**3GPP TSG-CT WG1 Meeting #124-eC1-20xxxx**

**Electronic meeting, 2-10 June 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **24.501** | **CR** | **2388** | **rev** | **1** | **Current version:** | **16.4.1** |  |
|  | | | | | | | | |
| *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 | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:*** | SNPN services via a PLMN over 3GPP access | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | Vertical\_LAN | | | | |  | ***Date:*** | | | 2020-05-12 |
|  |  | | | |  | |  | | |  |
| ***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 can be 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | As specified in sub 4.14.2 as below:  "*If the UE is accessing the PLMN using non-3GPP access, the access to 5GCN of the SNPN via PLMN is not specified in this release.*"  Hence, in this release of TS 24.501, the term "access to SNPN services via a PLMN" can be only applied when the UE is accessing the PLMN using 3GPP access.  To avoid unnecessary mis-interpretation, it is better to have a term definition for "access to SNPN services via a PLMN" to clearly indicate that the UE is accessing PLMN using 3GPP access". | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | It proposes to have a term definition for "access to SNPN services via a PLMN" to clearly indicate that the UE is accessing PLMN using 3GPP access". | | | | | | | | |
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| ***Consequences if not approved:*** | | Mis-interpretation may be made by the term "access to SNPN services via a PLMN". | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1, 4.9.3, 4.14.2, 5.3.20.3, 5.4.1.2.3A.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**5GMM-IDLE mode:** In this specification, if the term is used standalone, a UE in 5GMM-IDLE mode means the UE can be either in 5GMM-IDLE mode over 3GPP access or in 5GMM-IDLE mode over non-3GPP access.

**5GMM-CONNECTED mode:** In this specification, if the term is used standalone, a UE in 5GMM-CONNECTED mode means the UE can be either in 5GMM-CONNECTED mode over 3GPP access or in 5GMM-CONNECTED mode over non-3GPP access.

**5GMM-IDLE mode over 3GPP access:** A UE is in 5GMM-IDLE mode over 3GPP access when no N1 NAS signalling connection between the UE and network over 3GPP access exists. The term 5GMM-IDLE mode over 3GPP access used in the present document corresponds to the term CM-IDLE state for 3GPP access used in 3GPP TS 23.501 [8].

**5GMM-CONNECTED mode over 3GPP access:** A UE is in 5GMM-CONNECTED mode over 3GPP access when an N1 NAS signalling connection between the UE and network over 3GPP access exists. The term 5GMM-CONNECTED mode over 3GPP access used in the present document corresponds to the term CM-CONNECTED state for 3GPP access used in 3GPP TS 23.501 [8].

**5GMM-IDLE mode over non-3GPP access:** A UE is in 5GMM-IDLE mode over non-3GPP access no N1 NAS signalling connection between the UE and network over non-3GPP access exists. The term 5GMM-IDLE mode over non-3GPP access used in the present document corresponds to the term CM-IDLE state for non-3GPP access used in 3GPP TS 23.501 [8].

**5GMM-CONNECTED mode over non-3GPP access:** A UE is in 5GMM-CONNECTED mode over non-3GPP access when it has N1 NAS signalling connection between the UE and network over non-3GPP access exists. The term 5GMM-CONNECTED mode over non-3GPP access used in the present document corresponds to the term CM-CONNECTED state for non-3GPP access used in 3GPP TS 23.501 [8].

**5GS services:** Services provided by PS domain. Within the context of this specification, 5GS services is used as a synonym for EPS services.

**5G-EA:** 5GS encryption algorithms. The term 5G-EA, 5G-EA0, 128-5G-EA1-3 and 5G-EA4-7 used in the present document corresponds to the term NEA, NEA0, NEA1-3 and NEA4-7 defined in 3GPP TS 33.501 [24].

**5G-IA:** 5GS integrity algorithms. The term 5G-IA, 5G-IA0, 128-5G-IA1-3 and 5G-IA4-7 used in the present document corresponds to the term NIA, NIA0, NIA1-3 and NIA4-7 defined in 3GPP TS 33.501 [24].

**Access stratum connection:** A peer to peer access stratum connection:

- between the UE and the NG-RAN for 3GPP access;

- between the UE and the N3IWF for untrusted non-3GPP access;

- between the UE and the TNGF for trusted non-3GPP access used by the UE;

- within the TWIF acting on behalf of the N5CW for trusted non-3GPP access used by the N5CW;

- between the 5G-RG and the W-AGF for wireline access used by the 5G-RG;

- within the W-AGF acting on behalf of the FN-RG for wireline access used by the FN-RG; or

- within the W-AGF acting on behalf of the N5GC device for wireline access used by the N5GC device.

The access stratum connection for 3GPP access corresponds to an RRC connection via the Uu reference point. The creation of the access stratum connection for untrusted non-3GPP access corresponds to the completion of the IKE\_SA\_INIT exchange (see IETF RFC 7296 [41]) via the NWu reference point. The creation of the access stratum connection for trusted non-3GPP access used by the UE corresponds to the UE reception of an EAP-request/5G-start via NWt reference point (see 3GPP TS 23.502 [9]). The creation of the access stratum connection for trusted non-3GPP access used by the N5CW corresponds to the TWIF's start of acting on behalf of the N5CW. The creation of the access stratum connection for wireline access used by the 5G-RG corresponds to the 5G-RG reception of an EAP-request/5G-packet over the W-CP connection via the Y4 reference point (see 3GPP TS 23.316 [6D]). The creation of the access stratum connection for wireline access used by the FN-RG corresponds to the W-AGF's start of acting on behalf of the FN-RG. The creation of the access stratum connection for wireline access used by the N5GC device corresponds to the W-AGF's start of acting on behalf of the N5GC device.

