**SA WG2 Meeting #153eS2-220**

**October 10th – 14th, 2022; Elbonia (revision of S2-220)**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.501** | **CR** |  | **rev** | **-** | **Current version:** | **17.6.0** |  |
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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 | **X** |

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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
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| ***Work item code:*** | 5WWC\_Ph2 | | | | |  | ***Date:*** | | | 2022-09-24 |
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| ***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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | |  | | | | | | | | |
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| ***Summary of change:*** | |  | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
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| ***Clauses affected:*** | |  | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

*FIRST CHANGE (all text is new)*

### 5.15.X Access to slices over non 3GPP access

#### 5.15.X.1 General

The access to slices over non 3GPP access follows the same principles than the access to slices over 3GPP access except the differences documented in this clause

* The UE Selection of a N3IWF that supports the S-NSSAIs needed by the UE is enabled based on ANDSP configuration defined in clause 5.15.X.2. The UE may receive this configuration from the PCF of the serving PLMN. The N3IWF selection based on this information is documented in clause 6.3.6.X,
* When a UE connects with a N3IWF that does not support the S-NSSAI(s) needed by the UE, the AMF may determine a target N3IWF which supports the S-NSSAI(s) needed by the UE and provide the target N3IWF information to the UE via the Registration Reject.
* The default value of Operator-controlled inclusion of NSSAI in Access Stratum Connection Establishment is defined in clause 5.15.9
* Support of data rate limitation per Network Slice for a UE (as defined in clause 5.15.13) does not apply for access over non 3GPP access

#### 5.15.X.2 ANDSP configuration for UE Selection of a N3IWF that supports the S-NSSAIs needed by the UE

The H-PCF may provide the UE with the following information for the HPLMN (which the UE stores and applies as described in clause 6.3.6.X):

- Extended Home N3IWF identifier configuration (one or multiple entries)

- FQDN or IP address of the N3IWF(s) in the HPLMN and the S-NSSAIs supported by these N3IWF

- Slice-specific N3IWF prefix information for the HPLMN (one or multiple entries)

- List of supported S-NSSAIs

- Prefix to be added to the existing Tracking Area (TA) or Operator Identifier (OI) FQDNs for

The V-PCF may provide the UE with the following information for that VPLMN (which the UE stores and applies as described in clause 6.3.6.X):

- Slice-specific N3IWF prefix information for that VPLMN (one or multiple entries)

- List of supported S-NSSAIs

- Prefix to be added to the existing TA or OI FQDNs

NOTE 1: The UE can indicate its supports of extended N3IWF configuration to the PCF as will be specified by CT1.

To enable the V-PCF to provide the UE with slice specific N3IWF configuration information, for roaming-in UE(s) the AMF provides the V-PCF with the Configured NSSAI for the serving PLMN during UE Policy Association Establishment/Modification. The PCF (V-PCF in the roaming case) is assumed to be locally configured with information about the slices supported by the different N3IWFs in the serving PLMN.

NOTE 2: The PCF already receives the subscribed NSSAI from the UDR, therefore there is no need for the AMF to provide the Configured NSSAI to the PCF in the non-roaming case.

*NEXT CHANGE*

#### 5.3.2.3 Registration Area management

Registration Area management comprises the functions to allocate and reallocate a Registration area to a UE. Registration area is managed per access type i.e. 3GPP access or Non-3GPP access.

When a UE registers with the network over the 3GPP access, the AMF allocates a set of tracking areas in TAI List to the UE. When the AMF allocates registration area, i.e. the set of tracking areas in TAI List, to the UE it may take into account various information (e.g. Mobility Pattern and Allowed/Non-Allowed Area (refer to clause 5.3.4.1)). An AMF which has the whole PLMN as serving area may alternatively allocate the whole PLMN ("all PLMN") as registration area to a UE in MICO mode (refer to clause 5.4.1.3). When AMF allocates registration area for UE registered for Disaster Roaming service as specified in clause 5.40.4, AMF shall only consider TAIs covering the area with the Disaster Condition.

The 5G System shall support allocating a Registration Area using a single TAI List which includes tracking areas of any NG-RAN nodes in the Registration Area for a UE.

