**3GPP TSG-CT WG1 Meeting #141eC1-23XXXX**

**Online 17– 21 April 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.122** | **CR** | **1090** | **rev** | **1** | **Current version:** | **18.2.0** |  |
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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 | **X** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | Forbidden SNPN lists for localized services |
|  |  |
| ***Source to WG:*** | MediaTek Inc. |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | eNPN\_Ph2 |  | ***Date:*** | 2023-04-18 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | When UE is registering for accessing localized services in an SNPN and the SNPN reject the UE due the UE is not authorized, e.g., time validity criteria is not met. The UE will put the SNPN into forbidden list, and then, when the time validity criteria becomes met, the UE will not be able to access the SNPN. |
|  |  |
| ***Summary of change:*** | Intorduce dedicated forbidden SNPN lists for localized services |
|  |  |
| ***Consequences if not approved:*** | UE is not able to access an SNPN providing localized service when time validity criteria is met, if the UE put the SNPN into forbidden list because the UE accessed the SNPN in the past when the time validity criteria is not met. |
|  |  |
| ***Clauses affected:*** | 1.2, 4.9.3.0 |
|  |  |
|  | **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:*** |  |

\*\*\*change\*\*\*

## 1.2 Definitions and abbreviations

For the purposes of the present document, the abbreviations defined in 3GPP TR 21.905 [36] apply.

**(A/Gb mode only):** Indicates this clause applies only to a GSM system which operates in A/Gb mode. For multi system case this is determined by the current serving radio access network.

**(Iu mode only):** Indicates this clause applies only to UMTS. For multi system case this is determined by the current serving radio access network.

NOTE 1: In accordance with the description of packet services in Iu mode in 3GPPS TS 24.008 [23], the terms 'CS/PS mode of operation' and 'PS mode of operation' are not used in the present document. Instead the terms 'MS operation mode A' and 'MS operation mode C' are used.

**(S1 mode only):** Indicates this clause applies only to an EPS. For multi system case this is determined by the current serving radio access network.

**Acceptable Cell:** This is a cell that the MS may camp on to make emergency calls or to access RLOS. It must satisfy criteria which are defined for A/Gb mode in 3GPP TS 43.022 [35], for Iu mode in 3GPP TS 25.304 [32], for S1 mode in 3GPP TS 36.304 [43], and for NR access in N1 mode in 3GPP TS 38.304 [61] and for E-UTRA access in N1 mode in 3GPP TS 36.304 [43]. For an MS in eCall only mode, an acceptable cell must further satisfy the criteria defined in clause 4.4.3.1.1.

**Access Technology:** The access technology associated with a PLMN or SNPN. The MS uses this information to determine what type(s) of radio carrier to search for when attempting to select a specific PLMN or SNPN (e.g., GSM, UTRAN, GSM COMPACT, E-UTRAN, NG-RAN, satellite NG-RAN or satellite E-UTRAN). A PLMN may support more than one access technology. SNPNs only support NG-RAN.

NOTE 2: Access technology "E-UTRAN" maps to core network type "EPC" and access technology "NG-RAN" maps to core network type "5GCN", see 3GPP TS 24.501 [64].

**ACDC:** Application specific Congestion control for Data Communication, see 3GPP TS 22.011 [9].

**Allowable PLMN:** In the case of an MS operating in MS operation mode A or B, this is a PLMN which is not in the list of "forbidden PLMNs" in the MS. In the case of an MS operating in MS operation mode C or an MS not supporting A/Gb mode and not supporting Iu mode, this is a PLMN which is not in the list of "forbidden PLMNs" and not in the list of "forbidden PLMNs for GPRS service" in the MS.

**Allowable SNPN:** In the case of an MS operating in SNPN access mode and for an SNPN candidate not belongs to clause 4.9.3.1.1 bullet a0), this is an SNPN which is not in the list of "permanently forbidden SNPNs" which is, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, and is not in the list of "temporarily forbidden SNPNs" which is, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription. In the case of an MS operating in SNPN access mode and for an SNPN candidate belongs to clause 4.9.3.1.1 bullet a0), this is an SNPN which is not in the list of "permanently forbidden SNPNs for access for localized services in SNPN" which is associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, and is not in the list of "temporarily forbidden SNPNs for access for localized services in SNPN" which is associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription.

**Allowable PLMN/access technology** **combination:** For an MS operating in MS operation mode C or an MS not supporting A/Gb mode and not supporting Iu mode, this is an allowable PLMN in any specific access technology. For an MS operating in MS operation mode A or B, this is a PLMN/access technology combination where:

- the PLMN is an allowable PLMN and the specific access technology is supporting non-GPRS services; or

- the PLMN is not in the list of "forbidden PLMNs" and not in the list of "forbidden PLMNs for GPRS service" in the MS and the specific access technology is only supporting GPRS services.

EXAMPLE: E-UTRAN, satellite E-UTRAN, satellite NG-RAN (see 3GPP TS 22.261 [74]) and NG-RAN are access technologies that are only supporting GPRS services.

**Available PLMN:** For GERAN A/Gb mode see 3GPP TS 43.022 [35]. For UTRAN see 3GPP TS 25.304 [32]. For E-UTRAN see 3GPP TS 36.304 [43]. For satellite E-UTRAN see 3GPP TS 36.304 [43]. For NG-RAN see 3GPP TS 36.304 [43] and 3GPP TS 38.304 [61]. For satellite NG-RAN, see 3GPP TS 38.304 [61]. For cdma2000® 1xRTT and cdma2000® HRPD see 3GPP2 C.S0016 [44].

