**3GPP TSG-CT WG1 Meeting #141-eC1-232434**

**E-meeting, 17th – 21st April 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.122** | **CR** | **1080** | **rev** | **-** | **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:***  | Correction to SOR for SNPN during registration |
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| ***Source to WG:*** | China Telecom, Huawei, HiSilicon |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5GProtoc18 |  | ***Date:*** | 2023-04-03 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18) Rel-19 (Release 19)* |
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| ***Reason for change:*** | In C.2 for the PLMN case, which is the stage-2 flow for steering of UE in VPLMN during registration it is specified that the UE shall not establish a new N1 NAS signalling connection unless its for an emergency service until the attempts to obtain service on a higher priority PLMN is completed. This should also be specificed for the SNPN case in C.5  |
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| ***Summary of change:*** | Updated C.5 (Registration in an SNPN) that the UE shall not try to establish N1 NAS signalling until the attempts to obtain service on a higher priority SNPN are completed unless the attempt is for an emergency service. |
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| ***Consequences if not approved:*** | Wrong UE behavior in an SNPN |
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| ***Clauses affected:*** | C.5 |
|  |  |
|  | **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 \* \* \* \*

# C.5 Stage-2 flow for steering of UE in SNPN during registration

The stage-2 flow for the case when the UE registers in a non-subscribed SNPN is described below in figure C.5.1. The AMF is located in the non-subscribed SNPN. The UDM is located in the HPLMN or subscribed SNPN.



Figure C.5.1: Procedure for providing SOR-SNPN-SI and SOR-SNPN-SI-LS (if any) during registration

For the steps below, security protection is described in 3GPP TS 33.501 [66].

1) The UE to the AMF: The UE initiates initial registration, emergency registration or registration procedure for mobility and periodic registration update (see 3GPP TS 24.501 [64]) to the AMF by sending REGISTRATION REQUEST message with the 5GS registration type IE indicating "initial registration", "emergency registration" or "mobility registration updating";

2) Upon receiving the REGISTRATION REQUEST message, the AMF executes the registration procedure as defined in clause 4.2.2.2 of 3GPP TS 23.502 [63]. As part of the registration procedure:

a) the AMF provides the registration type to the UDM using Nudm\_UECM\_Registration. As a consequence, in case of the 5GS registration type message indicates "initial registration" or "emergency registration" the UDM shall delete the stored "ME support of SOR-CMCI" indicator, if any, and the stored "ME support of SOR-SNPN-SI-LS" indicator, if any, in UDR using Nudr\_DM\_Update service operation (see 3GPP TS 23.502 [63]).

NOTE 1: Nudr\_DM\_Update service operation corresponds to Nudr\_DR\_Update service operation (see 3GPP TS 29.504 [82] and 3GPP TS 29.505 [83]).

 In addition:

a) if the AMF does not have subscription data for the UE, the AMF invokes Nudm\_SDM\_Get service operation to the UDM to get amongst other information the Access and Mobility Subscription data for the UE (see step 14b in clause 4.2.2.2.2 of 3GPP TS 23.502 [63]); or

b) if the AMF already has subscription data for the UE and:

i) the 5GS registration type IE in the received REGISTRATION REQUEST message indicates "initial registration" and the "SoR Update Indicator for Initial Registration" field in the UE context is set to 'the UDM requests the AMF to retrieve SoR information when the UE performs NAS registration type "initial registration"' as specified in table 5.2.2.2.2-1 of 3GPP TS 23.502 [63]); or

ii) the 5GS registration type IE in the received REGISTRATION REQUEST message indicates "emergency registration" and the "SoR Update Indicator for Emergency Registration" field in the UE context is set to 'the UDM requests the AMF to retrieve SoR information when the UE performs NAS registration type "emergency registration"' as specified in table 5.2.2.2.2-1 of 3GPP TS 23.502 [63]);

 then the AMF invokes Nudm\_SDM\_Get service operation message to the UDM to retrieve the steering of roaming information (see step 14b in clause 4.2.2.2.2 of 3GPP TS 23.502 [63]);

 otherwise the AMF sends a REGISTRATION ACCEPT message without the steering of roaming information to the UE and steps 3a, 3b, 3c, 3d, 4, 5, 6 are skipped;

3a) If the user subscription information indicates to send the steering of roaming information due to initial registration in a non-subscribed SNPN, then the UDM shall provide the steering of roaming information to the UE when the UE performs initial registration in a non-subscribed SNPN. Otherwise:

a) If the UE is registering on the subscribed SNPN and the UE has not indicated support for SOR-SNPN-SI in the REGISTRATION REQUEST message, the UDM shall not provide the SOR-SNPN-SI to the UE; and

b) If the UE is registering on the subscribed SNPN and the UE has indicated support for SOR-SNPN-SI in the REGISTRATION REQUEST message, or the UE is not registering on the subscribed SNPN, the UDM may provide the SOR-SNPN-SI to the UE based on the subscribed SNPN or HPLMN policy.

