**3GPP TSG-SA5 Meeting #131eS5-203302**

**e-meeting, 25 May – 3 June 2020**

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| *CR-Form-v11.4* |
| **CHANGE REQUEST** |
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|  | **28.552** | **CR** | **0242** | **rev** | **-** | **Current version:** | **16.5.0** |  |
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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:***  | Cleanup based on refined slice definitions |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | S5 |
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| ***Work item code:*** | TEI16 |  | ***Date:*** | 2020-05-15 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | network slice instance ( or NSI) is used in many places of this specification, but for different purposes. 1. In some places, NSI is used to represent Network Slice2. In other places, NSI is used to represent Managed Object Instance of NetworkSlice IOC. |
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| ***Summary of change:*** | 1. Replace “network slice instance (or NSI)” with “Network Slice” if the NSI is used to represent Network Slice2. Replace “network slice instance (or NSI)” with NetworkSlice instance or MOI of NetworkSlice if the NSI is used to represent Managed Object Instance of NetworkSlice Information Object Class. |
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| ***Consequences if not approved:*** | Mis-using network slice instance caused conceptual issues inside and outside 3GPP, and let existing specification not implementable. |
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| ***Clauses affected:*** | 2, 3.2, 4.1, 5.2.1, 5.2.2, 5.2.4, 5.3.1, 5.5.1, 5.5.2, A.9, A.10, A.17 |
|  |  |
|  | **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:*** |  |

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| **Start of 1st modification** |

# 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".3 Definitions, abbreviations and measurement family”.

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

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1], 3GPP TS 23.501 [4] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1] and 3GPP TS 23.501 [4].

PI Performance Indicator.

kbit kilobit (1000 bits)

MN Master Node.

NG-RAN Next Generation Radio Access Network

SN Secondary Node.

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| **End of 1st modification** |

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| **Start of 2nd modification** |

# 4 Concepts and overview

## 4.1 Performance indicators

Performance Indicators are the performance data aggregated over a group of NFs, such as, for example, average latency along the network slice. The Performance Indicators can be derived from the performance measurements collected at the NFs that belong to the group. The aggregation method is identified in the Performance Indicator definition

Performance Indicators at the network slice subnet level can be derived from the performance measurements collected at the NFs that belong to the network slice subnets or to the constituent network slice subnets. The Performance Indicators at the network slice subnet level can be made available via the corresponding performance management service for network slice subnet.

The Performance Indicators at the network slice level, can be derived from the network slice subnet level Performance Indicators collected at the constituent network slice subnets and/or NFs. The network slice level Performance Indicators can be made available via the corresponding performance management service for network slice.

When providing a communication service to a tenant, the performance indicators can be derived from corresponding Performance Indicators related to network slice, network slice subnet and NFs and they can be made available via the corresponding performance management service, consumed by a tenant.

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| **End of 2nd modification** |

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| **Start of 3rd modification** |

### 5.2.1 Registered subscribers measurement

#### 5.2.1.1 Mean number of registered subscribers

a) This measurement provides the mean number of registered state subscribers per AMF

b) SI

c) This measurement is obtained by sampling at a pre-defined interval the number of registered subscribers in an AMF and then taking the arithmetic mean. The measurement can be split into subcounters per S-NSSAI.

d) A single integer value

e) RM.RegisteredSubNbrMean.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI

f) AMFFunction

g) Valid for packet switching

h) 5GS

#### 5.2.1.2 Maximum number of registered subscribers

a) This measurement provides the maximum number of registered state subscribers per AMF

b) SI

c) This measurement is obtained by sampling at a pre-defined interval the number of registered subscribers in an AMF and then taking the maximum. The measurement can be split into subcounters per S-NSSAI.

d) A single integer value

e) RM.RegisteredSubNbrMax.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI

f) AMFFunction

g) Valid for packet switching

h) 5GS

### 5.2.2 Registration procedure related measurements

#### 5.2.2.1 Number of initial registration requests

a) This measurement provides the number of initial registration requests received by the AMF.

b) CC

c) On receipt by the AMF from the UE of Registration Request with the registration type indicating an initial registration (see clause 4.2.2.2.2 of 3GPP TS 23.502 [7]). Each initial registration request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegInitReq.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.2.2.2 Number of successful initial registrations

a) This measurement provides the number of successful initial registrations at the AMF.