**Available SNPN:** For NG-RAN see 3GPP TS 38.304 [61].

**Available PLMN/access technology** **combination:** This is an available PLMN in a specific access technology.

**CAG-ID authorized based on "Allowed CAG list":** A CAG-ID in an "Allowed CAG list", without a time validity information, or with a time validity information matching UE's current time.

**Camped on a cell:** The MS (ME if there is no SIM) has completed the cell selection/reselection process and has chosen a cell from which it plans to receive all available services. Note that the services may be limited, and that the PLMN or the SNPN may not be aware of the existence of the MS (ME) within the chosen cell.

**Country:** A country is identified by a single MCC value defined in ITU-T recommendation E.212 [76], with the exception of the following MCC ranges that identify a single country:

- values 310 through 316 (USA);

- values 404 through 406 (India);

- values 440 through 441 (Japan);

- values 460 through 461 (China); and

- values 234 through 235 (United Kingdom).

**Permitted CSG list:** See 3GPP TS 36.304 [43].

**Current serving cell:** This is the cell on which the MS is camped.

**CTS MS:** An MS capable of CTS services is a CTS MS.

Discontinuous coverage: Deployment option for satellite E-UTRAN access, in which shorter periods of satellite E-UTRAN access radio coverage are followed by longer periods of satellite E-UTRAN access coverage gaps. During coverage gaps, the access stratum may be deactivated. For more details see 3GPP TS 23.401 [58] and 3GPP TS 36.304 [43].

**EAB:** Extended Access Barring, see 3GPP TS 22.011 [9].

**Extended Coverage in GSM for Internet of Things (EC-GSM-IoT):** Extended coverage in GSM for IoT is a feature which enables extended coverage operation. See 3GPP TS 43.064 [55].

**EHPLMN:** Any of the PLMN entries contained in the Equivalent HPLMN list.

**Equivalent HPLMN list:** To allow provision for multiple HPLMN codes, PLMN codes that are present within this list shall replace the HPLMN code derived from the IMSI for PLMN selection purposes. This list is stored on the USIM and is known as the EHPLMN list. The EHPLMN list may also contain the HPLMN code derived from the IMSI. If the HPLMN code derived from the IMSI is not present in the EHPLMN list then it shall be treated as a Visited PLMN for PLMN selection purposes.

**Generic Access Network (GAN):** See 3GPP TS 43.318 [35A].

**GAN mode:** See 3GPP TS 43.318 [35A].

**GPRS MS:** An MS capable of GPRS services is a GPRS MS.

**MS operation mode:** See 3GPP TS 23.060 [27].

**High quality signal:** The high quality signal limit is used in the PLMN selection procedure. It is defined in the appropriate AS specification: 3GPP TS 43.022 [35] for the GSM radio access technology, 3GPP TS 25.304 [32] for the UMTS radio access technology (FDD or TDD mode), 3GPP TS 36.304 [43] for the E‑UTRAN radio access technology (WB-S1 mode, NB-S1 mode, WB-N1 mode or NB-N1 mode), 3GPP TS 36.304 [43] and 3GPP TS 38.304 [61] for the NG-RAN radio access technology. For 3GPP2 access technologies the high quality signal limit is defined in 3GPP2 C.S0011 [45] for cdma2000® 1xRTT and in 3GPP2 C.S0033 [46] for cdma2000® HRPD. A mobile station attempting to find a cell that supports EC-GSM-IoT (see 3GPP TS 43.064 [55]) does not use high quality signal limit in the PLMN selection procedure, i.e. for the purpose of PLMN selection, when attempting to find a cell that supports EC-GSM-IoT, any found cell supporting EC-GSM-IoT is considered to be received with high quality signal. A UE attempting to find a cell that supports enhanced coverage when operating in any WB-S1 or WB-N1 enhanced coverage mode does not use high quality signal limit in the PLMN selection procedure, i.e. for the purpose of PLMN selection, when attempting to find a cell that supports enhanced coverage, any found cell supporting enhanced coverage and satisfying the coverage specific quality signal limit defined for CE mode (see 3GPP TS 36.304 [43]) is considered to be received with high quality signal.

**Home PLMN:** This is a PLMN where the MCC and MNC of the PLMN identity match the MCC and MNC of the IMSI. Matching criteria are defined in Annex A.

**In A/Gb mode:** Indicates this clause applies only to a GSM system which operates in A/Gb mode. For multi system case this is determined by the current serving radio access network.

**In Iu mode:** Indicates this clause applies only to UMTS. For multi system case this is determined by the current serving radio access network.

**In N1 mode:** Indicates this clause applies only to an 5GS. For multi system case this is determined by the current serving radio access network.

**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 5G network services via E-UTRA connected to 5GCN by NB-IoT (see 3GPP TS 36.300 [56], 3GPP TS 36.331 [42], 3GPP TS 36.306 [54]).

**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 S1 mode:** Indicates this clause applies only to an EPS. The S1 mode includes WB-S1 mode and NB-S1 mode. For multi system case this is determined by the current serving radio access network.

