**3GPP TSG-SA5 Meeting #135e *S5-211355d2***

**25 January to 03 February 2021**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **28.552** | **CR** | **-** | **rev** | **1** | **Current version:** | **17.1.0** |  |
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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 |
|  |  |
| ***Source to WG:*** | Intel |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** | ePM\_KPI\_5G |  | ***Date:*** | 04 |
|  |  |  |  |  |
| ***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;- S5-205310;- S5-205311;- S5-211102;- S5-211103;- S5-211104.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;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.Add the measurements related to SMF-NEF connection establishment on NEF.Add the measurements related to service specific parameter provisioning on NEF.Add the measurements related to policy negotiation for future background data transfer on NEF. |
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| ***Consequences if not approved:*** | The measurement of handover-related indicators is incomplete.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.The performance of SMF-NEF connection establishment cannot be monitored.The performance of service specific parameter provisioning cannot be monitored.The performance of policy negotiation for future background data transfer 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), 5.9.e (new), 5.9.f (new), 5.9.g (new), A.17, A.a (new), A.b (new), A.c (new), A.d (new), A.e (new), A.f (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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | 1. Updated from S5-205282 to change the baseline TS version number from 17.0.0 to 17.1.0 |

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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".

[c] 3GPP TS 23.503: "Policy and charging control framework for the 5G System (5GS); Stage 2"

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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)

- PAG (measurements related to Paging)

- NIDD (measurements related to Non-IP Data Delivery)

- EPP (measurements related to external parameter provisioning)

- TI (measurements related to traffic influence)

- CE (measurements related to Connection Establishment)

- SPP (measurements related to Service Parameter Provisioning)

- BDTP (measurements related to Background Data Transfer Policy)

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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** |

### 5.9.e Connection establishment related measurements

#### 5.9.e.1 SMF-NEF connection creation

##### 5.9.e.1.1 Number of SMF-NEF connection creation requests

a) This measurement provides the number of SMF-NEF connection creation requests received by the NEF from SMF.

b) CC.

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

d) A single integer value.

e) CE.NbrSmfNefCreatReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.e.1.2 Number of successful SMF-NEF connection creations

a) This measurement provides the number of successful SMF-NEF connection creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_SMContext\_Create response message to SMF indicating a successful SMF-NEF connection creation (see 3GPP TS 29.541 [b]).

d) A single integer value.

e) CE.NbrSmfNefCreatSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.e.1.3 Number of failed SMF-NEF connection creations

a) This measurement provides the number of failed SMF-NEF connection creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_SMContext\_Create response message to SMF indicating a failed SMF-NEF connection creation (see 3GPP TS 29.541 [b]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) CE.NbrSmfNefCreatFail*.cause*
Where *cause* indicates the failure cause of the SMF-NEF connection creation.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.e.2 SMF-NEF Connection release

##### 5.9.e.2.1 Number of SMF-NEF Connection release requests

a) This measurement provides the number of SMF-NEF Connection release requests received by the NEF from SMF.

b) CC.

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

d) A single integer value.

e) CE.NbrSmfNefRelReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.e.2.2 Number of successful SMF-NEF Connection releases

a) This measurement provides the number of successful SMF-NEF Connection releases by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_SMContext\_Delete response message to AF indicating a successful SMF-NEF Connection release (see 3GPP TS 29.541 [b]).

d) A single integer value.

e) CE.NbrSmfNefRelSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.e.2.3 Number of failed SMF-NEF Connection releases

a) This measurement provides the number of failed SMF-NEF Connection releases by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_SMContext\_Delete response message to AF indicating a failed SMF-NEF Connection release (see 3GPP TS 29.541 [b]), each message increments the relevant subcounter per failure cause by 1.

d) Each measurement is an integer value.

e) CE.NbrSmfNefRelFail*.cause*
Where *cause* indicates the failure cause of the SMF-NEF Connection release.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

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| **Next modified section** |

### 5.9.f Service specific parameters provisioning related measurements

#### 5.9.f.1 Service specific parameters creation

##### 5.9.f.1.1 Number of service specific parameters creation requests

a) This measurement provides the number of service specific parameters creation requests received by the NEF from AF.

b) CC.

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

d) A single integer value.

e) SPP.NbrCreatReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.f.1.2 Number of successful service specific parameters creations

a) This measurement provides the number of successful service specific parameters creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ServiceParameter\_Create response message to SMF indicating a successful service specific parameters creation (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) SPP.NbrCreatSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.f.1.3 Number of failed service specific parameters creations

a) This measurement provides the number of failed service specific parameters creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ServiceParameter\_Create response message to AF indicating a failed service specific parameters 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) SPP.NbrCreatFail*.cause*
Where *cause* indicates the failure cause of the service specific parameters creation.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.f.2 Service specific parameters update

##### 5.9.f.2.1 Number of service specific parameters update requests

a) This measurement provides the number of service specific parameters update requests received by the NEF from AF.

b) CC.