 If the UDM is to provide the steering of roaming information to the UE when the UE performs the registration in a non-subscribed SNPN and the subscribed SNPN or HPLMN policy for the SOR-AF invocation is absent then steps 3b and 3c are not performed and the UDM obtains the available SOR-SNPN-SI (i.e. all retrieved from the UDR). In addition, if the UDM obtains the SOR-SNPN-SI and

- the "ME support of SOR-CMCI" indicator is stored for the UE, then the UDM shall obtain the SOR-CMCI, if available, otherwise the UDM shall not obtain the SOR-CMCI. If the SOR-CMCI is provided then the UDM may indicate to the UE to store the SOR-CMCI in the ME by providing the "Store the SOR-CMCI in the ME" indicator; and

- the "ME support of SOR-SNPN-SI-LS" indicator is stored for the UE, then the UDM shall obtain the SOR-SNPN-SI-LS, if available, otherwise the UDM shall not obtain the SOR-SNPN-SI-LS.

 If the UDM is to provide the steering of roaming information to the UE when the UE performs the registration in a non-subscribed SNPN and the subscribed SNPN or HPLMN policy for the SOR-AF invocation is present, then the UDM obtains the SOR-SNPN-SI, SOR-CMCI, if any, and SOR-SNPN-SI-LS, if any, from the SOR-AF using steps 3b and 3c;

3b) The UDM to the SOR-AF: Nsoraf\_SoR\_Get request (SNPN identity, SUPI of the UE, access type (see 3GPP TS 29.571 [72])). The SNPN identity and the access type parameters, indicating where the UE is registering, are stored in the UDM;

3c) The SOR-AF to the UDM: Nsoraf\_SoR\_Get response (the SOR-SNPN-SI, the SOR-CMCI, if any, the "Store the SOR-CMCI in the ME" indicator, if any, and the SOR-SNPN-SI-LS, if any);

 Based on the information received in step 3b and any subscribed SNPN or HPLMN specific criteria, the SOR-AF may include the SOR-SNPN-SI, the SOR-CMCI, if any, optionally the "Store the SOR-CMCI in the ME" indicator, if any, and the SOR-SNPN-SI-LS, if any.

 If the SOR-AF includes the SOR-SNPN-SI and the ME supports:

- the SOR-CMCI, the SOR-AF may provide the SOR-CMCI and optionally the "Store the SOR-CMCI in the ME" indicator, otherwise the SOR-AF shall provide neither the SOR-CMCI nor the "Store the SOR-CMCI in the ME" indicator;and

- the SOR-SNPN-SI-LS, the SOR-AF may provide the SOR-SNPN-SI-LS, otherwise the SOR-AF shall not provide SOR-SNPN-SI-LS.

NOTE 1: In this version of the specification, when the access type where the UE is registering indicates 3GPP access, then the UE is registering over the NG-RAN access technology.

NOTE 2: The SOR-AF can include a different SOR-SNPN-SI, different SOR-CMCI, if any, different "Store the SOR-CMCI in the ME" indicator, if any, and different SOR-SNPN-SI-LS, if any, for each Nsoraf\_SoR\_Get request even if the same SNPN identity, the SUPI of the UE, and the access type are provided to the SOR-AF.

NOTE 3: The SOR-AF can subscribe to the UDM to be notified about the changes of the roaming status of the UE identified by SUPI.

NOTE 4: The SOR-AF can determine that the ME supports the SOR-CMCI or the SOR-SNPN-SI-LS if the Nsoraf\_SoR\_Info service operation has returned the "ME support of SOR-CMCI" indicator or the "ME support of SOR-SNPN-SI-LS" indicator, respectively.