**In NB-S1 mode:** Indicates this paragraph applies only to a system which operates in NB-S1 mode. For a multi-access system this case applies if the current serving radio access network provides access to network services via E-UTRA by NB-IoT (see 3GPP TS 36.300 [56], 3GPP TS 36.331 [22], 3GPP TS 36.306 [54]).

**In WB-S1 mode:** Indicates this paragraph applies only to a system which operates in WB-S1 mode. For a multi-access system this case applies if the system operates in S1 mode, but not in NB-S1 mode.

**Limited Service State:** See clause 3.5.

**Localised Service Area (LSA):** A localised service area consists of a cell or a number of cells. The cells constituting a LSA may not necessarily provide contiguous coverage.

**Localized services in NPN:** Localized services in NPN are services, which are provided by an NPN at specific or limited area, are bounded in time, or both.

**Localized services in SNPN:** Localized services in SNPN are localized services in NPN, which are provided by an SNPN at specific or limited area, are bounded in time, or both.

**Location Registration (LR):** An MS which is IMSI attached to non-GPRS services only performs location registration by the location updating procedure. A GPRS MS which is IMSI attached to GPRS services or to GPRS and non-GPRS services performs location registration by the routing area update procedure only when in a network of network operation mode I. Both location updating and routing area update procedures are performed independently by the GPRS MS when it is IMSI attached to GPRS and non-GPRS services in a network of network operation mode II (see 3GPP TS 23.060 [27]). An MS which is attached via the E-UTRAN performs location registration by the tracking area update procedure. An MS which is registered via the NG-RAN performs location registration by the registration procedure for mobility and periodic registration update (see 3GPP TS 24.501 [64]).

**MINT: Minimization of service interruption (see 3GPP TS 22.261 [71]).**

**MS:** Mobile Station. The present document makes no distinction between MS and UE.

**N1 mode capability:** Capability of the UE associated with an N1 NAS signalling connection between the UE and network. The present document refers to the N1 mode capability over 3GPP access only (see 3GPP TS 24.501 [64]).

**NarrowBand Internet of Things (NB-IoT):** NB-IoT is a non-backward compatible variant of E-UTRAN supporting a reduced set of functionality. NB-IoT allows access to EPC or 5GCN network services via E-UTRA with a channel bandwidth limited to 180 kHz (see 3GPP TS 36.300 [20], 3GPP TS 36.331 [42], 3GPP TS 36.306 [44]).

**Network Type:** The network type associated with HPLMN or a PLMN on the PLMN selector (see 3GPP TS 31.102 [40]). The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN. A PLMN may support more than one network type.

**Onboarding services in SNPN**: Onboarding services in SNPN allow an MS to access an SNPN indicating that onboarding is allowed, using default UE credentials for primary authentication in order for the MS to be configured with one or more entries of the "list of subscriber data".

NOTE 3: When the MS is registered for onboarding services in SNPN, services other than the onboarding services in SNPN are not available. When the MS is not registered for onboarding services in SNPN, onboarding services in SNPN are not available.

**MS determined PLMN with disaster condition:** A PLMN to which a disaster condition applies, determined as described in clause 4.4.3.1.1.

**Registered PLMN (RPLMN):** This is the PLMN on which certain LR outcomes have occurred (see table 1). In a shared network the RPLMN is the PLMN defined by the PLMN identity of the CN operator that has accepted the LR.

**Registered SNPN (RSNPN):** This is the SNPN on which certain LR outcomes have occurred. In a shared network the RSNPN is the SNPN defined by the SNPN identity of the CN operator that has accepted the LR.

**Registration:** This is the process of camping on a cell of the PLMN or the SNPN and doing any necessary LRs.

**Registration Area:** A registration area is an area in which mobile stations may roam without a need to perform location registration. The registration area corresponds to location area (LA) for performing location updating procedure, to routing area for performing the GPRS attach or routing area update procedures, and to a list of tracking areas (TAs) for performing the EPS attach, tracking area update, or 5GS registration procedure.

The PLMN to which a cell belongs (PLMN identity):

- for GERAN, in the system information (MCC + MNC part of LAI) broadcast as specified in 3GPP TS 44.018 [34];

- for UTRA, see the broadcast information as specified in 3GPP TS 25.331 [33];

- for E-UTRA, see the broadcast information as specified in 3GPP TS 36.331 [42]; and

- for NR, see the broadcast information as specified in 3GPP TS 38.331 [65].

The SNPN to which a cell belongs (SNPN identity):

- for NR, see the broadcast information as specified in 3GPP TS 38.331 [65].

In a shared network, a cell belongs to all PLMNs given in the system information broadcasted as specified in 3GPP TS 44.018 [34] for GERAN, in 3GPP TS 25.331 [33] for UTRAN, and in 3GPP TS 36.331 [42] for E-UTRAN, and a cell belongs to all PLMNs, all SNPNs, or all PLMNs and all SNPNs, given in the system information broadcasted as specified in 3GPP TS 36.331 [42] for E-UTRA connected to 5GCN, and in 3GPP TS 38.331 [65] for NR.

**Secured packet:** In this specification, a secured packet contains one or both of the following:

- list of preferred PLMN/access technology combinations,

- SOR-CMCI,

encapsulated with a security mechanism as described in 3GPP TS 31.115 [67].

