**3GPP TSG-CT WG1 Meeting #138-eC1-225945**

**E-Meeting, 10th – 14th October 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.122** | **CR** | **0993** | **rev** | **-** | **Current version:** | **17.8.0** |  |
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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:***  | Clarification on secured packet is provided by HPLMN in SNPN access mode |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | eNPN |  | ***Date:*** | 2022-09-30 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | As agreed in C1-223409, the SOR-SNPN-SI can’t be provided in secured packet in SOR transparent container to the UE. It was not clear in SNPN access mode, whether the SOR-CMCI can be provided in secured packet to the UE or not. There are two possible cases for the UE working in SNPN access mode:1. the UE uses PLMN subscription to access the SNPN: for this case, the UE has USIM which can decode secured packet.
2. the UE uses credential from a CH to access the SNPN: for this case, the ME may be not able to decode secured packet.

Hence, it is proposed when the UE is registered in a non-subscribed SNPN, the SOR-CMCI can be provided in a secured packet only if the UE is using a PLMN subscription to access the non-subscribed SNPN.Besides, the agreed CR C1-221894 corrected some unreadable sentences about “due to IMS voice not available and the MS's usage setting was "voice centric"”. There are still 3 sentences left need to be resolved.Backward compatibility analysis:This CR only clarifies what has been reflected implicitly in current spec, there is no backward compatible issue in this CR. |
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| ***Summary of change:*** | It is proposed that when the UE is registered in a non-subscribed SNPN, the SOR-CMCI can be provided in a secured packet only if the UE is using a PLMN subscription to access the non-subscribed SNPN; andChange “due to IMS voice not available and the MS's usage setting was "voice centric"” to be “because IMS voice was not available and the MS's usage setting was "voice centric"”. |
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| ***Consequences if not approved:*** | It is not clear in SNPN access mode, whether the SOR-CMCI can be provided in secured packet to the UE or not. |
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| ***Clauses affected:*** | 3.1B, 3.1C, C.4.3, 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:*** |  |

\*\*\*\*\*First change \*\*\*\*\*

## 3.1B PLMN selection triggered by ProSe communications

If the MS supports ProSe communications and needs to perform PLMN selection for ProSe communications as specified in 3GPP TS 24.334 [51] or 3GPP TS 24.554 [80], then the MS shall proceed as follows:

i) the MS shall store a duplicate value of the RPLMN and a duplicate of the PLMN selection mode that were in use before PLMN selection due to ProSe communications was initiated, unless this PLMN selection due to ProSe communications follows another PLMN selection due to ProSe communications or a manual CSG selection as specified in clause 4.4.3.1.3.3;

ii) the MS shall enter into Automatic mode of PLMN selection as specified in clause 4.4 taking into account the additional requirements in items iii) to x) below;

iii) among the PLMNs advertised by the E-UTRA cell or NR cell operating in the radio resources provisioned to the MS for ProSe communications as specified in 3GPP TS 24.333 [52], 3GPP TS 24.555 [81] or 3GPP TS 31.102 [40], the MS shall choose one allowable PLMN which meets:

1) the following:

- is advertised by the E-UTRA cell;

- provides radio resources for ProSe communications over E-UTRA PC5;

- is in the list of authorised PLMNs for ProSe communications as specified in 3GPP TS 24.334 [51]; and

- is not in the list of "PLMNs with E-UTRAN not allowed" as specified in clause 3.1; or

2) the following:

- is advertised by the NR cell;

- provides radio resources for 5G ProSe communications over NR PC5;

- is in the list of authorised PLMNs for 5G ProSe communications over PC5 as specified in 3GPP TS 24.554 [80];

- is the advertised PLMN(s) of the 5G ProSe layer-2 UE-to-network relay UE if the MS is acting as a 5G ProSe layer-2 remote UE;