TAI used for non-3GPP access shall be dedicated to non-3GPP access. TAI(s) dedicated to Non-3GPP access may be defined in a PLMN and apply within this PLMN. Each N3IWF, TNGF, TWIF and W-AGF is locally configured with one TAI value. Each N3IWF, TNGF, TWIF and W-AGF may be configured with a different TAI value or with the same TAI value as other N3IWFs, TNGFs, TWIFs and/or W-AGFs. The TAI is provided to the AMF during N2 interface setup as described in TS 38.413 [34].

When a UE registers with the network over a Non-3GPP access, the AMF allocates to the UE a registration area that only includes the TAI received from the serving N3IWF, TNGF, TWIF or W-AGF.

NOTE 1: For example, two W-AGFs can each correspond to a different TAI (one TAI per W-AGF) and thus support different sets of S-NSSAI(s).

When generating the TAI list, the AMF shall include only TAIs that are applicable on the access type (i.e. 3GPP access or Non-3GPP access) where the TAI list is sent.

NOTE 2: To prevent extra signalling load resulting from Mobility Registration Update occurring at every RAT change, it is preferable to avoid generating a RAT-specific TAI list for a UE supporting more than one RAT.

NOTE 3: For a UE registered on N3GPP access the TAI(s) provided to the UE as part of the Registration Area is expected to enable the support of the slices that are intended to be provided for this UE over this specific Non-3GPP access. In addition, the Registration Area provided to the UE for non-3GPP access will never change until the UE deregisters from non-3GPP access (either explicit deregistration or implicit deregistration due to Deregistration timer expiring due to UE entering CM\_IDLE state).

For all 3GPP Access RATs in NG-RAN and for Non-3GPP Access, the 5G System supports the TAI format as specified in TS 23.003 [19] consisting of MCC, MNC and a 3-byte TAC only.

The additional aspects for registration management when a UE is registered over one access type while the UE is already registered over the other access type is further described in clause 5.3.2.4.

To ensure a UE initiates a Mobility Registration procedure when performing inter-RAT mobility to or from NB-IoT, a Tracking Area shall not contain both NB-IoT and other RATs cells (e.g. WB-E-UTRA, NR), and the AMF shall not allocate a TAI list that contains both NB-IoT and other RATs Tracking Areas.

For 3GPP access the AMF determines the RAT type the UE is camping on based on the Global RAN Node IDs associated with the N2 interface and additionally the Tracking Area indicated by NG-RAN. When the UE is accessing NR using unlicensed bands, as defined in clause 5.4.8, an indication is provided in N2 interface as defined in TS 38.413 [34].

The AMF may also determine more precise RAT Type information based on further information received from NG-RAN:

- The AMF may determine the RAT Type to be LTE-M as defined in clause 5.31.20; or

- The AMF may determine the RAT Type to be NR using unlicensed bands, as defined in clause 5.4.8.

- The AMF may determine the RAT Type to be one of the RAT types for satellite access, as defined in clause 5.4.10.

- The AMF may determine the RAT Type to be NR RedCap as defined in clause 5.41.

For Non-3GPP accesses the AMF determines the RAT type the UE is camping based on the 5G-AN node associated with N2 interface as follows:

- The RAT type is Untrusted Non-3GPP if the 5G-AN node has a Global N3IWF Node ID;

- The RAT type is Trusted Non-3GPP if the 5G-AN node has a Global TNGF Node ID or a Global TWIF Node ID; and

- The RAT type is Wireline -BBF if the 5G-AN node has a Global W-AGF Node ID corresponding to a W-AGF supporting the Wireline BBF Access Network. The RAT type is Wireline-Cable if the 5G-AN node has a Global W-AGF Node ID corresponding to a W-AGF supporting the Wireline Cable Access Network. If not possible to distinguish between the two, the RAT type is Wireline.

NOTE 4: How to differentiate between W-AGF supporting either Wireline BBF Access Network or the Wireline (e.g. different Global W-AGF Node ID IE or the Global W-AGF Node ID including a field to distinguish between them) is left to Stage 3 definition.

NOTE 5: If an operator supports only one kind of Wireline Access Network (either Wireline BBF Access Network or a Wireline Cable Access Network) the AMF may be configured to use RAT type Wireline or the specific one.

For Non-3GPP access the AMF may also use the User Location Information provided at N2 connection setup to determine a more precise RAT Type, e.g. identifying IEEE 802.11 access, Wireline-Cable access, Wireline-BBF access.