**Access to SNPN services via a PLMN:** A UE is accessing to SNPN services via a PLMN when the UE is accessing the PLMN using 3GPP access.

**Aggregate maximum bit rate:** The maximum bit rate that limits the aggregate bit rate of a set of non-GBR bearers of a UE. Definition derived from 3GPP TS 23.501 [8].

**Always-on PDU session:** A PDU session for which user-plane resources have to be established during every transition from 5GMM-IDLE mode to 5GMM-CONNECTED mode. A UE requests a PDU session to be established as an always-on PDU session based on indication from upper layers and the network decides whether a PDU session is established as an always-on PDU session.

NOTE 1: How the upper layers in the UE are configured to provide an indication is outside the scope of the present document.

**Applicable UE radio capability ID for the current UE radio configuration in the selected network:** The UE has an applicable UE radio capability ID for the current UE radio configuration in the selected network if:

a) the UE supports RACS; and

b) the UE has:

1) a stored network-assigned UE radio capability ID which is associated with the PLMN ID or SNPN identity of the serving network and which maps to the set of radio capabilities currently enabled at the UE; or

2) a manufacturer-assigned UE radio capability ID which maps to the set of radio capabilities currently enabled at the UE.

**CAG cell:** A cell in which only members of the CAG can get normal service. Depending on local regulation, the CAG cell can provide emergency services also to subscribers who are not members of the CAG.

**CAG-ID:** A CAG-ID is a unique identifier within the scope of one PLMN defined in 3GPP TS 23.003 [4] which identifies a Closed Access Group (CAG) in the PLMN associated with a cell or group of cells to which access is restricted to members of the CAG.

**Cleartext IEs:** Information elements that can be sent without confidentiality protection in initial NAS messages as specified in subclause 4.4.6.

**Control plane CIoT 5GS optimization:** signalling optimizations to enable efficient transport of user data (IP, Ethernet, Unstructured or SMS) over control plane via the AMF including optional header compression of IP data and Ethernet data.

**DNN determined by the AMF:** If no DNN requested by the UE is provided, a DNN determined by the AMF based subscription information or local policy. Otherwise DNN determined by the AMF is the DNN requested by the UE.

**DNN requested by the UE:** A DNN explicitly requested by the UE and included in a NAS request message.

**DNN selected by the network:** If DNN replacement applies, a DNN selected and indicated to the AMF by PCF. Otherwise DNN selected by the network is the DNN determined by the AMF.

**Globally-unique SNPN identity:** An SNPN identity with an NID whose assignment mode is not set to 1 (see 3GPP TS 23.003 [4]).

**User plane CIoT 5GS optimization:** signalling optimizations to enable efficient transport of user data (IP, Ethernet or Unstructured) over the user plane.

**UE supporting CIoT 5GS optimizations:** A UE that supports control plane CIoT 5GS optimization or user plane CIoT 5GS optimization and one or more other CIoT 5GS optimizations when the UE is in N1 mode.

**Registered for 5GS services with control plane CIoT 5GS optimization:** A UE supporting CIoT 5GS optimizations is registered for 5GS services, and control plane CIoT 5GS optimization along with one or more other CIoT 5GS optimizations have been accepted by the network.

**Registered** **for 5GS services with user plane CIoT 5GS optimization:** A UE supporting CIoT 5GS optimizations is registered for 5GS services, and user plane CIoT 5GS optimization along with one or more other CIoT 5GS optimizations have been accepted by the network.

**Registered** **for 5GS services with CIoT 5GS optimization:** A UE is registered for 5GS services with control plane CIoT 5GS optimization or registered for 5GS services with user plane CIoT 5GS optimization.

**DNN based congestion control:** Type of congestion control at session management level that is applied to reject session management requests from UEs or release PDU sessions when the associated DNN is congested. DNN based congestion control can be activated at the SMF over session management level and also activated at the AMF over mobility management level.

**Emergency PDU session:** A PDU session which was established with the request type "initial emergency request" or "existing emergency PDU session".

**General NAS level congestion control:** Type of congestion control at mobility management level that is applied at a general overload or congestion situation in the network, e.g. lack of processing resources.

**Initial NAS message:** A NAS message is considered as an initial NAS message, if this NAS message can trigger the establishment of an N1 NAS signalling connection. For instance, the REGISTRATION REQUEST message is an initial NAS message.

**Initial registration for emergency services:** A registration performed with 5GS registration type "emergency registration" in the REGISTRATION REQUEST message.

**Last visited registered TAI:** A TAI which is contained in the registration area that the UE registered to the network and which identifies the tracking area last visited by the UE.

**Mapped S-NSSAI:** An S-NSSAI in the subscribed S-NSSAIs for the HPLMN, which is mapped to an S-NSSAI of the registered PLMN in case of a roaming scenario.

**N1 mode:** A mode of a UE allowing access to the 5G core network via the 5G access network.

**Non-globally-unique SNPN identity:** An SNPN identity with an NID whose assignment mode is set to 1 (see 3GPP TS 23.003 [4]).

**In NB-N1 mode:** Indicates this paragraph applies only to a system which operates in NB-N1 mode. For a multi-access system this case applies if the current serving radio access network provides access to network services via E-UTRA connected to 5GCN by NB-IoT (see 3GPP TS 36.300 [25B], 3GPP TS 36.331 [25A], 3GPP TS 36.306 [25D]).