**Selected PLMN:** This is the PLMN that has been selected according to clause 3.1, either manually or automatically.

**Selected SNPN:** This is the SNPN that has been selected according to clause 3.9, either manually or automatically.

**Shared MCC:** MCC assigned by ITU-T as shared MCC according to ITU-T E.212 [76], except within this specification for PLMN selection purposes the MCC of value 999 is not considered a shared MCC.

**Shared Network:** An MS considers a cell to be part of a shared network, when multiple PLMN identities are received as specified in 3GPP TS 44.018 [34] for GERAN, in 3GPP TS 25.331 [33] for UTRAN, and in 3GPP TS 36.331 [42] for E-UTRAN, and when multiple PLMN identities, multiple SNPN identities or one or more PLMN identities and one or more SNPN identities are received as specified in 3GPP TS 36.331 [42] for E-UTRA connected to 5GCN, and in 3GPP TS 38.331 [65] for NR.

**SIM:** Subscriber Identity Module (see 3GPP TS 21.111 [38]). The present document makes no distinction between SIM and USIM.

**SNPN identity**: a PLMN ID and an NID combination.

**SoLSA exclusive access:** Cells on which normal camping is allowed only for MS with Localised Service Area (LSA) subscription.

**Subscribed SNPN:** An SNPN for which the UE has a subscription.

**Suitable Cell:** This is a cell on which an MS may camp. It must satisfy criteria which are defined for GERAN A/Gb mode in 3GPP TS 43.022 [35], for UTRAN in 3GPP TS 25.304 [32], for E-UTRAN in 3GPP TS 36.304 [43] and for NG-RAN see 3GPP TS 36.304 [43] and 3GPP TS 38.304 [61]. For 3GPP2 access technologies the criteria are defined in 3GPP2 C.S0011 [45] for cdma2000® 1xRTT and in 3GPP2 C.S0033 [46] for cdma2000® HRPD. For an MS in eCall only mode, a suitable cell must further satisfy the criteria defined in clause 4.4.3.1.1.

**Steering of Roaming (SOR):** A technique whereby a roaming UE is encouraged to roam to a preferred roamed-to-network indicated by the HPLMN.

**Steering of Roaming application function (SOR-AF):** An application function that can provide UDM with one of the following:

a) one or more of the following:

- list of preferred PLMN/access technology combinations;

- SOR-CMCI, together with the "Store SOR-CMCI in ME" indicator if applicable;

- SOR-SNPN-SI; and

- SOR-SNPN-SI-LS;

b) a secured packet, together with the indicator, if applicable, that "the list of preferred PLMN/access technology combinations is not included in the secured packet"; or

c) neither of a) or b),

generated dynamically based on operator specific data analytics solutions.

**Steering of Roaming information:** This consists of the following HPLMN or subscribed SNPN protected information (see 3GPP TS 33.501 [66]):

a) the following indicators, of whether:

- the UDM requests an acknowledgement from the UE for successful reception of the steering of roaming information.

- the UDM requests the UE to store the SOR-CMCI in the ME, which is provided along with the SOR-CMCI in plain text; and

b) one of the following:

1) one or more of the following:

- list of preferred PLMN/access technology combinations with an indication that it is included;

- SOR-CMCI;

- SOR-SNPN-SI; and

- SOR-SNPN-SI-LS;

2) a secured packet with an indication that it is included;

3) the HPLMN indication that 'no change of the "Operator Controlled PLMN Selector with Access Technology" list stored in the UE is needed and thus no list of preferred PLMN/access technology combinations is provided'; or

4) the subscribed SNPN or HPLMN indication that 'no change of the SOR-SNPN-SI stored in the UE is needed and thus no SOR-SNPN-SI is provided'.

**Steering of roaming connected mode control information (SOR-CMCI):** HPLMN information to control the timing for a UE in connected mode to move to idle mode in order to perform steering of roaming.

**Steering of roaming SNPN selection information (SOR-SNPN-SI):** Provisioning information for SNPN selection consisting of:

a) the credentials holder controlled prioritized list of preferred SNPNs;

b) the credentials holder controlled prioritized list of GINs; or

c) both of the above.

**Steering of roaming SNPN selection information for localized services in SNPN (SOR-SNPN-SI-LS):** Provisioning information for SNPN selection (if the access for localized services in SNPN has been enabled) by an MS supporting access to an SNPN providing access for localized services in SNPN consisting of:

a) a "credentials holder controlled prioritized list of preferred SNPNs for access for localized services in SNPN", where each entry contains an SNPN identity and a validity information consisting of time validity information;

b) a "credentials holder controlled prioritized list of preferred GINs for access for localized services in SNPN", where each entry contains a GIN and a validity information consisting of time validity information; or

c) both of the above.

Editor's note: (WI: eNPN\_Ph2, CR 1039) Location validity information is FFS.

**Visited PLMN**: This is a PLMN different from the HPLMN (if the EHPLMN list is not present or is empty) or different from an EHPLMN (if the EHPLMN list is present).