- is not in the list of PLMNs where the N1 mode capability was disabled because IMS voice was not available and the MS's usage setting was "voice centric" as PLMNs where voice service was not possible; and

- is not in the list of PLMNs where the N1 mode capability was disabled due to receipt of a reject from the network with 5GMM cause #27 "N1 mode not allowed" in N1 mode as specified in clause 3.1;

 if either condition 1) or condition 2) above is met then the MS shall attempt to register on that PLMN. If none of the PLMNs meet either condition 1) or condition2) above, the MS shall return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action;

iv) if the registration fails due to "PLMN not allowed" or "EPS services not allowed" as specified in 3GPP TS 24.334 [51], or due to "PLMN not allowed" or "5GS services not allowed" as specified in 3GPP TS 24.554 [80], then the MS shall update the appropriate list of forbidden PLMNs as specified in clause 3.1, and shall either:

A) if the PLMN provides common radio resources needed by the MS to do ProSe communications as specified in 3GPP TS 36.331 [42] or 3GPP TS 38.331 [65], perform ProSe communications on the selected PLMN in limited service state. In this case the MS shall not search for available and allowable PLMNs during the duration of ProSe communications;

B) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action; or

C) perform the action described in iii) again with the choice of PLMNs further excluding the PLMNs on which the MS has failed to register.

 Whether the MS performs A), B) or C) above is left up to MS implementation.

v) if the registration fails due to causes other than "PLMN not allowed" or "EPS services not allowed" or "5GS services not allowed", the MS shall:

- if the handling of the failure requires updating a list of forbidden PLMNs, update the appropriate list (as specified in 3GPP TS 24.301 [23A] or 3GPP TS 24.501 [64]); and

- if the handling of the failure does not require updating a list of forbidden PLMNs (as specified in 3GPP TS 24.301 [23A] or 3GPP TS 24.501 [64]), remember the PLMN as a PLMN on which the MS has failed to register;

NOTE 1: How long the MS memorizes the PLMNs on which it has failed to register is implementation dependent.

 and the MS shall either:

A1) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action;

B1) perform the action described in iii) again with the choice of PLMNs further excluding the PLMNs on which the MS has failed to register; or

C1) perform ProSe communications in limited service state on a PLMN advertised by the cell operating in the radio resources provisioned to the MS for ProSe communications as specified in 3GPP TS 24.333 [52], 3GPP TS 24.555 [81] or 3GPP TS 31.102 [40], if registration on this PLMN has previously failed due to "PLMN not allowed" or "EPS services not allowed" as specified in 3GPP TS 24.334 [51] or due to "PLMN not allowed" or "5GS services not allowed" as specified in 3GPP TS 24.554 [80] and if this PLMN provides common radio resources needed by the MS to do ProSe communications as specified in 3GPP TS 36.331 [42] or 3GPP TS 38.331 [65]. In this case the MS shall not search for available and allowable PLMNs during the duration of ProSe communications;

 Whether the MS performs A1), B1) or C1) above is left up to MS implementation.

vi) if the MS is no longer in the coverage of the selected PLMN, then the MS shall either:

A2) perform ProSe communications procedures for MS to use provisioned radio resources as specified in 3GPP TS 24.334 [51] or 3GPP TS 24.554 [80]; or

B2) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action.

 Whether the MS performs A2) or B2) above is left up to MS implementation.

vii) if the MS is unable to find a suitable cell on the selected PLMN as specified in 3GPP TS 24.334 [51], then the MS shall either:

A3) if the PLMN provides common radio resources needed by the MS to do ProSe communications as specified in 3GPP TS 36.331 [42] or 3GPP TS 38.331 [65], perform ProSe communications on the selected PLMN in limited service state. In this case the MS shall not search for available and allowable PLMNs during the duration of ProSe communications; or

B3) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action.