**In WB-N1 mode:** Indicates this paragraph applies only to a system which operates in WB-N1 mode. For a multi-access system this case applies if the system operates in N1 mode with E-UTRA connected to 5GCN, but not in NB-N1 mode.

**In WB-N1/CE mode:** Indicates this paragraph applies only when a UE, which is a CE mode B capable UE (see 3GPP TS 36.306 [25D]), is operating in CE mode A or B in WB-N1 mode.

**Initial small data rate control parameters:** Parameters that, if received by the UE during the establishment of a PDU session, are used as initial parameters to limit the allowed data for the PDU session according to small data rate control after establishment of a PDU session as described in subclause 6.2.13. At expiry of the associated validity period, the initial small data rate control parameters are no longer valid and the small data rate control parameters apply.

**Initial small data rate control parameters for exception data:** Parameters corresponding to initial small data rate control parameters for small data rate control of exception data.

**N1 NAS signalling connection:** A peer to peer N1 mode connection between UE and AMF. An N1 NAS signalling connection is either the concatenation of an RRC connection via the Uu reference point and an NG connection via the N2 reference point for 3GPP access, or the concatenation of an IPsec tunnel via the NWu reference point and an NG connection via the N2 reference point for non-3GPP access.

**N6 PDU session:** A PDU session established between the UE and the User Plane Function (UPF) for transmitting the UE's IP data, Ethernet data or Unstructured data related to a specific application.

**NEF PDU session:** A PDU session established between the UE and the Network Exposure Function (NEF) for transmitting the UE's Unstructured data related to a specific application.

**Network slicing information:** information stored at the UE consisting of one or more of the following:

a) default configured NSSAI;

b) configured NSSAI for a PLMN or an SNPN;

c) mapped S-NSSAI(s) for the configured NSSAI for a PLMN;

d) pending NSSAI; and

e) for each access type:

1) allowed NSSAI for a PLMN or an SNPN; and

2) mapped S-NSSAI(s) for the allowed NSSAI for a PLMN.

**Non-cleartext IEs:** Information elements that are not cleartext IEs.

**Non-emergency PDU session:** Any PDU session which is not an emergency PDU session.

**PDU address:** An IP address assigned to the UE by the packet data network.

**PDU session for LADN:** A PDU session with a DNN associated with a LADN.

**PDU session with suspended user-plane resources:** A PDU session for which user-plane resources were established or re-established, and for which data radio bearers were suspended when transiting to 5GMM-CONNECTED mode with RRC inactive indication.

**Persistent PDU session:** either a non-emergency PDU session contains a GBR QoS flow with QoS equivalent to QoS of teleservice 11 and where there is a radio bearer associated with that PDU session, or an emergency PDU session where there is a radio bearer associated with that PDU session.

NOTE 2: An example of a persistent PDU session is a non-emergency PDU session with 5QI = 1 where there is a radio bearer associated with that context.

**Procedure transaction identity:** An identity which is dynamically allocated by the UE for the UE-requested 5GSM procedures, or allocated by the UE or the PCF for the UE policy delivery procedures. The procedure transaction identity is released when the procedure is completed but it should not be released immediately.

**RAT frequency selection priority index:** A parameter provided by the AMF to the NG-RAN via the N2 reference point. The AMF selects an RFSP index for a particular UE based on the subscribed RFSP index, the locally configured operator's policies, the allowed NSSAI and the UE context information, including the UE's usage setting, if received during the registration procedure. Definition derived from 3GPP TS 23.501 [8].

**Registered for emergency services:** A UE is considered as "registered for emergency services" when it has successfully completed initial registration for emergency services.

**Registered PLMN**: The PLMN on which the UE is registered. The identity of the registered PLMN (MCC and MNC) is provided to the UE within the GUAMI field of the 5G-GUTI.

**Rejected NSSAI:** Rejected NSSAI for the current PLMN, SNPN or rejected NSSAI for the current registration area or rejected NSSAI for the failed or revoked NSSAA.

NOTE 3: Rejected NSSAI only contains a set of S-NSSAI(s) associated with a PLMN identity or SNPN identity for the current PLMN or SNPN.

**Rejected NSSAI for the current PLMN or SNPN:** A set of S-NSSAI(s) which was included in the requested NSSAI by the UE and is sent by the AMF with the rejection cause "S-NSSAI not available in the current PLMN or SNPN".

**Rejected NSSAI for the current registration area:** A set of S-NSSAI(s) which was included in the requested NSSAI by the UE and is sent by the AMF with the rejection cause "S-NSSAI not available in the current registration area".

**Rejected NSSAI for the failed or revoked NSSAA**: A set of S-NSSAI(s) which is sent by the AMF with the rejection cause "rejected NSSAI due to the failed or revoked network slice-specific authentication and authorization".

**Local release:** Release of a PDU session without peer-to-peer signalling between the network and the UE,

NOTE 4: Local release can include communication among network entities.

**Removal of eCall only mode restriction:** All the limitations as described in 3GPP TS 22.101 [2] for the eCall only mode do not apply any more.

**Routing indicator:** Routing Indicator is an identifier assigned by the UE's home network operator to be used together with the Home Network Identifier for routing network signalling. Routing Indicator is provisioned in the USIM. The term Routing indicator used in the present document corresponds to the term Routing ID used in 3GPP TS 23.501 [8].