b) CC

c) On transmission of Registration Accept by the AMF to the UE that sent the initial registration request (see 3GPP TS 23.502 [7]). Each accepted initial registration is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegInitSucc.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.2.2.3 Number of mobility registration update requests

a) This measurement provides the number of mobility registration update requests received by the AMF.

b) CC

c) On receipt by the AMF from the UE of Registration Request with the registration type indicating a Mobility Registration Update (see clause 4.2.2.2.2 of 3GPP TS 23.502 [7]). Each mobility registration update request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegMobReq.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.2.2.4 Number of successful mobility registration updates

a) This measurement provides the number of successful mobility registration updates at the AMF.

b) CC

c) On transmission of Registration Accept by the AMF to the UE that sent the mobility registration update request (see 3GPP TS 23.502 [7]). Each accepted mobility registration update is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegMobSucc.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.2.2.5 Number of periodic registration update requests

a) This measurement provides the number of periodic registration update requests received by the AMF.

b) CC

c) On receipt by the AMF from the UE of Registration Request with the registration type indicating a Periodic Registration Update (see clause 4.2.2.2.2 of 3GPP TS 23.502 [7]). Each periodic registration update request is added to the relevant subcounter S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegPeriodReq.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.2.2.6 Number of successful periodic registration updates

a) This measurement provides the number of successful mobility registration updates at the AMF.

b) CC

c) On transmission of Registration Accept by the AMF to the UE that sent the periodic registration update request (see 3GPP TS 23.502 [7]). Each accepted periodic registration update is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegPeriodSucc.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.2.2.7 Number of emergency registration requests

a) This measurement provides the number of emergency registration requests received by the AMF.

b) CC

c) On receipt by the AMF from the UE of Registration Request with the registration type indicating an Emergency Registration (see clause 4.2.2.2.2 of 3GPP TS 23.502 [7]). Each emergency registration request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegEmergReq.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.2.2.8 Number of successful emergency registrations

a) This measurement provides the number of successful emergency registrations at the AMF.

b) CC

c) On transmission Registration Accept by the AMF to the UE that sent the emergency registration request (see 3GPP TS 23.502 [7]). Each accepted emergency registration is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) RM.RegEmergSucc.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction

g) Valid for packet switched traffic

h) 5GS

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

### 5.2.4 Measurements related to registration via untrusted non-3GPP access

#### 5.2.4.1 Number of initial registration requests via untrusted non-3GPP access

a) This measurement provides the number of initial registration requests via untrusted non-3GPP access received by the AMF.

b) CC.

c) Receipt by the AMF from N3IWF of an N2 message that contains Registration Request with the registration type indicating an initial registration (see clause 4.12.2.2 of 3GPP TS 23.502 [7]). Each initial registration request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegInitReqNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.2.4.2 Number of successful initial registrations via untrusted non-3GPP access

a) This measurement provides the number of successful initial registrations via untrusted non-3GPP access at the AMF.

b) CC.

c) Transmission by the AMF to N3IWF of an N2 message that contains Registration Accept corresponding to an initial registration request (see clause 4.12.2.2 of 3GPP TS 23.502 [7]). Each accepted initial registration is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegInitSuccNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.2.4.3 Number of mobility registration update requests via untrusted non-3GPP access

a) This measurement provides the number of mobility registration update requests via untrusted non-3GPP access received by the AMF.

b) CC.

c) Receipt by the AMF from N3IWF of an N2 message that contains Registration Request with the registration type indicating a Mobility Registration Update (see clause 4.12.2.2 of 3GPP TS 23.502 [7]). Each mobility registration update request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegMobReqNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.2.4.4 Number of successful mobility registration updates via untrusted non-3GPP access

a) This measurement provides the number of successful mobility registration updates via untrusted non-3GPP access at the AMF.

b) CC.

c) Transmission by the AMF to N3IWF of an N2 message that contains Registration Accept corresponding to a mobility registration update request (see clause 4.12.2.2 of 3GPP TS 23.502 [7]). Each accepted mobility registration update is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegMobSuccNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.2.4.5 Number of periodic registration update requests via untrusted non-3GPP access

a) This measurement provides the number of periodic registration update requests via untrusted non-3GPP access received by the AMF.

b) CC.

c) Receipt by the AMF from N3IWF of an N2 message that contains Registration Request with the registration type indicating a Periodic Registration Update (see clause 4.12.2.2 of 3GPP TS 23.502 [7]). Each periodic registration update request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegPeriodReqNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.2.4.6 Number of successful periodic registration updates via untrusted non-3GPP access

a) This measurement provides the number of successful mobility registration updates via untrusted non-3GPP access at the AMF.