When the 5G-AN node has either a Global N3IWF Node ID, or a Global TNGF Node ID, or a Global TWIF Node ID, or a Global W-AGF Node ID, the Access Type is Non-3GPP Access.

*NEXT CHANGE*

##### 5.15.4.1.1 UE Network Slice configuration

The Network Slice configuration information contains one or more Configured NSSAI(s). A Configured NSSAI may either be configured by a Serving PLMN and apply to the Serving PLMN, or may be a Default Configured NSSAI configured by the HPLMN and that applies to any PLMNs for which no specific Configured NSSAI has been provided to the UE. There is at most one Configured NSSAI per PLMN.

NOTE 1: The value(s) used in the Default Configured NSSAI are expected to be commonly decided by all roaming partners, e.g. by the use of values standardized by 3GPP or other bodies.

The Default Configured NSSAI, if it is configured in the UE, is used by the UE in a Serving PLMN only if the UE has no Configured NSSAI for the Serving PLMN.

The Configured NSSAI of a PLMN may include S-NSSAIs that have standard values or PLMN-specific values.

The Configured NSSAI for the Serving PLMN includes the S-NSSAI values which can be used in the Serving PLMN and may be associated with mapping of each S-NSSAI of the Configured NSSAI to one or more corresponding HPLMN S-NSSAI values.

A UE subscription may contain Network Slice Simultaneous Registration Group (NSSRG) information. If so, the UE configuration is performed as described in clause 5.15.12.2.

The UE may be pre-configured with the Default Configured NSSAI. The UE may be provisioned/updated with the Default Configured NSSAI, determined by the UDM in the HPLMN, using the UE Parameters Update via UDM Control Plane procedure defined in clause 4.20 of TS 23.502 [3]. Each S-NSSAI in the Default Configured NSSAI may have a corresponding S-NSSAI as part of the Subscribed S-NSSAI(s). Consequently, if the Subscribed S-NSSAI(s) which are also present in the Default Configured NSSAI are updated the UDM should update the Default Configured NSSAI in the UE.

In the HPLMN, the S-NSSAIs in the Configured NSSAI provided as described in clause 5.15.4.2, at the time when they are provided to the UE, shall match the Subscribed S-NSSAIs for the UE. When the Subscribed S-NSSAI(s) are updated (i.e. some existing S-NSSAIs are removed and/or some new S-NSSAIs are added) and one or more are applicable to the Serving PLMN the UE is registered in, as described in clause 5.15.3, or when the associated mapping is updated the AMF shall update the UE with the Configured NSSAI for the Serving PLMN and/or Allowed NSSAI and/or the associated mapping to HPLMN S-NSSAIs (see clause 5.15.4.2). When there is the need to update the Allowed NSSAI, the AMF shall provide the UE with the new Allowed NSSAI and the associated mapping to HPLMN S-NSSAIs, unless the AMF cannot determine the new Allowed NSSAI (e.g. all S-NSSAIs in the old Allowed NSSAI have been removed from the Subscribed S-NSSAIs), in which case the AMF shall not send any Allowed NSSAI to the UE but indicate to the UE to perform a Registration procedure. If the UE is in a CM-IDLE state, the AMF may trigger Network Triggered Service Request or wait until the UE is in a CM-CONNECTED state as described in clause 4.2.4.2, TS 23.502 [3].

When providing a Requested NSSAI to the network upon registration, the UE in a given PLMN only includes and uses S-NSSAIs applying to this PLMN. The mapping of S-NSSAIs of the Requested NSSAI to HPLMN S-NSSAIs may also be provided (see clause 5.15.4.1.2 for when this is needed). The S-NSSAIs in the Requested NSSAI are part of the Configured and/or Allowed NSSAIs applicable for this PLMN, when they are available. If the UE has received NSSRG information together with the Configured NSSAI, it only includes in the Requested NSSAI S-NSSAIs that all share a common NSSRG. If no Configured NSSAI and Allowed NSSAI for the PLMN are available, the S-NSSAIs in the Requested NSSAI correspond to the Default Configured NSSAI, if configured in the UE. Upon successful completion of a UE's Registration procedure over an Access Type, the UE obtains from the AMF an Allowed NSSAI for this Access Type, which includes one or more S-NSSAIs and, if needed (see clause 5.15.4.1.2 for when this is needed), their mapping to the HPLMN S-NSSAIs. These S-NSSAIs are valid for the current Registration Area and Access Type provided by the AMF the UE has registered with and can be used simultaneously by the UE (up to the maximum number of simultaneous Network Slice instances or PDU Sessions).