**S-NSSAI-based congestion control:** Type of congestion control at session management level that is applied to reject session management requests from UEs or release PDU sessions when the associated S-NSSAI and optionally the associated DNN are congested. S-NSSAI based congestion control can be activated at the SMF over session management level and also activated at the AMF over mobility management level.

**Selected core network type information:** A type of core network (EPC or 5GCN) selected by the UE NAS layer in case of an E-UTRA cell connected to both EPC and 5GCN.

**UE configured for high priority access in selected PLMN:** A UE configured with one or more access identities equal to 1, 2, or 11-15 applicable in the selected PLMN as specified in subclause 4.5.2. Definition derived from 3GPP TS 22.261 [3].

**N5CW device supporting 3GPP access:** An N5CW device which supports acting as a UE in 3GPP access (i.e. which supports NAS over 3GPP access).

**UE operating in single-registration mode in a network supporting N26 interface:** a UE, supporting both N1 mode and S1 mode. During the last attach, tracking area update (see 3GPP TS 24.301 [15]) or registration procedures, the UE has received either a 5GS network feature support IE with IWK N26 bit set to "interworking without N26 interface not supported" or an EPS network feature support IE with IWK N26 bit set to "interworking without N26 interface not supported".

**UE using 5GS services with control plane CIoT 5GS optimization:** AUE that is registered for 5GS services with the control plane CIOT 5GS optimization accepted by the network.

**UE-DS-TT residence time:** The time taken within the UE and DS-TT to forward a packet between the UE and the DS-TT port.

**User-plane resources:** Resources established between the UE and the UPF. The user-plane resources consist of one of the following:

- user plane radio bearers via the Uu reference point, a tunnel via the N3 reference point and a tunnel via the N9 reference point (if any) for 3GPP access;

- IPsec tunnels via the NWu reference point, a tunnel via the N3 reference point and a tunnel via the N9 reference point (if any) for untrusted non-3GPP access;

- IPsec tunnels via the NWt reference point, a tunnel via the N3 reference point and a tunnel via the N9 reference point (if any) for trusted non-3GPP access used by the UE;

- a layer-2 connection via the Yt reference point, a layer-2 or layer-3 connection via the Yw reference point, a tunnel via the N3 reference point and a tunnel via the N9 reference point (if any) for trusted non-3GPP access used by the N5CW;

- W-UP resources via Y4 reference point, a tunnel via the N3 reference point and a tunnel via the N9 reference point (if any) for wireline access used by the 5G-RG; and

- L-W-UP resources via Y5 reference point, a tunnel via the N3 reference point and a tunnel via the N9 reference point (if any) for wireline access used by the FN-RG.

**W-AGF acting on behalf of the N5GC device:** A W-AGF that enables an N5GC device behind a 5G-CRG or an FN-CRG to connect to the 5G Core.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 22.261 [2] apply:

**Non-public network**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.003 [4] apply:

**5G-GUTI**

**5G-S-TMSI**

**Global Line Identifier (GLI)**

**Global Cable Identifier (GCI)**

**PEI**

**SUPI**

**SUCI**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.122 [5] apply:

**CAG selection**

**Country**

**EHPLMN**

**HPLMN**

**Selected PLMN**

**Shared network**

**SNPN identity**

**Steering of Roaming (SOR)**

**Steering of Roaming information**

**Suitable cell**

**VPLMN**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.167 [6] apply:

**eCall over IMS**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.216 [6A] apply:

**SRVCC**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.401 [7] apply:

**eCall only mode**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.501 [8] apply:

**5G access network**

**5G core network**

**5G QoS flow**

**5G QoS identifier**

**5G-RG**

**5G-BRG**

**5G-CRG**

**5G System**

**Allowed area**

**Allowed NSSAI**

**AMF region**

**AMF set**

**Closed access group**

**Configured NSSAI**

**Local area data network**

**Network identifier (NID)**

**Network slice**

**NG-RAN**

**Non-allowed area**

**PDU session**

**PDU session type**

**Pending NSSAI**

**Requested NSSAI**

**Routing ID**

**Service data flow**

**Service Gap Control**

**Serving PLMN rate control**

**Small data rate control status**

**SNPN access mode**

**SNPN enabled UE**

**Stand-alone Non-Public Network**

**Time Sensitive Communication**

**UE presence in LADN service area**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.503 [10] apply:

**UE local configuration**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.008 [12] apply:

**GMM**

**MM**

**A/Gb mode**

**Iu mode**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.301 [15] apply:

**CIoT EPS optimization**

**Control plane CIoT EPS optimization**

**EENLV**

**EMM**

**EMM-DEREGISTERED**

**EMM-DEREGISTERED-INITIATED**

**EMM-IDLE mode**

**EMM-NULL**

**EMM-****REGISTERED**

**EMM-REGISTERED-INITIATED**

**EMM-SERVICE-REQUEST-INITIATED**

**EMM-TRACKING-AREA-UPDATING-INITIATED**

**EPS**

**EPS security context**

**EPS services**

**Lower layer failure**

**Megabit**

**Message header**

**NAS signalling connection recovery**

**NB-S1 mode**

**Non-EPS services**

**S1 mode**

**User plane CIoT EPS optimization**

**WB-S1 mode**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 33.501 [24] apply:

**5G security context**

**5G NAS security context**

**ABBA**

**Current 5G NAS security context**

**Full native 5G NAS security context**

**K'**AME

**K**AMF

**K**ASME

**Mapped 5G NAS security context**

**Mapped security context**

**Native 5G NAS security context**

**NCC**

**Non-current 5G NAS security context**

**Partial native 5G NAS security context**

**RES\***

For the purposes of the present document, the following terms and definitions given in 3GPP TS 38.413 [31] apply:

**NG connection**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.587 [19B] apply:

**E-UTRA-PC5**

**NR-PC5**

**V2X**

\* \* \* Next Change \* \* \* \*

### 4.9.3 Disabling and re-enabling of UE's N1 mode capability for non-3GPP access

When the UE disables the N1 mode capability for non-3GPP access, the UE NAS layer shall not initiate any 5GS NAS procedures towards the network over non-3GPP access.