 Whether the MS performs A3) or B3) above is left up to MS implementation.

viii) if the MS is switched off while on the selected PLMN and switched on again, the MS shall use the stored duplicate value of RPLMN as RPLMN and behave as specified in clause 4.4.3.1;

ix) if the user initiates a PLMN selection while on the selected cell, the MS shall delete the stored duplicate value of PLMN selection mode, use the stored duplicate value of RPLMN as RPLMN and follow the procedures (as specified for switch-on or recovery from lack of coverage) in clause 4.4.3.1. The MS shall delete the stored duplicate value of RPLMN once the MS has successfully registered to the selected PLMN; and

x) if the MS no longer needs to perform Prose communications, the MS shall return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action.

NOTE 2: If the MS returns to the RPLMN due to a failure to register in the selected PLMN, the upper layers of the MS can trigger PLMN selection again to initiate ProSe communications.

If the PLMN selected for ProSe communications is a VPLMN, the MS shall not periodically scan for higher priority PLMNs during the duration of ProSe communications.

The solution to prevent potential ping-pong between the RPLMN and the PLMN selected for ProSe communications is MS implementation specific.

\*\*\*\*\* End of changes \*\*\*\*\*

\*\*\*\*\*Next change \*\*\*\*\*

## 3.1C PLMN selection triggered by V2X communication over PC5

If the MS supports V2X communication over E-UTRA-PC5 or NR-PC5 and needs to perform PLMN selection for V2X communication over PC5 as specified in 3GPP TS 24.386 [59] or 3GPP TS 24.587 [75], then the MS shall proceed as follows:

i) the MS shall store a duplicate value of the RPLMN and a duplicate of the PLMN selection mode that were in use before PLMN selection due to V2X communication over PC5 was initiated, unless this PLMN selection due to V2X communication over PC5 follows another PLMN selection due to V2X communication over PC5 or a manual CSG selection as specified in clause 4.4.3.1.3.3;

 ii) the MS shall enter into Automatic mode of PLMN selection as specified in clause 4.4 taking into account the additional requirements in items iii) to x) below;

iii) Among the PLMNs advertised by the E-UTRA or NG-RAN cell operating in the radio resources provisioned to the MS for V2X communication over PC5 as specified in 3GPP TS 24.385 [60], 3GPP TS 24.588 [79] or 3GPP TS 31.102 [40], the MS shall choose one allowable PLMN which meets:

1) the following:

- provides radio resources for V2X communication over PC5;

- is in the list of authorised PLMNs for V2X communication over PC5 as specified in 3GPP TS 24.386 [59] or 3GPP TS 24.587 [75]; and

- is not in the list of "PLMNs with E-UTRAN not allowed" as specified in clause 3.1; or

2) the following:

- provides radio resources for V2X communication over PC5;

- is in the list of authorised PLMNs for V2X communication over PC5 as specified in 3GPP TS 24.386 [59] or 3GPP TS 24.587 [75];

- is not in the list of PLMNs where the N1 mode capability was disabled because IMS voice was not available and the MS's usage setting was "voice centric" as PLMNs where voice service was not possible; and

- is not in the list of PLMNs where the N1 mode capability was disabled due to receipt of a reject from the network with 5GMM cause #27 "N1 mode not allowed" in N1 mode as specified in clause 3.1;

 if condition 1) or 2) above are met then the MS shall attempt to register on that PLMN. If none of the PLMNs meet condition 1) or 2) above, the MS shall return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action;

iv) if the registration fails due to "PLMN not allowed" or "EPS services not allowed" as specified in 3GPP TS 24.386 [59], or due to "PLMN not allowed" or "5GS services not allowed" as specified in 3GPP TS 24.587 [75], or both, then the MS shall update the appropriate list of forbidden PLMNs as specified in clause 3.1, and shall:

A) if the PLMN provides common radio resources needed by the MS to do V2X communication over PC5 as specified in 3GPP TS 36.331 [42] or 3GPP TS 38.331 [65], perform V2X communication over PC5 on the selected PLMN in limited service state. In this case the MS shall not search for available and allowable PLMNs during the duration of V2X communication over PC5;

B) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action; or

C) perform the action described in iii) again with the choice of PLMNs further excluding the PLMNs on which the MS has failed to register.