3d) The UDM forms the steering of roaming information as specified in 3GPP TS 33.501 [66] from the SOR-SNPN-SI, the SOR-CMCI, if any, the "Store the SOR-CMCI in the ME" indicator, if any, and SOR-SNPN-SI-LS, if any, obtained in step 3a or the SOR-SNPN-SI, the SOR-CMCI, if any, the "Store the SOR-CMCI in the ME" indicator, if any, and SOR-SNPN-SI-LS, if any, obtained in step 3c.

 If:

- the SOR-SNPN-SI was not obtained in steps 3a or 3c; or

- the SOR-AF has not sent to the UDM an Nsoraf\_SoR\_Get response (step 3c) within an operator defined time after the UDM sending to the SOR-AF an Nsoraf\_SoR\_Get request (step 3b);

NOTE 5: Stage 3 to define the timer needed for the SOR-AF to respond to the UDM. The max time needs to be defined considering that this procedure is part of the registration procedure.

 and the UE is performing initial registration in a non-subscribed SNPN and the user subscription information indicates to send the steering of roaming information due to initial registration in a non-subscribed SNPN, then the UDM forms the steering of roaming information as specified in 3GPP TS 33.501 [66] from 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';

4) The UDM to the AMF: The UDM sends a response to the Nudm\_SDM\_Get service operation to the AMF, which includes the steering of roaming information within the Access and Mobility Subscription data. The Access and Mobility Subscription data type is defined in clause 5.2.3.3.1 of 3GPP TS 23.502 [63]).

NOTE 6: The UDM cannot provide the SOR-SNPN-SI, the SOR-CMCI, if any, or the SOR-SNPN-SI-LS to the AMF which does not support receiving SOR transparent container (see 3GPP TS 29.503 [78]).

 If the UE is performing initial registration or emergency registration and the UDM supports SOR-CMCI or SOR-SNPN-SI-LS, the subscribed SNPN or HPLMN shall request the UE to acknowledge the successful security check of the received steering of roaming information, by providing the indication as part of the steering of roaming information in the Nudm\_SDM\_Get response service operation. Otherwise, the subscribed SNPN or HPLMN may request the UE to acknowledge the successful security check of the received steering of roaming information, by providing the indication as part of the steering of roaming information in the Nudm\_SDM\_Get response service operation;

5) The AMF to the UDM: As part of the registration procedure, the SNPN also invokes Nudm\_SDM\_Subscribe service operation to the UDM to subscribe to notification of changes of the subscription data (e.g. received in step 4) including notification of updates of the steering of roaming information included in the Access and Mobility Subscription data (see step 14c in clause 4.2.2.2.2 of 3GPP TS 23.502 [63]);

6) The AMF to the UE: The AMF shall transparently send the received steering of roaming information to the UE in the REGISTRATION ACCEPT message;

7) If the steering of roaming information is received and the security check is successful, then:

a) if the UDM has not requested an acknowledgement from the UE, then the UE shall send the REGISTRATION COMPLETE message to the serving AMF without including an SOR transparent container; and

b) if the steering of roaming information contains the SOR-SNPN-SI, the ME shall replace the credentials holder controlled prioritized list of preferred SNPNs for the selected entry of the "list of subscriber data" or the selected PLMN subscription with the received credentials holder controlled prioritized list of preferred SNPNs, if any, and the ME shall replace the credentials holder controlled prioritized list of GINs for the selected entry of the "list of subscriber data" or the selected PLMN subscription with the received credentials holder controlled prioritized list of GINs, if any, and delete the SNPNs identified by the credentials holder controlled prioritized list of preferred SNPNs or credentials holder controlled prioritized list of GINs from the list of "temporarily forbidden SNPNs" and the list of "permanently forbidden SNPNs", if they are present in these lists. If the SOR information contains the SOR-SNPN-SI-LS, the ME shall replace the "credentials holder controlled prioritized list of preferred SNPNs for access for localized services in SNPN" for the selected entry of the "list of subscriber data" or the selected PLMN subscription with the received "credentials holder controlled prioritized list of preferred SNPNs for access for localized services in SNPN", if any, and the ME shall replace the "credentials holder controlled prioritized list of preferred GINs for access for localized services in SNPN" for the selected entry of the "list of subscriber data" or the selected PLMN subscription with the received "credentials holder controlled prioritized list of preferred GINs for access for localized services in SNPN", if any, and delete the SNPNs identified by the "credentials holder controlled prioritized list of preferred SNPNs for access for localized services in SNPN" from the list of "temporarily forbidden SNPNs" and the list of "permanently forbidden SNPNs", if they are present in these lists. Additionally, the UE may perform SNPN selection. If the UE decides to perform SNPN selection:

i) if the UE has a list of available and allowable SNPN in the area and based on this list or any other implementation specific means the UE determines that there is a higher priority SNPN than the selected SNPN; or

ii) the UE does not have a list of available and allowable SNPN in the area and is unable to determine whether there is a higher priority SNPN than the selected SNPN using any other implementation specific means;

 and the UE is in automatic network selection mode:

A) if the UE is configured with the SOR-CMCI or received the SOR-CMCI over N1 NAS signalling, the UE shall apply the actions in clause C.4.2. In this case steps 8 to 11 are skipped;

B) otherwise, the UE shall:

i) release the current N1 NAS signalling connection locally and then attempt to obtain service on a higher priority SNPN as specified in clause 4.9.3. In this case, steps 8 to 11 are skipped. The UE shall suspend the transmission of 5GSM messages until the N1 NAS signalling is released. The UE shall not initiate the establishment of a new N1 signalling connection, unless for the purpose of initiating a registration procedure for emergency services or establishing an emergency PDU session, until the attempts to obtain service on a higher priority SNPN are completed. If the UE has an established emergency PDU session (see 3GPP TS 24.501 [64]), the receipt of the steering of roaming information shall not trigger the release of the N1 NAS signalling connection. The UE shall release the current N1 NAS signalling connection locally subsequently after the emergency PDU session is released. If the UE needs to disable the N1 mode capability (see 3GPP TS 24.501 [64]) and there is no emergency service pending, the UE shall first attempt to obtain service on a higher priority SNPN as described in this step, and if no higher priority SNPN can be selected but the last registered SNPN is selected, then the UE shall disable the N1 mode capability; or

ii) not release the current N1 NAS signalling connection locally (e.g. if the UE has established PDU session(s)) and skip steps 8 to 10;

NOTE 7: When the UE is in the manual mode of operation or the current chosen non-subscribed SNPN is part of the user controlled prioritized list of preferred SNPNs, the UE stays on the current chosen non-subscribed SNPN.

8) If the UE's ME is configured with an indication that the UE is to receive the steering of roaming information due to initial registration in a non-subscribed SNPN, but neither the SOR-SNPN-SI nor 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' is received in the REGISTRATION ACCEPT message, when the UE performs initial registration in a VPLMN or if the steering of roaming information is received but the security check is not successful, then the UE shall:

a) if the SOR transparent container is included in the REGISTRATION ACCEPT message, send the REGISTRATION COMPLETE message to the serving AMF without including an SOR transparent container;

b) if the current chosen non-subscribed SNPN is not contained in the list of "SNPNs where registration was aborted due to SOR" for the selected entry in the "list of subscriber data" or the selected PLMN subscription, and is not part of the user controlled prioritized list of preferred SNPNs for the selected entry in the "list of subscriber data" or the selected PLMN subscription, and the UE is not in manual mode of operation, release the current N1 NAS signalling connection locally and attempt to obtain service on a higher priority SNPN as specified in clause 4.9.3, with an exception that the current SNPN is considered as lowest priority, and skip steps 9 to 11. The UE shall suspend the transmission of 5GSM messages until the N1 NAS signalling is released. If the UE has an established emergency PDU session (see 3GPP TS 24.501 [64]), the UE shall release the current N1 NAS signalling connection locally after the release of the emergency PDU session. If the UE needs to disable the N1 mode capability (see 3GPP TS 24.501 [64]) and there is no emergency service pending, the UE shall first attempt to obtain service on a higher priority SNPN as described in this step, and if no higher priority SNPN can be selected but the last registered SNPN is selected, then the UE shall disable the N1 mode capability; and

c) if the current chosen non-subscribed SNPN is not contained in the list of "SNPNs where registration was aborted due to SOR" for the selected entry in the "list of subscriber data" or the selected PLMN subscription, store the SNPN identity in the list of "SNPNs where registration was aborted due to SOR" for the selected entry in the "list of subscriber data" or the selected PLMN subscription;

NOTE 8: When the UE is in the manual mode of operation or the current chosen non-subscribed SNPN is part of the user controlled prioritized list of preferred SNPNs, the UE stays on the current chosen non-subscribed SNPN.