When the UE supporting both N1 mode and S1 mode needs to stay in non-3GPP access connected to EPC (e.g. due to the domain selection for UE originating sessions as specified in subclause 4.3.2), in order to prevent unintentional selection of a non-3GPP access network connected to 5GCN, the UE operating in single-registration mode shall not transfer any PDN connection to a non-3GPP access network connected to the 5GCN.

If the disabling of N1 mode capability for non-3GPP access was due to IMS voice is not available over non-3GPP access in 5GS and the UE's usage setting is "voice centric", the UE shall re-enable the N1 mode capability for non-3GPP access when the UE's usage setting is changed from "voice centric" to "data centric" as specified in subclauses 4.3.3.

The UE shall re-enable the N1 mode capability for non-3GPP access when a new PLMN or SNPN is selected over non-3GPP access.

NOTE: In SNPN, the term "UE's N1 mode capability for non-3GPP access" in this subclause refers to the UE's N1 mode capability to access to SNPN services via a PLMN.

As an implementation option, the UE may start a timer for re-enabling the N1 mode capability for non-3GPP access, after the the N1 mode capability for non-3GPP access was disabled. On the expiry of this timer, the UE should re-enable the the N1 mode capability for non-3GPP access.

\* \* \* Next Change \* \* \* \*

### 4.14.2 Stand-alone non-public network

If the UE is not SNPN enabled, the UE is always considered to be not operating in SNPN access mode. If the UE is SNPN enabled, the UE can operate in SNPN access mode. Details of activation and deactivation of SNPN access mode at the SNPN enabled UE are up to UE implementation.

The functions and procedures of NAS described in the present document are applicable to an SNPN and an SNPN enabled UE unless indicated otherwise. The key differences brought by the SNPN to the NAS layer are as follows:

a) instead of the PLMN selection process, the SNPN selection process is performed by a UE operating in SNPN access mode (see 3GPP TS 23.122 [5] for further details on the SNPN selection);

b) a "permanently forbidden SNPNs" list and a "temporarily forbidden SNPNs" list are managed by a UE operating in SNPN access mode instead of forbidden PLMN lists;

c) inter-system change to and from S1 mode is not supported;

d) emergency services are not supported in SNPN access mode;

e) CAG is not supported in SNPN access mode;

f) with respect to the 5GMM cause values:

1) 5GMM cause values #74 "Temporarily not authorized for this SNPN" and #75 "Permanently not authorized for this SNPN" are supported whereas these 5GMM cause values cannot be used in a PLMN; and

2) 5GMM cause values #11 "PLMN not allowed", #31 "Redirection to EPC required", #73 "Serving network not authorized", and #76 "Not authorized for this CAG or authorized for CAG cells only" are not supported whereas these 5GMM cause values can be used in a PLMN;

Editor's note [WI: Vertical\_LAN, CR#1286]: It is FFS whether 5GMM cause value # 72 "Non-3GPP access to 5GCN not allowed" is supported in an SNPN.

g) a list of "5GS forbidden tracking areas for roaming" and a list of "5GS forbidden tracking areas for regional provision of service" are managed per SNPN (see 3GPP TS 23.122 [5]);

h) when accessing SNPN services via a PLMN using 3GPP access, access to 5GCN of the SNPN is performed using 5GMM procedures for non-3GPP access and 5GMM parameter for non-3GPP access. When accessing PLMN services via a SNPN, access to 5GCN of the PLMN is performed using 5GMM procedures for non-3GPP access and 5GMM parameter for non-3GPP access. If the UE is accessing the PLMN using non-3GPP access, the access to 5GCN of the SNPN via PLMN is not specified in this release of specification;

i) when registered to an SNPN, the UE shall use only the UE policies provided by the registered SNPN;

j) equivalent SNPN is not supported;

k) neither the default configured NSSAI nor the network slicing indication is supported in SNPNs;

l) roaming is not supported in SNPN access mode; and

m) handover between SNPNs is not supported.

\* \* \* Next Change \* \* \* \*

#### 5.3.20.3 Requirements for UE in an SNPN

If the UE is operating in SNPN access mode, the UE shall maintain, for each of the entries in the "list of subscriber data":

- one SNPN-specific attempt counter for 3GPP access. The counter is applicable to access attempts via 3GPP access only;

- one SNPN-specific attempt counter for non-3GPP access. The counter is applicable in case of accessing to SNPN services via a PLMN only;

- one counter for "the entry for the current SNPN considered invalid for 3GPP access" events; and

- one counter for "the entry for the current SNPN considered invalid for non-3GPP access" events. The counter is applicable in case of accessing to SNPN services via a PLMN only.

NOTE 1: The term "non-3GPP access" used in the counter for "SNPN-specific attempt counter for non-3GPP access" events and the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events, is used to express access to SNPN services via a PLMN.

The UE shall store the above counters in its non-volatile memory. The UE shall erase the attempt counters and reset the event counters to zero when the entry of the "list of subscriber data" with the corresponding SNPN identity is updated. The counter values shall not be affected by the activation or deactivation of MICO mode or power saving mode (see 3GPP TS 24.301 [15]).