 Whether the MS performs A), B) or C) above is left up to MS implementation.

v) if the registration fails due to causes other than "PLMN not allowed" or "EPS services not allowed" or "5GS services not allowed", the MS shall:

- if the handling of the failure requires updating a list of forbidden PLMNs, update the appropriate list (as specified in 3GPP TS 24.301 [23A] or 3GPP TS 24.501 [64]); and

- if the handling of the failure does not require updating a list of forbidden PLMNs (as specified in 3GPP TS 24.301 [23A] or 3GPP TS 24.501 [64]), remember the PLMN as a PLMN on which the MS has failed to register;

NOTE 1: How long the MS memorizes the PLMNs on which it has failed to register is implementation dependent.

 and the MS shall:

A1) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action;

B1) perform the action described in iii) again with the choice of PLMNs further excluding the PLMNs on which the MS has failed to register; or

C1) perform V2X communication over PC5 in limited service state on a PLMN advertised by the cell operating in the radio resources provisioned to the MS for V2X communication over PC5 as specified in 3GPP TS 24.385 [60], 3GPP TS 24.588 [79] or 3GPP TS 31.102 [40], if registration on this PLMN has previously failed due to "PLMN not allowed" or "EPS services not allowed" as specified in 3GPP TS 24.386 [59], or due to "PLMN not allowed" or "5GS services not allowed" as specified in 3GPP TS 24.587 [75], or both, and if this PLMN provides common radio resources needed by the MS to do V2X communication over PC5 as specified in 3GPP TS 36.331 [42] or 3GPP TS 38.331 [65]. In this case the MS shall not search for available and allowable PLMNs during the duration of V2X communication over PC5;

 Whether the MS performs A1), B1) or C1) above is left up to MS implementation.

vi) if the MS is no longer in the coverage of the selected PLMN, then the MS shall:

A2) perform V2X communication over PC5 procedures for MS to use provisioned radio resources as specified in 3GPP TS 24.386 [59] or 3GPP TS 24.587 [75]; or

B2) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action.

 Whether the MS performs A2) or B2) above is left up to MS implementation.

vii) if the MS is unable to find a suitable cell on the selected PLMN as specified in 3GPP TS 24.386 [59] or 3GPP TS 24.587 [75], then the MS shall:

A3) if the PLMN provides common radio resources needed by the MS to do V2X communication over PC5 as specified in 3GPP TS 36.331 [42] or 3GPP TS 38.331 [65], perform V2X communication over PC5 on the selected PLMN in limited service state. In this case the MS shall not search for available and allowable PLMNs during the duration of V2X communication over PC5; or

B3) return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action.

 Whether the MS performs A3) or B3) above is left up to MS implementation.

viii) if the MS is switched off while on the selected PLMN and switched on again, the MS shall use the stored duplicate value of RPLMN as RPLMN and behave as specified in clause 4.4.3.1;

ix) if the user initiates a PLMN selection while on the selected cell, the MS shall delete the stored duplicate value of PLMN selection mode, use the stored duplicate value of RPLMN as RPLMN and follow the procedures (as specified for switch-on or recovery from lack of coverage) in clause 4.4.3.1. The MS shall delete the stored duplicate value of RPLMN once the MS has successfully registered to the selected PLMN; and

x) if the MS no longer needs to perform V2X communication over PC5, the MS shall return to the stored duplicate PLMN selection mode and use the stored duplicate value of RPLMN for further action.

NOTE 2: If the MS returns to the RPLMN due to a failure to register in the selected PLMN, the upper layers of the MS can trigger PLMN selection again to initiate V2X communication over PC5.