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.167 [57] apply:

**eCall over IMS**

**EPC**

**E-UTRAN**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.401 [58] apply:

**eCall only mode**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.221 [69] apply:

**Restricted local operator services (RLOS)**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.501 [62] apply:

**Closed Access Group (CAG)**

**Credentials holder**

**Group ID for Network Selection (GIN)**

**Network identifier (NID)**

**NG-RAN**

**NR RedCap**

**Stand-alone Non-Public Network (SNPN)**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.501 [64] apply:

**5GCN**

**CAG cell**

**Emergency PDU session**

**Initial registration for emergency services**

**Initial registration for onboarding services in SNPN**

**Non-CAG cell**

**Registered for emergency services**

**Registered for onboarding services in SNPN**

**SNPN access operation mode**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 22.261 [74] apply:

**Disaster condition**

**Disaster roaming**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 33.501 [66] apply:

**Default UE credentials for primary authentication**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.229 [84] apply:

**IMS registration related signalling**

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#### 4.9.3.0 General

The ME is configured with a "list of subscriber data" containing zero or more entries. Each entry of the "list of subscriber data" consists of:

a) a subscriber identifier in the form of a SUPI with the SUPI format "network specific identifier" containing a network-specific identifier or with the SUPI format "IMSI" containing an IMSI, except when the subscribed SNPN uses:

1) the EAP based primary authentication and key agreement procedure using the EAP-AKA'; or

2) the 5G AKA based primary authentication and key agreement procedure;

NOTE 1: A subscriber identifier in the form of a SUPI with the SUPI format "network specific identifier" containing a network-specific identifier or with the SUPI format "IMSI" containing an IMSI, is available in USIM if the subscribed SNPN uses the EAP based primary authentication and key agreement procedure using the EAP-AKA' or the 5G AKA based primary authentication and key agreement procedure.

NOTE 2: If the MS supports access to an SNPN using credentials from a credentials holder and is configured with the SNPN selection parameters as described in h), the subscriber identifier in the form of a SUPI configured in the ME or the USIM needs to be:

- with the SUPI format "network specific identifier"; or

- with the SUPI format "IMSI", if the subscribed SNPN has an assigned PLMN ID.

b) credentials except when the subscribed SNPN uses:

1) the EAP based primary authentication and key agreement procedure using the EAP-AKA'; or

2) the 5G AKA based primary authentication and key agreement procedure.

 If the MS supports access to an SNPN using credentials from a credentials holder, the credentials can include an indication to use MSK for derivation of KAUSF after success of primary authentication and key agreement procedure;

NOTE 3: Credentials are available in USIM if the subscribed SNPN uses the EAP based primary authentication and key agreement procedure using the EAP-AKA' or the 5G AKA based primary authentication and key agreement procedure. If the MS supports access to an SNPN using credentials from a credentials holder, credentials available in USIM can include an indication to use MSK for derivation of KAUSF after success of primary authentication and key agreement procedure.

ba) optionally, a routing indicator, except when the subscribed SNPN uses:

1) the EAP based primary authentication and key agreement procedure using the EAP-AKA'; or

2) the 5G AKA based primary authentication and key agreement procedure;

NOTE 3A: Routing indicator is available in USIM if the subscribed SNPN uses the EAP based primary authentication and key agreement procedure using the EAP-AKA' or the 5G AKA based primary authentication and key agreement procedure.

bb) optionally, the protection scheme identifier as specified in 3GPP TS 33.501 [66], except when the subscribed SNPN uses:

1) the EAP based primary authentication and key agreement procedure using the EAP-AKA'; or

2) the 5G AKA based primary authentication and key agreement procedure;

 If the protection scheme identifier is configured in the entry of the "list of subscriber data" and not set to "null-scheme", the entry of the "list of subscriber data" also contains the home network public key and the home network public key identifier as specified in in 3GPP TS 33.501 [66];

NOTE 3B: The protection scheme identifier, the home network public key and the home network public key identifier are available in USIM if the subscribed SNPN uses the EAP based primary authentication and key agreement procedure using the EAP-AKA' or the 5G AKA based primary authentication and key agreement procedure.

c) an SNPN identity of the subscribed SNPN;

d) optionally, the unified access control configuration indicating for which access identities (see 3GPP TS 24.501 [64]) the ME is configured, when the MS accesses an SNPN using the entry.

 Access identity 11 or 15, if configured, is applicable for the MS only in the subscribed SNPN.

 Access identity 12, 13 or 14, if configured, is applicable for the MS only:

1) in the subscribed SNPN; and

2) if the MCC of the SNPN identity of the subscribed SNPN is not the MCC of value 999, in the non-subscribed SNPNs of the same country as the subscribed SNPN;

 Access identity 1 or 2, if configured, is applicable for the MS only:

1) in the subscribed SNPN;

2) if the MCC of the SNPN identity of the subscribed SNPN is not the MCC of value 999, in the non-subscribed SNPNs of the same country as the subscribed SNPN; and

3) in an SNPN equivalent to the subscribed SNPN;

e) zero or more sets of pre-configured URSP rules (see 3GPP TS 24.526 [77]), each set for the subscribed SNPN or a non-subscribed SNPN;

f) optionally, the default configured NSSAI (see 3GPP TS 24.501 [64]);

g) optionally, if the MS supports access to an SNPN using credentials from a credentials holder, the SNPN selection parameters, consisting of:

1) a user controlled prioritized list of preferred SNPNs, where each entry contains an SNPN identity;

2) a credentials holder controlled prioritized list of preferred SNPNs, where each entry contains an SNPN identity;

3) a credentials holder controlled prioritized list of Group IDs for Network Selection (GINs); and

4) optionally, if the MS supports access to an SNPN providing access for localized services in SNPN, the SNPN selection parameters for access for localized services in SNPN, consisting of:

i) a "credentials holder controlled prioritized list of preferred SNPNs for access for localized services in SNPN", where each entry contains an SNPN identity and a validity information consisting of time validity information; and

ii) a "credentials holder controlled prioritized list of preferred GINs for access for localized services in SNPN", where each entry contains an GIN and a validity information consisting of time validity information;

Editor's note: (WI: eNPN\_Ph2, CR 1029) location validity information is FFS.