The UE implementation-specific maximum value for any of the above counters shall not be greater than 10.

NOTE 2: Different counters can use different UE implementation-specific maximum values.

If the UE receives a REGISTRATION REJECT or SERVICE REJECT message without integrity protection with 5GMM cause value #3, #6, #7, #12, #13, #15, #27, #74, or #75 before the network has established secure exchange of NAS messages for the N1 NAS signalling connection, the UE shall stop timer T3510 or T3517, if running, and start timer T3247 (see 3GPP TS 24.008 [12]) with a random value uniformly drawn from the range between:

a) 15 minutes and 30 minutes for 5GMM cause value #74; or

b) 30 minutes and 60 minutes for other 5GMM cause values;

if the timer is not running, and take the following actions:

Editor's note [WI: Vertical\_LAN, CR#1453]: It is FFS whether 5GMM cause value # 72 "Non-3GPP access to 5GCN not allowed" is impacted by the requirements captured in the clause.

a) if the 5GMM cause value received is #3, #6, or #7:

1) if the 5GMM cause value is received over 3GPP access:

i) if the UE is already registered over another access, the UE shall:

A) store the current TAI in the list of "5GS forbidden tracking areas for roaming", memorize the current TAI was stored in the list of "5GS forbidden tracking areas for roaming" for non-integrity protected NAS reject message and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE; and

B) search for a suitable cell in another tracking area according to 3GPP TS 38.304 [28] or 3GPP TS 36.304 [25C]; or

ii) otherwise if the counter for "the entry for the current SNPN considered invalid for 3GPP access" events has a value less than a UE implementation-specific maximum value, the UE shall:

A) set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete 5G-GUTI, last visited registered TAI, TAI list, and ngKSI for 3GPP access;

B) increment the counter for "the entry for the current SNPN considered invalid for 3GPP access" events;

C) reset the registration attempt counter in case of a REGISTRATION REJECT message or reset the service request attempt counter in case of a SERVICE REJECT message;

D) store the current TAI in the list of "5GS forbidden tracking areas for roaming" for the current SNPN, memorize the current TAI was stored in the list of "5GS forbidden tracking areas for roaming" for the current SNPN for non-integrity protected NAS reject message, and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE; and

E) search for a suitable cell in another tracking area according to 3GPP TS 38.304 [28] or 3GPP TS 36.304 [25C]. As a UE implementation option, if accessing to SNPN services via a PLMN is available and the entry of the "list of subscriber data" with the SNPN identity of the current SNPN is not considered invalid for non-3GPP access, then the UE may attempt to access to SNPN services via a PLMN; or

iii) otherwise, the UE shall proceed as specified in subclauses 5.5.1 and 5.6.1;

2) if the 5GMM cause value is received over non-3GPP access:

NOTE 2: A 5GMM cause value "received over non-3GPP access" in this subclause refers to a 5GMM cause value received via a PLMN when the UE attempts to access to SNPN services via a PLMN.

i) if the UE is already registered over another access, the UE shall enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE; or

ii) otherwise if the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events has a value less than a UE implementation-specific maximum value, the UE shall:

A) set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete the 5G-GUTI, last visited registered TAI, TAI list, and ngKSI for non-3GPP access;

B) enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE; and

C) increment the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events. As a UE implementation option, if 3GPP access is available and the entry of the "list of subscriber data" with the SNPN identity of the current SNPN is not considered invalid for 3GPP access, then the UE may make a registration attempt over 3GPP access; or

iii) otherwise, the UE shall proceed as specified in subclauses 5.5.1 and 5.6.1;

b) if the 5GMM cause value received is #12, #13, or #15, the UE shall proceed as specified in subclauses 5.5.1 and 5.6.1. Additionally:

1) if the 5GMM cause value is received over 3GPP access, accessing to SNPN services via a PLMN is available, the UE has not accessed to SNPN services via a PLMN yet, and the entry of the "list of subscriber data" with the SNPN identity of the current SNPN is not considered invalid for non-3GPP access, the UE may attempt to access to SNPN services via a PLMN; or

2) if the 5GMM cause value is received over non-3GPP access, 3GPP access is available, the UE is not registered to the current SNPN over 3GPP access yet, and the entry of the "list of subscriber data" with the SNPN identity of the current SNPN is not considered invalid for 3GPP access, the UE may make a registration attempt over 3GPP access;

c) if the 5GMM cause value received is #27, the UE shall proceed as specified in subclauses 5.5.1 and 5.6.1. Additionally, if the SNPN-specific attempt counter for 3GPP access and for the current SNPN has a value less than a UE implementation-specific maximum value, the UE shall increment this counter for the SNPN; and

d) if the 5GMM cause value received is #74 or #75, the UE shall:

1) if the 5GMM cause value is received over 3GPP access, the UE shall:

i) set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to clause 5.1.3.2.2) and shall delete the 5G-GUTI, last visited registered TAI, TAI list, and ngKSI for 3GPP access;

ii) reset the registration attempt counter in case of a REGISTRATION REJECT message or reset the service request attempt counter in case of a SERVICE REJECT message;

iii) store the current TAI in the list of "5GS forbidden tracking areas for roaming" for the current SNPN, memorize the current TAI was stored in the list of "5GS forbidden tracking areas for roaming" for the current SNPN for non-integrity protected NAS reject message, and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE; and

iv) search for a suitable cell in another tracking area according to 3GPP TS 38.304 [28] or 3GPP TS 36.304 [25C]. As a UE implementation option, if accessing to SNPN services via a PLMN is available, the UE has not accessed to SNPN services via a PLMN yet, and the entry of the "list of subscriber data" with the SNPN identity of the current SNPN is not considered invalid for non-3GPP access, then the UE may attempt to access to SNPN services via a PLMN; or

