update requests

a) This measurement provides the number of external parameter update requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_ParameterProvision\_Update request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) EPP.NbrUpdateReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.d.2.2 Number of successful external parameter updates

a) This measurement provides the number of successful external parameter updates by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ParameterProvision\_Update response message to AF indicating a successful external parameter update (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) EPP.NbrUpdateSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.d.2.3 Number of failed external parameter updates

a) This measurement provides the number of failed external parameter updates by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ParameterProvision\_Update response message to AF indicating a failed external parameter update (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) EPP.NbrUpdateFail*.cause*
Where *cause* indicates the failure cause of the external parameter update.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.d.3 External parameter deletion

##### 5.9.d.3.1 Number of external parameter deletion requests

a) This measurement provides the number of external parameter deletion requests received by the NEF from AF.

b) CC.

c) Receipt by the NEF of an Nnef\_ParameterProvision\_Delete request message from AF (see 3GPP TS 23.502 [7]).

d) A single integer value.

e) EPP.NbrDelReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.d.3.2 Number of successful external parameter deletions

a) This measurement provides the number of external parameter deletions by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ParameterProvision\_Delete response message to AF indicating a successful external parameter deletion (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) EPP.NbrDelSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.d.3.3 Number of failed external parameter deletions

a) This measurement provides the number of failed external parameter deletions by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ParameterProvision\_Delete response message to AF indicating a failed external parameter deletion (see 3GPP TS 29.522 [a]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) EPP.NbrDelFail*.cause*
Where *cause* indicates the failure cause of the external parameter deletion.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

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| **Next modified section** |

# A.17 Monitoring of handovers

Mobility is one of the most significant feature of the mobile networks, and handover is one typical action of the mobility. The handover failure would cause service discontinuation, thus the performance of the handover has direct impact to the user experience.The handover procedure includes handover preparation, handover resource allocation and handover execution, and the performance related to handover needs to be monitored for each phase. The resources (e.g., PDU Session Resource) need to be prepared and allocated for a handover according to the QoS requirements for each S-NSSAI.

The handover could occur intra-gNB and inter-gNB for 5G networks, and for inter-gNB case the handover could happen via NG or Xn interface. The handover could occur Intra-frequency and Inter-frequency for 5G networks. The handover could also occur between 5GS and EPS.

For the handover failures, the measurements with specific causes are required for trouble shooting.

The handover parameters setting could be specific for each NCR, and the handover performance could vary significantly for different NCRs, therefore the performance needs to be measured per NCR to support handover parameters optimization when necessary.

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| **Next modified section** |

# A.28 Monitor of QoS flow release

QoS flow is the key and limited resource for 5G RAN (including NG-RAN and non-3GPP access) to deliver services. The release of the QoS flow needs to be monitored as:

- an abnormal release of the QoS flow will cause the call(/session) drop, which directly impacts the QoS delivered by the networks, and the satisfaction degree of the end user;

- a successfully released QoS flow can be used to setup other requested calls(/sessions). The QoS flow failed to be released will still occupy the limited resource and hence it can not be used to admit other requested calls(/sessions).

From a retainability measurement aspect, QoS flows do not need to be released because they are inactive, they can be kept to give fast access when new data arrives.

To define (from a QoS flow release measurement point of view) if a QoS flow is considered active or not, the QoS flow can be divided into two groups:

For QoS flows with bursty flow, a UE is said to be "in session" if any QoS flow data on a Data Radio Bearer (UL or DL) has been transferred during the last 100 ms.
For QoS flows with continuous flow, the QoS flow (and the UE) is always seen as being "in session" in the context of this measurement, and the session time is increased from the first data transmission on the QoS flow until 100 ms after the last data transmission on the QoS flow.

A particular QoS flow is defined to be of type continuous flow if the 5QI is any of {1, 2, 65, 66}.

The specific reason causing the abnormal and failed release of the QoS flow is required in order to find out the problem and ascertain the solutions. And due to different priority and tolerance for different service type with different QoS level in the networks, the monitor needs to be opened on each service type with QoS level.