NOTE 4: How the ME is configured with the "list of subscriber data" is out of scope of 3GPP in this release of the specification.

NOTE 5: Multiple entries can include the same subscriber identifier and credentials.

NOTE 6: Handling of more than one entry with the same SNPN identity is left up to MS implementation.

NOTE 7: Handling of the case when the subscribed SNPN uses the EAP based primary authentication and key agreement procedure using the EAP-AKA' or the 5G AKA based primary authentication and key agreement procedure and the MS has multiple valid USIMs (3GPP TS 31.102 [40]) is left up to MS implementation.

NOTE 8: To enable UE mobility between SNPNs in 5GMM-IDLE mode, SNPN identities in the credentials holder controlled prioritized list of preferred SNPNs are assumed to be globally-unique SNPN identities.

h) optionally:

1) an indication of whether the MS shall ignore all warning messages received in the subscribed SNPN; and

2) an indication of whether the MS shall ignore all warning messages received in an SNPN other than the subscribed SNPN.

NOTE 9: The ME can be configured with an indication to use anonymous SUCI associated with an entry of "list of subscriber data" when the EAP method associated with the credentials of the entry supports SUPI privacy at the EAP layer.

NOTE 10: Anonymous SUCI is not used if the subscribed SNPN of the entry uses the EAP based primary authentication and key agreement procedure using the EAP-AKA' or the 5G AKA based primary authentication and key agreement procedure.

The MS which supports onboarding services in SNPN shall be pre-configured with default UE credentials for primary authentication and may be pre-configured with onboarding SNPN selection information. Contents of the onboarding SNPN selection information are MS implementation specific. Contents of default UE credentials for primary authentication are out of scope of 3GPP.

Additionally, if the MS has a USIM with a PLMN subscription, the ME may be configured with the SNPN selection parameters associated with the PLMN subscription, consisting of:

a) a user controlled prioritized list of preferred SNPNs, where each entry contains an SNPN identity;

b) a credentials holder controlled prioritized list of preferred SNPNs, where each entry contains an SNPN identity;

c) a credentials holder controlled prioritized list of GINs;and

d) optionally, if the MS supports access to an SNPN providing access for localized services in SNPN, with the following SNPN selection parameters for access for localized services in SNPN associated with the PLMN subscription, consisting of:

1) a "credentials holder controlled prioritized list of preferred SNPNs for access for localized services in SNPN", where each entry contains an SNPN identity and a validity information consisting of time validity information; and

2) a "credentials holder controlled prioritized list of preferred GINs for access for localized services in SNPN", where each entry contains an GIN and a validity information consisting of time validity information;

Editor's note: (WI: eNPN\_Ph2, CR 1029) location validity information is FFS.

and with the following configuration parameters associated with the PLMN subscription:

a) zero or more sets of pre-configured URSP rules (see 3GPP TS 24.526 [77]), each set for the HPLMN or a non-subscribed SNPN.

NOTE 11: To enable MS mobility between SNPNs in 5GMM-IDLE mode, SNPN identities in the credentials holder controlled prioritized list of preferred SNPNs are assumed to be globally-unique SNPN identities.

NOTE 12: If an MS accesses an SNPN using the PLMN subscription, access identity 1, 2, 12, 13, or 14 is configured in the USIM of the MS, and the SNPN is of the same country as the HPLMN, then the configured access identity 1, 2, 12, 13, or 14 is applicable for the MS.

NOTE 13: If an MS accesses an SNPN using the PLMN subscription, an indication of whether the MS shall ignore all warning messages in an SNPN is configured in the USIM of the MS.

NOTE 14: Handling of URSP rules is specified in 3GPP TS 24.526 [77].

The MS shall maintain a list of "temporarily forbidden SNPNs" and a list of "permanently forbidden SNPNs" in the ME. Each entry of those lists consists of an SNPN identity. If the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, the MS shall maintain one list of “temporarily forbidden SNPNs” and one list of “permanently forbidden SNPNs” per entry of the “list of subscriber data”. If the MS supports access to an SNPN using credentials from a credentials holder, the MS shall maintain one list of "temporarily forbidden SNPNs" and one list of "permanently forbidden SNPNs" per the PLMN subscription, If the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, the MS shall use the lists associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription. In addition, if the MS supports access to an SNPN providing access for localized services in SNPN, the MS shall maintain one list of "temporarily forbidden SNPNs for access for localized services in SNPN" and one list of "permanently forbidden SNPNs for access for localized services in SNPN" per entry of the "list of subscriber data" and per the PLMN subscription, the MS shall use the lists associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription. In addition, if the MS supports onboarding services in SNPN, a "permanently forbidden SNPNs" list for onboarding services and a "temporarily forbidden SNPNs" list for onboarding services shall be maintained.