2) if the 5GMM cause value is received over non-3GPP access, the UE shall:

i) set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete the 5G-GUTI, last visited registered TAI, TAI list and ngKSI for non-3GPP access;

ii) reset the registration attempt counter in case of a REGISTRATION REJECT message or reset the service request attempt counter in case of a SERVICE REJECT message; and

iii) enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE. As a UE implementation option, if 3GPP access is available, the UE is not registered to the current SNPN over 3GPP access yet, and the entry of the "list of subscriber data" with the SNPN identity of the current SNPN is not considered invalid for 3GPP access, the UE may make a registration attempt over 3GPP access.

Upon expiry of timer T3247, the UE shall:

- remove, for the current SNPN, all tracking areas from the list of "5GS forbidden tracking areas for regional provision of service" and the list of "5GS forbidden tracking areas for roaming", which were stored in these lists for non-integrity protected NAS reject message;

- set the entry of the "list of subscriber data" with the SNPN identity of the current SNPN to valid for 3GPP access, if the counter for "the entry for the current SNPN considered invalid for 3GPP access" events has a value less than a UE implementation-specific maximum value;

- set the entry of the "list of subscriber data" with the SNPN identity of the current SNPN to valid for non-3GPP access, if the counter for "the entry for the current SNPN invalid for non-3GPP access" events has a value less than a UE implementation-specific maximum value;

- remove the SNPN identity of the current SNPN from the "permanently forbidden SNPNs" list or "temporarily forbidden SNPNs" list, if the SNPN-specific attempt counter for 3GPP access for the current SNPN has a value greater than zero and less than a UE implementation-specific maximum value and the SNPN identity of the current SNPN is included in any of the "permanently forbidden SNPNs" list or "temporarily forbidden SNPNs" list;

- remove the SNPN identity of the current SNPN from the "permanently forbidden SNPNs" list for non-3GPP access or "temporarily forbidden SNPNs" list for non-3GPP access, if the SNPN-specific attempt counter for non-3GPP access that has a value greater than zero and less than a UE implementation-specific maximum value and the SNPN identity of the current SNPN is included in any of the "permanently forbidden SNPNs" list for non-3GPP access or "temporarily forbidden SNPNs" list for non-3GPP access; and

- initiate a registration procedure, if still needed, dependent on 5GMM state and 5GS update status, or perform SNPN selection according to 3GPP TS 23.122 [5].

When the UE is switched off:

- for each SNPN-specific attempt counter for 3GPP access having a value greater than zero and less than the UE implementation-specific maximum value, the UE shall remove the respective SNPN identity from the "permanently forbidden SNPNs" list or "temporarily forbidden SNPNs" list, if available; and

- for each SNPN-specific attempt counter for non-3GPP access having a value greater than zero and less than the UE implementation-specific maximum value, the UE shall remove the respective SNPN identity from the "permanently forbidden SNPNs" list for non-3GPP access or "temporarily forbidden SNPNs" list for non-3GPP access, if available.

When an entry of the "list of subscriber data" is updated:

- if the SNPN-specific attempt counter for 3GPP access for the SNPN corresponding to the entry has a value greater than zero and less than the UE implementation-specific maximum value, the UE shall remove the SNPN identity corresponding to the entry from the "permanently forbidden SNPNs" list or "temporarily forbidden SNPNs" list, if available; and

- if the SNPN-specific attempt counter for non-3GPP access for the SNPN corresponding to the entry has a value greater than zero and less than the UE implementation-specific maximum value, the UE shall remove the SNPN identity corresponding to the entry from the "permanently forbidden SNPNs" list for non-3GPP access or "temporarily forbidden SNPNs" list for non-3GPP access, if available.

\* \* \* Next Change \* \* \* \*

###### 5.4.1.2.3A.1 General

This subclause applies when an EAP method:

a) supporting mutual authentication;

b) supporting EMSK generation; and

c) other than EAP-AKA' and EAP-TLS;

is used for primary authentication and key agreement in an SNPN.

The UE may support acting as EAP peer of such EAP method as specified in 3GPP TS 33.501 [24]. The AUSF may support acting as EAP server of such EAP method as specified in 3GPP TS 33.501 [24].

When initiating an EAP based primary authentication and key agreement procedure using such EAP method, the network shall select an ngKSI value. If an ngKSI is contained in an initial NAS message during a 5GMM procedure, the network shall select a different ngKSI value. The network shall send the selected ngKSI value to the UE along with each EAP message. The network shall send the ABBA value as described in subclause 9.11.3.10 to the UE along with the EAP-request message and EAP-success message.

When the EAP based primary authentication and key agreement procedure uses such EAP method, the ME and the AUSF shall generate EMSK as described in 3GPP TS 33.501 [24].

When handling of an EAP-request message results into generation of EMSK, the ME may generate the KAUSF from the EMSK, the KSEAF from the KAUSF, and the KAMF from the ABBA received together with the EAP-request message, and the KSEAF as described in 3GPP TS 33.501 [24], and create a partial native 5G NAS security context identified by the ngKSI value received together with the EAP-request message in subclause 5.4.1.2.4.2, in the volatile memory of the ME. If the KAMF and the partial native 5G NAS security context are created, the ME shall store the KAMF in the created partial native 5G NAS security context.