The UE might also obtain one or more rejected S-NSSAIs with cause and validity of rejection from the AMF. An S-NSSAI may be rejected:

- for the entire PLMN; or

- for the current Registration Area.

While it remains RM-REGISTERED in the PLMN and regardless of the Access Type, the UE shall not re-attempt to register to an S-NSSAI rejected for the entire PLMN until this rejected S-NSSAI is deleted as specified below.

While it remains RM-REGISTERED in the PLMN, the UE shall not re-attempt to register to an S-NSSAI rejected in the current Registration Area until it moves out of the current Registration Area.

NOTE 2: The details and more cases of S-NSSAI rejection are described in TS 24.501 [47].

S-NSSAIs that the UE provides in the Requested NSSAI which are neither in the Allowed NSSAI nor provided as a rejected S-NSSAI, shall, by the UE, not be regarded as rejected, i.e. the UE may request to register these S-NSSAIs again next time the UE sends a Requested NSSAI.

The UE stores (S-)NSSAIs as follows:

- When provisioned with a Configured NSSAI for a PLMN and/or a mapping of Configured NSSAI to HPLMN S-NSSAIs and possibly NSSRG information for each S-NSSAI in the Configured NSSAI (if applicable and supported by the UE), or when requested to remove the configuration due to network slicing subscription change, the UE shall:

- replace any stored (old) Configured NSSAI for this PLMN with the new Configured NSSAI for this PLMN (if applicable); and

- delete any stored associated mapping of this old Configured NSSAI for this PLMN to HPLMN S-NSSAIs and, if present and applicable, store the mapping of Configured NSSAI to HPLMN S-NSSAIs; and

- delete any stored associated NSSRG information for each S-NSSAI of the Configured NSSAI and, if present, store the associated NSSRG information for each S-NSSAI of the Configured NSSAI; and

- delete any stored rejected S-NSSAI for this PLMN;

- keep the received Configured NSSAI for a PLMN (if applicable) and associated mapping to HPLMN S-NSSAIs (if applicable) and associated NSSRG information for each S-NSSAI of the Configured NSSAI (if applicable and supported by the UE) stored in the UE, even when registering in another PLMN, until a new Configured NSSAI for this PLMN and/or associated mapping are provisioned in the UE, or until the network slicing subscription changes, as described in clause 5.15.4.2. The number of Configured NSSAIs and associated mapping to be kept stored in the UE for PLMNs other than the HPLMN is up to UE implementation. A UE shall at least be capable of storing a Configured NSSAI for the serving PLMN including any necessary mapping of the Configured NSSAI for the Serving PLMN to HPLMN S-NSSAIs and the Default Configured NSSAI.

- The Allowed NSSAI received in a Registration Accept message or a UE Configuration Update Command applies to a PLMN when at least a TAI of this PLMN is included in the RA/TAI list included in this Registration Accept message or UE Configuration Update Command. If the UE Configuration Update Command contains an Allowed NSSAI but not a TAI List, then the last received RA/TAI list applies for the decision on which PLMN(s) the Allowed NSSAI is applicable. If received, the Allowed NSSAI for a PLMN and Access Type and any associated mapping of this Allowed NSSAI to HPLMN S-NSSAIs shall be stored in the UE. The UE should store this Allowed NSSAI and any associated mapping of this Allowed NSSAI to HPLMN S-NSSAIs also when the UE is turned off, or until the network slicing subscription changes, as described in clause 5.15.4.2:

NOTE 3: Whether the UE stores the Allowed NSSAI and any associated mapping of the Allowed NSSAI to HPLMN S-NSSAIs also when the UE is turned off is left to UE implementation.