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

d) A single integer value.

e) SPP.NbrUpdateReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.f.2.2 Number of successful service specific parameters updates

a) This measurement provides the number of successful service specific parameters updates by the NEF.

b) CC.

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

d) A single integer value.

e) SPP.NbrUpdateSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.f.2.3 Number of failed service specific parameters updates

a) This measurement provides the number of failed service specific parameters updates by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ServiceParameter\_Update response message to AF indicating a failed service specific parameters 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) SPP.NbrUpdateFail*.cause*
Where *cause* indicates the failure cause of the service specific parameters update.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.9.f.3 Service specific parameters deletion

##### 5.9.f.3.1 Number of service specific parameters deletion requests

a) This measurement provides the number of service specific parameters deletion requests received by the NEF from AF.

b) CC.

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

d) A single integer value.

e) SPP.NbrDelReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.f.3.2 Number of successful service specific parameters deletions

a) This measurement provides the number of successful service specific parameters deletions by the NEF.

b) CC.

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

d) A single integer value.

e) SPP.NbrDelSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.f.3.3 Number of failed service specific parameters deletions

a) This measurement provides the number of failed service specific parameters deletions by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_ServiceParameter\_Delete response message to AF indicating a failed service specific parameters 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) SPP.NbrDelFail*.cause*
Where *cause* indicates the failure cause of the service specific parameters deletion.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

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| **Next modified section** |

### 5.9.g Background data transfer policy related measurements

#### 5.9.g.1 Background data transfer policy negotiation

##### 5.9.g.1.1 Number of background data transfer policy negotiation creation requests

a) This measurement provides the number of background data transfer policy negotiation creation requests received by the NEF from AF.

b) CC.

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

d) A single integer value.

e) BDTP.NbrNegCreatReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.g.1.2 Number of successful background data transfer policy negotiation creations

a) This measurement provides the number of successful background data transfer policy negotiation creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_BDTPNegotiation\_Create response message to SMF indicating a successful background data transfer policy negotiation creation (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) BDTP.NbrNegCreatSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.g.1.3 Number of failed background data transfer policy negotiation creations

a) This measurement provides the number of failed background data transfer policy negotiation creations by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_BDTPNegotiation\_Create response message to AF indicating a failed background data transfer policy negotiation 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) BDTP.NbrNegCreatFail*.cause*
Where *cause* indicates the failure cause of the background data transfer policy negotiation creation.

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.g.1.4 Number of background data transfer policy negotiation update requests

a) This measurement provides the number of background data transfer policy negotiation update requests received by the NEF from AF.

b) CC.

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

d) A single integer value.

e) BDTP.NbrNegUpdateReq

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.g.1.5 Number of successful background data transfer policy negotiation updates

a) This measurement provides the number of successful background data transfer policy negotiation updates by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_BDTPNegotiation Update response message to AF indicating a successful background data transfer policy negotiation update (see 3GPP TS 29.522 [a]).

d) A single integer value.

e) BDTP.NbrNegUpdateSucc

f) NEFFunction.

g) Valid for packet switched traffic.

h) 5GS.

##### 5.9.g.1.6 Number of failed background data transfer policy negotiation updates

a) This measurement provides the number of failed background data transfer policy negotiation updates by the NEF.

b) CC.

c) Transmission by the NEF of an Nnef\_BDTPNegotiation Update response message to AF indicating a failed background data transfer policy negotiation (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) BDTP.NbrNegUpdateFail*.cause*
Where *cause* indicates the failure cause of the failed background data transfer policy negotiation update.

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.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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| **Next modified section** |

# A.d Monitoring of SMF-NEF connection establishment

For delivering the NIDD service, the SMF-NEF connection needs to be established for a PDU Session for a UE. NEF provides the capabilities to create, update and release the SMF-NEF connection.

The SMF-NEF connection is used for transferring the NIDD data, therefore the performance of the SMF-NEF connection establishment impacts users’ experience about the NIDD service.

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| **Next modified section** |

# A.e Monitoring of service specific parameters provisioning

AF may need to provide service specific parameters to 5G system via NEF in order to support the service not provided by the PLMN. The 5GS, after receiving via NEF, delivers the service specific parameters to the target UEs.

The service specific parameter provisioning service provided by NEF is critical for the 5GS (including the UEs) to support these services. Therefore, it would be necessary for the operators to monitor the performance of the service specific parameter provisioning.

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| **Next modified section** |

# A.f Monitoring of background data transfer policy negotiation

AF may need to negotiate the policies for future background data transfer with 5GS via NEF, before the UE's PDU Session establishment. Per the request from AF, the NEF negotiates with H-PCF about the transfer policies for the future background data transfer. The transfer policies may contain a desired time window for the background data transfer, a reference to a charging rate for the time window, network area information, and optionally a maximum aggregated bitrate, as described in clause 6.1.2.4 of TS 23.503 [x].

The AF may apply the negotiated policies for a future PDU Session at some point.

The policies for the background data transfer have strong relevance to users’ experience, therefore the measurements are needed to monitor the performance of policy negotiation for future background data transfer.

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| **End of modified section** |