b) CC.

c) Transmission by the AMF to N3IWF of an N2 message that contains Registration Accept corresponding to a periodic registration update request (see clause 4.12.2.2 of 3GPP TS 23.502 [7]). Each accepted periodic registration update is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegPeriodSuccNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.2.4.7 Number of emergency registration requests via untrusted non-3GPP access

a) This measurement provides the number of emergency registration requests via untrusted non-3GPP access received by the AMF.

b) CC.

c) Receipt by the AMF from N3IWF of an N2 message that contains Registration Request with the registration type indicating an Emergency Registration (see clause 4.2.2.2.2 of 3GPP TS 23.502 [7]). Each emergency registration request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegEmergReqNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI; f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

#### 5.2.4.8 Number of successful emergency registrations via untrusted non-3GPP access

a) This measurement provides the number of successful emergency registrations via untrusted non-3GPP access Transmission by the AMF to N3IWF of an N2 message that contains Registration Accept corresponding to at the AMF.

b) CC.

c) Transmission by the AMF to N3IWF of an N2 message that contains Registration Accept corresponding to an emergency registration request (see clause 4.12.2.2 of 3GPP TS 23.502 [7]). Each accepted emergency registration is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value.

e) RM.RegEmergSuccNon3GPP.*SNSSAI.*

 Where *SNSSAI* identifies the S-NSSAI;

f) AMFFunction.

g) Valid for packet switched traffic.

h) 5GS.

### 5.3.1 Session Management

#### 5.3.1.1 Number of PDU sessions (Mean)

1. a) This measurement provides the mean number of PDU sessions.
2. b) SI
3. c) The measurement is obtained by sampling at a pre-defined interval, the number of PDU sessions established by SMF, and then taking the arithmetic mean. The measurement is optionally split into subcounters per S-NSSAI.
4. d) A single integer value
5. e) SM.SessionNbrMean.*SNSSAI*Where *SNSSAI* identifies the S-NSSAI
6. f) SMFFunction
7. g) Valid for packet switched traffic
8. h) 5GS

#### 5.3.1.2 Number of PDU sessions (Maximum)

a) This measurement provides the max number of PDU sessions.

b) SI

c) The measurement is obtained by sampling at a pre-defined interval, the number of PDU sessions established by SMF, and then selecting the maximum value. The measurement is optionally split into subcounters per S-NSSAI.

d) A single integer value

e) SM.SessionNbrMax.*SNSSAI*
Where *SNSSAI* identifies the S-NSSAI

f) SMFFunction

g) Valid for packet switched traffic

h) 5GS

#### 5.3.1.3 Number of PDU session creation requests

a) This measurement provides the number of PDU sessions requested to be created by the SMF.

b) CC

c) On receipt by the SMF from AMF of Nsmf\_PDUSession\_CreateSMContext Request (see 3GPP TS 23.502 [7]). Each PDU session requested to be created is added to the relevant subcounter per S-NSSAI and the relevant subcounter per request type.

d) Each subcounter is an integer value

e) SM.PduSessionCreationReq.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

 SM.PduSessionCreationReq*ReqType*.

 Where*ReqType* indicates the request type (e.g., initial request, initial emergency request) cause for the PDU session.

f) SMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.3.1.4 Number of successful PDU session creations

a) This measurement provides the number of PDU sessions successfully created by the SMF.

b) CC

c) On transmission by the SMF to AMF of Nsmf\_PDUSession\_CreateSMContext Response that indicates a successful PDU session creation (see 3GPP TS 23.502 [7]). Each PDU session successfully created is added to the relevant subcounter per S-NSSAI and the relevant subcounter per request type.

d) Each subcounter is an integer value

e) SM.PduSessionCreationSucc.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

 SM.PduSessionCreationSucc*ReqType*.