- When a new Allowed NSSAI for a PLMN and any associated mapping of the Allowed NSSAI to HPLMN S-NSSAIs are received over an Access Type, the UE shall:

- replace any stored (old) Allowed NSSAI and any associated mapping for these PLMN and Access Type with this new Allowed NSSAI; and

- delete any stored associated mapping of this old Allowed NSSAI for this PLMN to HPLMN S-NSSAIs and, if present, store the associated mapping of this new Allowed NSSAI to HPLMN S-NSSAIs;

- If received, an S-NSSAI rejected for the entire PLMN shall be stored in the UE while RM-REGISTERED in this PLMN regardless of the Access Type or until it is deleted.

- If received, an S-NSSAI rejected for the current Registration Area shall be stored in the UE while RM-REGISTERED until the UE moves out of the current Registration Area or until the S-NSSAI is deleted.

NOTE 4: The storage aspects of rejected S-NSSAIs are described in TS 24.501 [47].

- If received, the Pending NSSAI shall be stored in the UE as described in TS 24.501 [47].

UE configuration to guide UE’selection of a N3IWF that supports the S-NSSAIs needed by the UE is defined in clause 5.15.X .

*NEXT CHANGE (4)*

### 6.3.6 N3IWF selection

#### 6.3.6.1 General

When the UE supports connectivity with N3IWF but does not support connectivity with ePDG, as specified in TS 23.402 [43], the UE shall perform the procedure in clause 6.3.6.2 for selecting an N3IWF.

When the UE supports connectivity with N3IWF, as well as with ePDG, as specified in TS 23.402 [43], the UE shall perform the procedure in clause 6.3.6.3 for selecting either an N3IWF or an ePDG, i.e. for selecting a non-3GPP access node.

In both cases above the UE can be configured by the HPLMN with the same information that includes:

1) ePDG identifier configuration: It contains the FQDN or IP address of the ePDG in the HPLMN, as specified in clause 4.5.4.3 of TS 23.402 [43]. This is used only when the UE supports connectivity with ePDG and attempts to select an ePDG. It is ignored in all other cases.

2) N3IWF identifier configuration: It contains the FQDN or IP address of the N3IWF in the HPLMN.

3) Non-3GPP access node selection information: It contains a prioritized list of PLMNs and for each PLMN it includes (i) a "Preference" parameter which indicates if ePDG or N3IWF is preferred in this PLMN and (ii) an FQDN parameter which indicates if the Tracking/Location Area Identity FQDN or the Operator Identifier FQDN (as specified in clause 4.5.4.4 of TS 23.402 [43]) should be used when discovering the address of an ePDG or N3IWF in this PLMN. The list of PLMNs shall include the HPLMN and shall include an "any PLMN" entry, which matches any PLMN the UE is connected to except the HPLMN.

The ePDG identifier configuration and the N3IWF identifier configuration are optional parameters, while the Non-3GPP access node selection information is required and shall include at least the HPLMN and the "any PLMN" entry.

If the ePDG identifier configuration is configured in the UE, then, when the UE decides to select an ePDG in the HPLMN (according to the procedure in clause 6.3.6.3), the UE shall use the ePDG identifier configuration to find the IP address of the ePDG in the HPLMN and shall ignore the FQDN parameter of the HPLMN in the Non-3GPP access node selection information.

If the N3IWF identifier configuration is configured in the UE, then, when the UE decides to select an N3IWF in the HPLMN (according to the procedure in clause 6.3.6.3 for combined N3IWF/ePDG selection and the procedure in clause 6.3.6.2 for Stand-alone N3IWF selection), the UE shall use the N3IWF identifier configuration to find the IP address of the N3IWF in the HPLMN and shall ignore the FQDN parameter of the HPLMN in the Non-3GPP access node selection information.

The HPLMN provides to the UE the Non-3GPP access node selection information and the N3IWF identifier configuration by taking into account the UE's subscribed S-NSSAIs.

NOTE 2: If the HPLMN deploys multiple N3IWFs with different TAs which support different S-NSSAIs, then the HPLMN can configure a UE with N3IWF identifier configuration so that the UE selects an N3IWF that supports the UE's subscribed S-NSSAIs.