The MS shall add an SNPN to the list of "temporarily forbidden SNPNs" (for access for localized services in SNPN, if the SNPN was selected according to clause 4.9.3.1.1 bullet a0)) (for onboarding services, if the MS is registered for onboarding services in SNPN or performing initial registration for onboarding services in SNPN) which is, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, if a message with cause value #74 "Temporarily not authorized for this SNPN" (see 3GPP TS 24.501 [64]) is received by the MS in response to an LR request from the SNPN. In addition, if:

- the message is integrity-protected; or

- the message is not integrity-protected, and the value of the SNPN-specific attempt counter for that SNPN is equal to the MS implementation specific maximum value as defined in 3GPP TS 24.501 [64];

then the MS shall start an MS implementation specific timer not shorter than 60 minutes.

The MS shall remove an SNPN from the list of "temporarily forbidden SNPNs" (for access for localized services in SNPN, if the SNPN was selected according to clause 4.9.3.1.1 bullet a0)) (for onboarding services, if the MS is registered for onboarding services in SNPN or performing initial registration for onboarding services in SNPN) which is, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, if:

a) there is a successful LR after a subsequent manual selection of the SNPN;

b) the MS implementation specific timer not shorter than 60 minutes expires;

c) the MS is configured to use timer T3245 and timer T3245 expires;

d) the MS is not configured to use timer T3245, the timer T3247 expires and the value of the SNPN-specific attempt counter for that SNPN is less than the MS implementation specific maximum value as defined in 3GPP TS 24.501 [64];

e) the MS is switched off;

f) an entry of the "list of subscriber data" with the subscribed SNPN identity identifying the SNPN is updated or the USIM is removed if:

- EAP based primary authentication and key agreement procedure using EAP-AKA'; or

- 5G AKA based primary authentication and key agreement procedure;

 was performed in the selected SNPN; or

g) the selected entry of the "list of subscriber data" is updated or USIM is removed for the selected PLMN subscription.

If an SNPN is removed from the list of "temporarily forbidden SNPNs" list, the MS shall stop the MS implementation specific timer not shorter than 60 minutes, if running.

The MS shall add an SNPN to the list of "permanently forbidden SNPNs" (for access for localized services in SNPN, if the SNPN was selected according to clause 4.9.3.1.1 bullet a0)) (for onboarding services, if the MS is registered for onboarding services in SNPN or performing initial registration for onboarding services in SNPN) which is, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, if a message with cause value #75 "Permanently not authorized for this SNPN", #3 "Illegal UE" (applicable in an onboarding SNPN only), #6 "Illegal ME" (applicable in an onboarding SNPN only), or #7 "5GS services not allowed" (applicable in an onboarding SNPN only) (see 3GPP TS 24.501 [64]) is received by the MS in response to an LR request from the SNPN.

The MS shall remove an SNPN from the list of "permanently forbidden SNPNs" (for access for localized services in SNPN, if the SNPN was selected according to clause 4.9.3.1.1 bullet a0)) (for onboarding services, if the MS is registered for onboarding services in SNPN or performing initial registration for onboarding services in SNPN) which is, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, if:

a) there is a successful LR after a subsequent manual selection of the SNPN;

b) the MS is configured to use timer T3245 and timer T3245 expires;

c) the MS is not configured to use timer T3245, the timer T3247 expires and the value of the SNPN-specific attempt counter for that SNPN is less than the MS implementation specific maximum value as defined in 3GPP TS 24.501 [64];

d) an entry of the "list of subscriber data" with the subscribed SNPN identity identifying the SNPN is updated or the USIM is removed if:

- EAP based primary authentication and key agreement procedure using EAP-AKA'; or

- 5G AKA based primary authentication and key agreement procedure;

 was performed in the selected SNPN; or

e) the selected entry of the "list of subscriber data" is updated or USIM is removed for the selected PLMN subscription.

When the MS reselects to a cell in a shared network, and the cell is a suitable cell for multiple SNPN identities received in the broadcast information as specified in 3GPP TS 38.331 [65], the AS indicates these multiple SNPN identities to the NAS according to 3GPP TS 38.304 [61]. The MS shall select one of these SNPNs. If the registered SNPN is available among these SNPNs, the MS shall not select a different SNPN.

The MS operating in SNPN access mode shall maintain one or more lists of "5GS forbidden tracking areas for roaming", each associated with an SNPN and, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, entry of the "list of subscriber data" or, if the MS supports access to an SNPN using credentials from a credentials holder, the PLMN subscription. The MS shall use the list of "5GS forbidden tracking areas for roaming" associated with the selected SNPN and, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, the selected entry of the "list of subscriber data" or the selected PLMN subscription. If the MS selects a new SNPN, the MS shall keep the list of "5GS forbidden tracking areas for roaming" associated with the previously selected SNPN and, if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, the selected entry of the "list of subscriber data" or the selected PLMN subscription. If the number of the lists to be kept is higher than supported, the MS shall delete the oldest stored list of "5GS forbidden tracking areas for roaming". The MS shall delete all lists of "5GS forbidden tracking areas for roaming", when the MS is switched off and periodically (with period in the range 12 to 24 hours). The MS shall delete the list of "5GS forbidden tracking areas for roaming" associated with an SNPN:

a) when the entry with the subscribed SNPN identifying the SNPN in the "list of subscriber data" is updated;

b) when the USIM is removed if:

- the EAP based primary authentication and key agreement procedure using the EAP-AKA'; or

- the 5G AKA based primary authentication and key agreement procedure;

 was performed in the selected SNPN; or

c) if the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, when the list of "5GS forbidden tracking areas for roaming" is associated with:

- the entry of the "list of subscriber data" and the entry of the "list of subscriber data" is updated; or

- the PLMN subscription and USIM is removed.