 Where*ReqType* indicates the request type (e.g., initial request, initial emergency request) cause for the PDU session.

f) SMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.3.1.8 Number of PDU session creation requests in HR roaming scenario

a) This measurement provides the number of PDU sessions requested to be created by the H-SMF in Home-Routed roaming scenario.

b) CC

c) On receipt by the H-SMF from V-SMF of Nsmf\_PDUSession\_Create Request (see 3GPP TS 23.502 [7]). Each PDU session requested to be created is added to the relevant subcounter per S-NSSAI and the relevant subcounter per request type.

d) Each subcounter is an integer value

e) SM.PduSessionCreationHRroam.*SNSSAI*

Where *SNSSAI* identifies the S-NSSAI;

SM.PduSessionCreationHRroam.*ReqType*

Where *ReqType* indicates the request type (e.g., initial request, initial emergency request) for the PDU session.

f) SMFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.3.1.9 Number of successful PDU session creations in HR roaming scenario

a) This measurement provides the number of PDU sessions successfully created by the H-SMF in Home-Routed roaming scenario.

b) CC

c) On transmission by the H-SMF to V-SMF of Nsmf\_PDUSession\_Create Response that indicates a successful PDU session creation (see 3GPP TS 23.502 [7]). Each PDU session successfully created is added to the relevant subcounter per S-NSSAI and the relevant subcounter per request type.

d) Each subcounter is an integer value

e) SM.PduSessionCreationHRroamSucc.*SNSSAI*

Where *SNSSAI* identifies the S-NSSAI;

SM.PduSessionCreationHRroamSucc.*ReqType*

Where *ReqType* indicates the request type (e.g., initial request, initial emergency request) for the PDU session.

f) SMFFunction

g) Valid for packet switched traffic

h) 5GS

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

### 5.5.1 AM policy association related measurements

#### 5.5.1.1 Number of AM policy association requests

a) This measurement provides the number of AM policy association requests received by the visiting PCF ((V-)PCF).

b) CC

c) On receipt by the PCF from the AMF of Npcf\_AMPolicyControl\_Create (see 3GPP TS 23.502 [7]). Each AM policy association request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) PA.PolicyAMAssoReq.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) PCFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.5.1.2 Number of successful AM policy associations

a) This measurement provides the number of successful AM policy associations at the visiting PCF ((V-)PCF).

b) CC

c) On transmission by the PCF to the AMF of Npcf\_AMPolicyControl\_Create response (see 3GPP TS 23.502 [7]). Each successful AM policy association is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) PA.PolicyAMAssoSucc.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) PCFFunction

g) Valid for packet switched traffic

h) 5GS

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

### 5.5.2 SM policy association related measurements

#### 5.5.2.1 Number of SM policy association requests

a) This measurement provides the number of SM policy association requests received by the PCF.

b) CC

c) On receipt by the PCF from the SMF of Npcf\_SMPolicyControl\_Create (see 3GPP TS 23.502 [7]). Each SM policy association request is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) PA.PolicySMAssoReq.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) PCFFunction

g) Valid for packet switched traffic

h) 5GS

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

#### 5.5.2.2 Number of successful SM policy associations

a) This measurement provides the number of successful SM policy associations at the PCF.

b) CC

c) On transmission by the PCF to the SMF of Npcf\_SMPolicyControl\_Create response (see 3GPP TS 23.502 [7]). Each successful SM policy association is added to the relevant subcounter per S-NSSAI.

d) Each subcounter is an integer value

e) PA.PolicySMAssoSucc.*SNSSAI*

 Where *SNSSAI* identifies the S-NSSAI;

f) PCFFunction

g) Valid for packet switched traffic

h) 5GS

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

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| **End of 3rd modification** |

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| **Start of 4th modification** |

# A.9 Monitoring of UE Throughput in NG-RAN

Keeping track of UL and DL UE throughput in the NG-RAN is essential, to ensure end user satisfaction and well-functioning and well configured cells and scheduling features.

The restricted UE throughput per mapped 5QI will show the scheduling efficiency and QoS priority handling in the gNB and the ratio between unrestricted and restricted volume will show the gNB ability to handle small data transfers efficiently.

To be able to monitor the spread of throughput within the cell, and estimate the ratio of satisfied users, the throughput distribution measurement can be used.

When network slicing is supported by the NG-RAN, multiple s S-NSSAIs may be supported. The UL and DL UE throughput for each S-NSSAI is then of importance to the operator to pinpoint a specific performance problem.

# A.10 Monitoring of Unrestricted volume in NG-RAN

Measuring the share of unrestricted user data volume in the NG-RAN is important, to show the gNB ability to handle small data transfers efficiently and to see how large share of the volume that is part of the UE throughput measurement. It is not meaningful to measure throughput for data transfers so small that they fit in one single slot but it is still important to know how much such transfers can be handled by the gNB.

When network slicing is supported by the NG-RAN, multiple s S-NSSAIs may be supported. The share of unrestricted volume for each S-NSSAI is then of importance to the operator to pinpoint a specific performance problem.

# 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 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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| **End of 4th modification** |