9) The UE to the AMF: If the UDM has requested an acknowledgement from the UE and the UE verified that the steering of roaming information has been provided by the subscribed SNPN or HPLMN in step 7, then:

a) the UE sends the REGISTRATION COMPLETE message to the serving AMF with an SOR transparent container including the UE acknowledgement;

b) the UE shall set the "ME support of SOR-CMCI" indicator in the header of the SOR transparent container to "supported";

b1) if the UE supports access to an SNPN providing access for localized services in SNPN, the UE shall set the "ME support of SOR-SNPN-SI-LS" indicator in the header of the SOR transparent container to "supported"; and

c) if:

1) the steering of roaming information contains the SOR-SNPN-SI, the UE is configured with the SOR-CMCI or received the SOR-CMCI over N1 NAS signalling, the UE is in automatic network selection mode and the UE decides to perform SNPN selection, then the UE shall apply the actions in clause C.4.2, and step 11 is skipped; or

2) the steering of roaming information contains 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', then step 11 is skipped;

10) The AMF to the UDM: If an SOR transparent container is received in the REGISTRATION COMPLETE message, the AMF uses the Nudm\_SDM\_Info service operation to provide the received SOR transparent container to the UDM. If the subscribed SNPN or HPLMN decided that the UE is to acknowledge the successful security check of the received steering of roaming information in step 4, the UDM verifies that the acknowledgement is provided by the UE as specified in 3GPP TS 33.501 [66]. If:

- the “ME support of SOR-CMCI” indicator in the header of the SOR transparent container is set to “supported”, then the UDM shall store the “ME support of SOR-CMCI” indicator, otherwise the UDM shall delete the stored “ME support of SOR-CMCI” indicator, if any; and

- the "ME support of SOR-SNPN-SI-LS" indicator in the header of the SOR transparent container is set to "supported", then the UDM shall store the "ME support of SOR-SNPN-SI-LS" indicator, otherwise the UDM shall delete the stored "ME support of SOR-SNPN-SI-LS" indicator, if any

NOTE 9: The UDM cannot receive the "ME support of SOR-CMCI" indicator or the "ME support of SOR-SNPN-SI-LS" indicator from the AMF which does not support receiving SoR transparent container (see 3GPP TS 29.503 [78]).

10a) The UDM to the SOR-AF: Nsoraf\_SoR\_Info (SUPI of the UE, successful delivery, "ME support of SOR-CMCI" indicator, if any, "ME support of SOR-SNPN-SI-LS" indicator, if any). If the subscribed SNPN or HPLMN policy for the SOR-AF invocation is present and the UDM received and verified the UE acknowledgement in step 10, then the UDM informs the SOR-AF about successful delivery of the SOR-SNPN-SI to the UE. If:

 - the "ME support of SOR-CMCI" indicator is stored for the UE, the UDM shall include the "ME support of SOR-CMCI" indicator; and

- the "ME support of SOR-SNPN-SI-LS" indicator is stored for the UE, the UDM shall include the "ME support of SOR-SNPN-SI-LS" indicator; and

11) If the UE has a list of available SNPNs in the area and based on this list the UE determines that there is a higher priority SNPN than the selected SNPN and the UE is in automatic network selection mode, then the UE may attempt to obtain service on a higher priority SNPN as specified in clause 4.9.3 after the release of the N1 NAS signalling connection. If within an implementation dependent time the N1 NAS signalling connection is not released, then the UE may locally release the N1 signalling connection except when the UE has an established emergency PDU session (see 3GPP TS 24.501 [64]).

When the UE performs initial registration for emergency services (see 3GPP TS 24.501 [64] and 3GPP TS 23.502 [63]) and the AMF performs the authentication procedure, then based on subscribed SNPN or HPLMN policy, the SOR procedure described in this clause may apply.

If:

- the UE in manual mode of operation encounters scenario mentioned in step 8 above; and

- upon switching to automatic network selection mode, the UE remembers that it is still registered on the where the security check failure of SOR information was encountered as described in step 8;

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 SNPN as specified in clause 4.9.3, with an exception that the current registered SNPN is considered as lowest priority. If the UE has an established emergency PDU session, then the UE shall attempt to perform the SNPN selection subsequently after the emergency PDU session is released.

NOTE 10: The receipt of the steering of roaming information by itself does not trigger the release of the emergency PDU session.

NOTE 11: The list of available and allowable SNPNs in the area is implementation specific.

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