The QoS flow can be released by PDU Session Resource Release procedure, UE Context Release procedure, Reset procedure either initiated by 5G RAN (including NG-RAN and non-3GPP access) or AMF and NG Path Switch procedure (see 3GPP TS 38.413 [11]).

So performance measurements related to QoS flow Release (see 3GPP TS 38.413 [11]) and UE Context Release (see 3GPP TS 38.413 [11]) procedure for each service type with QoS level are necessary to support the monitor of QoS flow release.

The abnormal release of the QoS flow has potential scenario where, regardless of receiving the UE Context Release Command with the cause related to abnormal release, the end user does not perceive it as abnormal. This scenario is explicitly related to 5QI 1 calls, for other services it is not possible to determine the reason behind the cause code. It is typical to encounter such scenario, a so called "double UE Context", when Radio Link Failure occurs during an ongoing 5QI 1 call and RRC Connection Re-establishment attempt fails on target or other cell. If then the UE does a new RRC Connection the 5QI 1 QoS flow is set-up during Initial Context Setup in the target or other cell. However, when AMF receives that service request with the Initial UE message through the target or other cell, it realizes that it already has the same UE Context but from the source cell (it has not been released yet). In such case, AMF sends UE Context Release Command to the source cell. As the 5QI 1 QoS flow has been successfully setup in the target or other cell, the 5QI 1 QoS flow release in the source cell may not be perceived as a drop (abnormal release) by the end user, as the service has been sustained with some interruption time, and can’t be considered as a drop in the 5QI 1 QoS flow Drop Ratio. This interruption time may be monitored in order to evaluate how it can impact the QoS of the 5QI 1 Flows due to double NG (double UE context)”. Moreover, the 5QI 1 QoS Flows that can be immediately released due to radio reasons with UE connectivity lost (when T-RLF timer was not started) may be delayed by time interval based on this average interruption time to possibly transform them to double NG scenario to keep the calls active and reduce further the 5QI 1 QoS flow Drop Ratio.

From QoS perspective it is important to focus also on call duration as in some cases wrong quality perceived by the end user is not fully reflected by drop ratio nor retainability KPI. Typical case is when due to poor radio conditions the end user redials (the call was terminated normally) to the same party to secure the quality. But in this case the drop ratio KPI will not show any degradation. Secondly, although the call is dropped the end user may or may not redial depending on dropped call duration compared to the case when the call would be normally released. It is therefore highly recommended to monitor average and distribution of duration of normally and abnormally released calls.

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| **Next modified section** |

# A.a Monitoring of NIDD (Non-IP Data Delivery)

NIDD service may be used to handle Mobile Originated (MO) and Mobile Terminated (MT) communication with UEs to AF, where the data used for the communication is considered unstructured (a.k.a., Non-IP).

NIDD is handled using an Unstructured PDU session to the NEF, and NIDD API may be used for a PDU session based on the configuration in the subscription.

The NIDD configuration service can be used for AF to update the NEF ID for the NIDD service, and to indicate which serialization formats it supports for mobile originated and mobile terminated traffic in the Reliable Data Server Configuration.

Therefore, for evaluation of NIDD performance, the NIDD configuration and NIDD service need to be monitored with the relevant performance measurements.

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| **Next modified section** |

# A.b Monitoring of AF traffic influence

As described in TS 23.501 [4], an Application Function may send requests to influence SMF routeing decisions for User Plane traffic of PDU Sessions. The AF requests may influence UPF (re)selection and allow routeing of user traffic to a local access (identified by a DNAI) to a Data Network. The AF may request the traffic influence via NEF.

The fulfilment of traffic influence per the request from AF means that the user data traffic is routed according to the requirements from the application, therefore performance measurements are needed to indicate whether the AF traffic influence requests are fulfilled.

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| **Next modified section** |

# A.c Monitoring of external parameter provisioning

The NEF allows an external party (AF) to provision the information, such as expected UE behaviour (regarding UE movement or communication characteristics) and service specific parameters, or the 5G VN (Virtual Network) group information to 5G network functions, see TS 23.501 [4].

The failed external parameter provisioning would impact the UE behaviour or service fulfilment; therefore, the performance of external parameter provisioning needs to be monitored.

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| **End of modified section** |