If the PLMN selected for V2X communication over PC5 is a VPLMN, the MS shall not periodically scan for higher priority PLMNs during the duration of V2X communication over PC5.

The solution to prevent potential ping-pong between the RPLMN and the PLMN selected for V2X communication over PC5 is MS implementation specific.

\*\*\*\*\* End of changes \*\*\*\*\*

\*\*\*\*\*Next change \*\*\*\*\*

## C.4.3 Stage-2 flow for providing UE with SOR-CMCI in HPLMN, VPLMN, subscribed SNPN or non-subscribed SNPN after registration

The stage-2 flow for providing UE with SOR-CMCI in HPLMN, VPLMN, subscribed SNPN or non-subscribed SNPN after registration is indicated in figure C.4.3.1, when the ME supports the SOR-CMCI. The selected PLMN or SNPN can be the HPLMN, a VPLMN, the subscribed SNPN or a non-subscribed SNPN. The AMF is located in the selected PLMN or SNPN. The UDM is located in the HPLMN or the subscribed SNPN.

In this procedure, the SOR-CMCI is sent without the list of preferred PLMN/access technology combinations and the SOR-SNPN-SI. In this procedure, the SOR-CMCI is sent in plain text or is sent within the secured packet.

NOTE : When the UE is registered in a non-subscribed SNPN, the SOR-CMCI can be provided in a secured packet only if the UE is using a PLMN subscription to access the non-subscribed SNPN.

NOTE 1: The SOR-AF can determine that the ME supports the SOR-CMCI if the Nsoraf\_SoR\_Info service operation has returned the "ME support of SOR-CMCI" indicator. The UDM can determine that the ME supports the SOR-CMCI if the "ME support of SOR-CMCI" indicator is stored for the UE. How the SOR-AF determines that the USIM for the indicated SUPI supports SOR-CMCI is implementation specific.

NOTE 2: The secured packet provided by the SOR-AF can include SOR-CMCI only if the SOR-AF has determined that the ME supports the SOR-CMCI and the USIM of the indicated SUPI supports SOR-CMCI. Otherwise if only the "ME support of SOR-CMCI" indicator is stored for the UE, then SOR-CMCI, if any, cannot be included in the secured packet.

The procedure is triggered:

- If the UDM supports obtaining the parameters of the list of preferred PLMN/access technology combinations, the SOR-SNPN-SI, the SOR-CMCI, and the "Store SOR-CMCI in ME" indicator, if any, or a secured packet from the SOR-AF, the HPLMN or subscribed SNPN policy for the SOR-AF invocation is present in the UDM and the SOR-AF provides the UDM with the SOR-CMCI for a UE identified by SUPI; or

- When the SOR-CMCI becomes available in the UDM (i.e., retrieved from the UDR).

Figure C.4.3.1: Procedure for configuring UE with SOR-CMCI after registration

For the steps below, security protection is described in 3GPP TS 33.501 [24].

1) The SOR-AF to the UDM: Nudm\_ParameterProvision\_Update request is sent to the UDM to trigger the update of the UE with the SOR-CMCI (in plain text or secured packet). In case of providing SOR-CMCI in plain text, include the "Store SOR-CMCI in ME" indicator, if applicable. In case of providing SOR-CMCI in a secured packet, include an indication that "the list of preferred PLMN/access technology combinations is not included in the secured packet".

2) The UDM to the AMF: The UDM notifies the changes of the user profile to the affected AMF by the means of invoking Nudm\_SDM\_Notification service operation. The Nudm\_SDM\_Notification service operation contains the steering of roaming information that needs to be delivered transparently to the UE over NAS within the Access and Mobility Subscription data. If the HPLMN or subscribed SNPN decided that the UE is to acknowledge successful security check of the received steering of roaming information, the Nudm\_SDM\_Notification service operation also contains an indication that the UDM requests an acknowledgement from the UE as part of the steering of roaming information. The UDM:

- upon receiving the SOR-CMCI (in plain text), shall:

i) if the UE is registered in the HPLMN or a VPLMN, include the SOR-CMCI, the "Store SOR-CMCI in ME" indicator, if any, and 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';

ii) if the UE is registered in a non-subcribed SNPN, include the SOR-CMCI, the "Store SOR-CMCI in ME" indicator, if any, and the HPLMN or subscribed SNPN indication that 'no change of the SOR-SNPN-SI stored in the UE is needed and thus no SOR-SNPN-SI is provided'; and

iii) if the UE is registered in a subcribed SNPN and the AMF has reported to the UDM that the UE supports SOR-SNPN-SI, include the SOR-CMCI, the "Store SOR-CMCI in ME" indicator, if any, and the HPLMN or subscribed SNPN indication that 'no change of the SOR-SNPN-SI stored in the UE is needed and thus no SOR-SNPN-SI is provided'; or

- upon receiving the SOR-CMCI in secured packet, shall include the secured packet into the steering of roaming information;

NOTE 3: The UDM considers "the list of preferred PLMN/access technology combinations is not included in the secured packet" received together with the secured packet from the SOR-AF to indicate that the UE is not expected to perform SOR based on the associated steering of roaming information sent to the UE. However, the SOR-CMCI included in the secured packet can be applied by the UE if the UE has one or more Tsor-cm timers running as described in C.4.2.

NOTE 4: The UDM cannot provide the SOR-CMCI, if any, to the AMF which does not support receiving SoR transparent container (see 3GPP TS 29.503 [78]).

3) The AMF to the UE: the AMF sends a DL NAS TRANSPORT message to the served UE. The AMF includes in the DL NAS TRANSPORT message the steering of roaming information received from the UDM.

4) Upon receiving the steering of roaming information containing the SOR-CMCI and 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 the HPLMN or subscribed SNPN indication that 'no change of the SOR-SNPN-SI stored in the UE is needed and thus no SOR-SNPN-SI is provided', or the secured packet, the UE shall perform a security check on the steering of roaming information included in the DL NAS TRANSPORT message to verify that the steering of roaming information is provided by HPLMN or subscribed SNPN, and:

a) if the security check is successful, the UE shall store the SOR-CMCI according to clause C.4.1. If the UE has one or more Tsor-cm timers running, the UE shall apply the received SOR-CMCI as described in C.4.2.

 If the steering of roaming information contains a secured packet and the UDM has requested an acknowledgement from the UE in the DL NAS TRANSPORT message, the UE sends an UL NAS TRANSPORT message to the serving AMF with an SOR transparent container including the UE acknowledgement and the UE shall set the "ME support of SOR-CMCI" indicator to "supported" only after the ME receives UICC responses indicating that the UICC has received the secured packet successfully. Otherwise, if the UDM has requested an acknowledgement from the UE in the DL NAS TRANSPORT message, the UE sends an UL NAS TRANSPORT message to the serving AMF with an SOR transparent container including the UE acknowledgement and the UE shall set the "ME support of SOR-CMCI" indicator to "supported". Additionally, if the UE supports access to an SNPN using credentials from a credentials holder and the UE is in a PLMN, the UE may set the "ME support of SOR-SNPN-SI" indicator to "supported".

 If the UDM has not requested an acknowledgement from the UE then step 5 is skipped; and

b) if the selected PLMN is a VPLMN or a non-subscribed SNPN, the security check is not successful and the UE is in automatic network selection mode, then:

- if the UE has a SOR-CMCI stored in the non-volatile memory of the ME, the current PLMN is considered as lowest priority and the UE shall apply the actions in clause C.4.2;

- otherwise, the UE shall wait until it moves to idle mode or 5GMM-CONNECTED mode with RRC inactive indication (see 3GPP TS 24.501 [64]) before attempting to obtain service on a higher priority PLMN as specified in clause 4.4.3.3 by acting as if timer T that controls periodic attempts has expired, with an exception that the current PLMN is considered as lowest priority, or before attempting to obtain service on a higher priority SNPN as specified in clause 4.9.3, with an exception that the current registered SNPN is considered as lowest priority. If the selected PLMN or SNPN is a VPLMN or a non-subscribed SNPN and the UE has an established emergency PDU session then the UE shall attempt to perform the PLMN selection after the emergency PDU session is released and after the UE enters idle mode or 5GMM-CONNECTED mode with RRC inactive indication (see 3GPP TS 24.501 [64]).