NOTE 15: The number of the lists of "5GS forbidden tracking areas for roaming" supported by the MS is MS implementation specific.

If a message with cause value #15 (see 3GPP TS 24.501 [64]) is received by an MS operating in SNPN access mode, the TA is added to the list of "5GS forbidden tracking areas for roaming" of the selected SNPN and, if the UE supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, the selected entry of the "list of subscriber data" or the selected PLMN subscription,. The MS shall then search for a suitable cell in the same SNPN but belonging to a TA which is not in the "5GS forbidden tracking areas for roaming" list of the selected SNPN and, if the UE supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, the selected entry of the "list of subscriber data" or the selected PLMN subscription.

The MS should maintain a list of SNPNs for which the N1 mode capability was disabled due to receipt of a reject from the network with 5GMM cause #27 "N1 mode not allowed". When the MS disables its N1 mode capability due to receipt of a reject from an SNPN with 5GMM cause #27 "N1 mode not allowed":

- the MS should add the SNPN identity of the SNPN which sent a reject with 5GMM cause #27 "N1 mode not allowed" to the list of SNPNs for which the N1 mode capability was disabled and should start timer TJ if timer TJ is not already running. The number of SNPNs for which the N1 mode capability was disabled that the MS can store is implementation specific, but it shall be at least one. The value of timer TJ is MS implementation specific;

- in automatic SNPN selection, the MS shall not select an SNPN for which the N1 mode capability was disabled as SNPN selection candidates, unless no other SNPN is available;

- if the MS is not configured to use timer T3245, the MS maintains a list of SNPN-specific attempt counters for 3GPP access as specified in 3GPP TS 24.501 [64], and T3247 expires, then the MS removes for each SNPN-specific attempt counter for 3GPP access that has a value greater than zero and less than the MS implementation-specific maximum value the respective SNPN from the list of SNPNs for which the N1 mode capability was disabled, as specified in clause 5.3.20.3 in 3GPP TS 24.501 [64]; and

- the MS shall delete stored information on SNPNs for which the N1 mode capability was disabled when the MS is switched off, the USIM is removed, the entries of the "list of subscriber data" for the SNPNs are updated, or timer TJ expires.

NOTE 16: The expiry of timer TJ does not cause a reset of the SNPN-specific attempt counters for 3GPP access (see 3GPP TS 24.501 [64]).

If the MS does not support access to an SNPN using credentials from a credentials holder and does not support equivalent SNPNs, the MS should maintain a list of SNPNs where the N1 mode capability was disabled because IMS voice was not available and the MS's usage setting was "voice centric". If the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both the MS should maintain one or more lists of SNPNs where the N1 mode capability was disabled because IMS voice was not available and the MS's usage setting was "voice centric", each associated with an entry of the "list of subscriber data". If the MS supports access to an SNPN using credentials from a credentials holder, the MS should maintain a list of SNPNs where the N1 mode capability was disabled because IMS voice was not available and the MS's usage setting was "voice centric", associated with the PLMN subscription. If the MS supports access to an SNPN using credentials from a credentials holder, equivalent SNPNs or both, the MS shall use the lists associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription. When the MS disables its N1 mode capability due to IMS voice not available and the MS's usage setting was "voice centric":

- the MS should add the SNPN identity of the SNPN to the list of SNPNs where voice service was not possible in N1 mode and should start timer TK if timer TK is not already running. The number of SNPNs that the MS can store where voice services is not possible is implementation specific, but it shall be at least one. The value of timer TK is MS implementation specific;

- in automatic SNPN selection the MS shall not consider SNPNs where voice service was not possible in N1 mode as SNPN selection candidates, unless no other SNPN is available; and

- the MS shall delete stored information on SNPNs where voice service was not possible in N1 mode when the MS is switched off, the USIM is removed, the entries of the "list of subscriber data" for the SNPNs are updated, or timer TK expires.

The MS may support equivalent SNPNs. If the MS supports equivalent SNPNs, the ME shall store up to one list of equivalent SNPNs:

- per entry of "list of subscriber data"; or

- per the PLMN subscription, if the MS supports access to an SNPN using credentials from a credentials holder.

SNPNs in the list of equivalent SNPNs associated with the selected entry of "list of subscriber data" or the selected PLMN subscription shall be regarded by the MS as equivalent to each other for SNPN selection, cell selection, and cell re-selection. The list of equivalent SNPNs associated with the selected entry of "list of subscriber data" or the selected PLMN subscription is created, replaced or deleted at the end of each registration procedure. The stored list consists of a list of equivalent SNPNs as provided by the network plus the SNPN identity of the registered SNPN that provided the list. When the MS is switched off, the MS shall keep the stored list(s) so that they can be used for SNPN selection after switch on. The MS shall delete the stored list associated with an entry of "list of subscriber data" or the PLMN subscription, when the USIM is removed, the associated entry of "list of subscriber data" is updated, or the MS registered for emergency services deregisters.

NOTE x: The MS can provide the list of equivalent SNPNs associated with the selected entry of "list of subscriber data" or the selected PLMN subscription to the lower layers.

Editor's note: (WI: eNPN\_Ph2, CR: 1003) when the MS is registering or is registered for onboarding services in SNPN, it is FFS whether list of equivalent SNPNs is needed.