When handling of an EAP response message results into generation of EMSK, the AUSF shall generate the KAUSF from the EMSK, and the KSEAF from the KAUSF as described in 3GPP TS 33.501 [24].

NOTE 1: The AUSF provides the KSEAF to the SEAF. Upon reception of the KSEAF, the SEAF generates the KAMF based on the ABBA and the KSEAF as described in 3GPP TS 33.501 [24], and provides ngKSI and the KAMF to the AMF. Upon reception of the ngKSI and the KAMF, the AMF creates a partial native 5G NAS security context identified by the ngKSI, and stores the KAMF in the created partial native 5G NAS security context.

If the UE fails to authenticate the network, the UE shall start timer T3520 when the AUTHENTICATION RESPONSE message containing the EAP-response message is sent. Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon receiving an AUTHENTICATION REQUEST message with the EAP message IE containing an EAP-request message from the network, the UE shall stop timer T3520, if running, and then process the EAP-request message as normally.

If the network fails to authenticate the UE, the network handling depends upon the type of identity used by the UE in the initial NAS message, that is:

- if the 5G-GUTI was used; or

- if the SUCI was used.

If the 5G-GUTI was used, the network should transport the EAP-failure message in the AUTHENTICATION RESULT message of the EAP result message transport procedure, initiate an identification procedure to retrieve SUCI from the UE and restart the EAP based primary authentication and key agreement procedure with the received SUCI.

If the SUCI was used for identification in the initial NAS message or in a restarted EAP based primary authentication and key agreement procedure, or the network decides not to initiate the identification procedure to retrieve SUCI from the UE after an unsuccessful the EAP based primary authentication and key agreement procedure, the network should transport the EAP-failure message in an AUTHENTICATION REJECT message of the EAP result message transport procedure.

If the EAP-failure message is received in an AUTHENTICATION REJECT message:

a) if the AUTHENTICATION REJECT message has been successfully integrity checked by the NAS:

1) the UE shall set the update status to 5U3 ROAMING NOT ALLOWED, delete the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI. The entry of the "list of subscriber data" with the SNPN identity of the current SNPN shall be considered invalid until the UE is switched off or the entry is updated; and

2) the UE shall set the counter for "the entry for the current SNPN considered invalid for 3GPP access" events and the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events in case of SNPN to UE implementation-specific maximum value; and

NOTE 2: The term "non-3GPP access" used in the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events, is used to express access to SNPN services via a PLMN.

b) if the AUTHENTICATION REJECT message is received without integrity protection, the UE shall start timer T3247 with a random value uniformly drawn from the range between 30 minutes and 60 minutes, if the timer is not running (see subclause 5.3.20). Additionally, the UE shall:

1) if the AUTHENTICATION REJECT message is received over 3GPP access, and the counter for "the entry for the current SNPN considered invalid for 3GPP access" events has a value less than a UE implementation-specific maximum value, proceed as specified in list item a) 1) of subclause 5.3.20.3 for the case that the 5GMM cause value received is #3;

2) if the AUTHENTICATION REJECT message is received over non-3GPP access, and the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events has a value less than a UE implementation-specific maximum value, proceed as specified in list item a)-2) of subclause 5.3.20.3 for the case that the 5GMM cause value received is #3; or

3) otherwise:

i) if the AUTHENTICATION REJECT message is received over 3GPP access:

- the UE shall set the update status for 3GPP access to 5U3 ROAMING NOT ALLOWED, delete for 3GPP access only the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI. The entry of the "list of subscriber data" with the SNPN identity of the current SNPN shall be considered invalid for 3GPP access until the UE is switched off or the entry is updated; and

- the UE shall set the counter for "the entry for the current SNPN considered invalid for 3GPP access" events to UE implementation-specific maximum value; and

ii) if the AUTHENTICATION REJECT message is received over non-3GPP access:

- the UE shall set the update status for non-3GPP access to 5U3 ROAMING NOT ALLOWED, delete for non-3GPP access only the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI. The entry of the "list of subscriber data" with the SNPN identity of the current SNPN shall be considered invalid for non-3GPP access until the UE is switched off or the entry is updated; and

- the UE shall set the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events to UE implementation-specific maximum value.

NOTE 3: The AUTHENTICATION REJECT message "received over non-3GPP access" in this subclause refers to an AUTHENTICATION REJECT message received via a PLMN when the UE attempts to access to SNPN services via a PLMN.

If the AUTHENTICATION REJECT message is received by the UE, the UE shall abort any 5GMM signalling procedure, stop any of the timers T3510, T3517, T3519 or T3521 (if they were running), enter state 5GMM-DEREGISTERED and delete any stored SUCI.

Upon receiving an EAP-success message, if the ME has not generated a partial native 5G NAS security context when handling the EAP-request message which resulted into generation of EMSK as described above , the ME shall generate the KAUSF from the EMSK, the KSEAF from the KAUSF, and the KAMF from the ABBA that was received with the EAP-success message, and the KSEAF as described in 3GPP TS 33.501 [24], shall create a partial native 5G NAS security context identified by the ngKSI value in the volatile memory of the ME, and shall store the KAMF in the created partial native 5G NAS security context.

The UE shall consider the procedure complete.

Upon receiving an EAP-failure message, the UE shall delete the partial native 5G NAS security context if any was created when handling the EAP-request message which resulted into generation of EMSK as described above .

The UE shall consider the procedure complete.

\* \* \* End of Change \* \* \* \*