 Step 5 is skipped;

NOTE 5: When the UE is in the manual mode of operation or the current chosen VPLMN is part of the "User Controlled PLMN Selector with Access Technology" list or the current chosen non-subscribed SNPN is part of the user controlled prioritized list of preferred SNPNs for the selected entry of the "list of subscriber data" the selected PLMN subscription, the UE stays on the VPLMN or non-subscribed SNPN.

5) The AMF to the UDM: If the UL NAS TRANSPORT message with an SOR transparent container is received, the AMF uses the Nudm\_SDM\_Info service operation to provide the received SOR transparent container to the UDM. If the HPLMN decided that the UE is to acknowledge successful security check of the received steering of roaming information in step 2, the UDM verifies that the acknowledgement is provided by the UE. The UDM shall store the "ME support of SOR-CMCI" indicator and the "ME support of SOR-SNPN-SI" indicator, if any; and

6) The UDM to the SOR-AF: Nsoraf\_SoR\_Info (SUPI of the UE, successful delivery, "ME support of SOR-CMCI" indicator, "ME support of SOR-SNPN-SI" indicator, if any). If the HPLMN policy for the SOR-AF invocation is present and the HPLMN UDM received and verified the UE acknowledgement in step 5, then the UDM informs the SOR-AF about successful delivery of the SOR-CMCI to the UE. The UDM shall include the "ME support of SOR-CMCI" indicator and the "ME support of SOR-SNPN-SI" indicator, if any.

If the selected PLMN is a VPLMN or a non-subscribed SNPN and:

- the UE in manual mode of operation encounters security check failure of SOR information in DL NAS TRANSPORT message; and

- upon switching to automatic network selection mode the UE remembers that it is still registered on the PLMN the non-subscribed SNPN where the security check failure of SOR information was encountered;

the UE shall wait until it moves to idle mode or 5GMM-CONNECTED mode with RRC inactive indication (see 3GPP TS 24.501 [64]) before attempting to obtain service on a higher priority PLMN as specified in clause 4.4.3.3, by acting as if timer T that controls periodic attempts has expired, with an exception that the current registered PLMN is considered as lowest priority, or before attempting to obtained service on a higher priority SNPN as specified in clause 4.9.3, with an exception that the current registered SNPN is considered as lowest priority. If the selected PLMN is a VPLMN or the selected SNPN is a non-subscribed SNPN and the UE has an established emergency PDU session then the UE shall attempt to perform the PLMN selection after the emergency PDU session is released and after the UE enters idle mode or 5GMM-CONNECTED mode with RRC inactive indication (see 3GPP TS 24.501 [64]).

NOTE 6: The receipt of the steering of roaming information by itself does not trigger the release of the emergency PDU session.

\*\*\*\*\* End of changes \*\*\*\*\*

\*\*\*\*\*Next change \*\*\*\*\*

#### 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.

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 1, 2, 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;

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; and

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

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; and

c) a credentials holder controlled prioritized list of GINs;

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, 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" or the PLMN subscription, and 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 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, 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 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, 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 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, 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 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, 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, entry of the "list of subscriber data" or 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, 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, 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, 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, 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, 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, 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, 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 selected entry of the "list of subscriber data" or the PLMN subscription. When the MS disables its N1 mode capability because IMS voice was 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.

\*\*\*\*\* End of changes \*\*\*\*\*