Further UE (ANDSP) configuration for UE Selection of a N3IWF that supports the S-NSSAIs needed by the UE is defined in clause 5.15.X.2

#### 6.3.6.2 Stand-alone N3IWF selection

The UE performs N3IWF selection based on the ePDG selection procedure as specified in clause 4.5.4 of TS 23.402 [43] except for the following differences:

- The Tracking/Location Area Identifier FQDN shall be constructed by the UE based only on the Tracking Area wherein the UE is located. The N3IWF Tracking/Location Area Identifier FQDN may use the 5GS TAI when the UE is registered to the 5GS, or the EPS TAI when the UE is registered to EPS. The Location Area is not applicable on the 3GPP access.

- The ePDG Operator Identifier (OI) FQDN format is substituted by with N3IWF OI FQDN format as specified in TS 23.003 [19].

- The ePDG identifier configuration and the ePDG selection information are substituted by the N3IWF identifier configuration and the Non-3GPP access node selection information respectively. The UE shall give preference to the N3IWF in all PLMNs in the Non-3GPP access node selection information independent of the "Preference" parameter.

- If the UE determines to be located in a country other than its home country (called the visited country), then instead of clause 4.5.4.4, bullet 3 of TS 23.402 [43], the following applies:

a) If the UE is registered via 3GPP access to a PLMN and this PLMN is included in the Non-3GPP access node selection information, then the UE shall select an N3IWF in this PLMN. If the UE fails to connect to an N3IWF in this PLMN, the UE shall select an N3IWF by performing the DNS procedure specified in clause 4.5.4.5 of TS 23.402 [43].

b) In all other cases, (e.g. when the UE is not configured with the Non-3GPP access node selection information, or the UE is registered via 3GPP access to a PLMN but this PLMN is not included in the Non-3GPP access node selection information, or the UE is not registered via 3GPP access to any PLMN), the UE shall select an N3IWF by performing the DNS procedure specified in clause 4.5.4.5 of TS 23.402 [43].

Network slice information cannot be used for N3IWF selection in this Release of the specification.

If the UE is accessing PLMN services via SNPN, the UE uses the procedure defined in this clause to select an N3IWF deployed in the PLMN. If the UE is accessing standalone non-public network service via a PLMN (see supported cases in clause 5.30.2.0), the UE uses the procedure defined in clause 6.3.6.2a.

The mechanisms described in this clause may be further augmented by mechanisms described in clause 6.3.6.X for N3IWF selection to support the slices needed by the UE

#### 6.3.6.2a SNPN N3IWF selection

In this Release of the specification this procedure only applies when the UE is accessing the SNPN N3IWF via a PLMN.

The UE shall first determine the country in which it is located. If the UE cannot determine the country in which the UE is located, the UE shall stop N3IWF selection and abort the attempt to access the SNPN via PLMN.

NOTE 1: It is up to UE implementation how to determine the country in which the UE is located.

If the UE determines that it is located in the country where the configured N3IWF is located, then the UE uses the configured N3IWF FQDN to select an N3IWF deployed in the SNPN.

If the UE determines that it is located in a country different from the country where the configured N3IWF is located (called the visited country), then:

- The UE shall construct an FQDN consisting of the SNPN ID of the SNPN subscription and the Visited Country FQDN and indicating the query is for SNPN, as specified in TS 23.003 [19] and perform a DNS query for the resulting FQDN.

- If the DNS response contains no records, then the UE determines that the visited country does not mandate the selection of an N3IWF in this country for the SNPN identified by the SNPN ID provided by the UE. In this case the UE uses the configured N3IWF FQDN to select an N3IWF deployed in the SNPN.

- If no DNS response is received, the UE shall stop the N3IWF selection.

NOTE 2: The DNS can be configured to return no records for the visited country regardless of the SNPN ID provided by the UE. This addresses the scenario that the visited country in general does not mandate selection of a local N3IWF.

- If the DNS response contains one or more records, then the UE determines that the visited country mandates the selection of an N3IWF in this country. Each record in the DNS response shall contain the identity of an N3IWF of the SNPN in the visited country which may be used for N3IWF selection. In this case:

- The UE shall select an N3IWF included in the DNS response based on its own implementation means.

- If the UE cannot select any N3IWF included in the DNS response, then the UE shall stop the N3IWF selection.

NOTE 3: Visited countries which mandate the selection of an N3IWF in the country are assumed to configure the DNS as follows:

(i) For SNPNs that do not have any dedicated N3IWFs in the country and which are not exempt from the requirement to select an N3IWF in the visited country, the DNS response contains a record that cannot be resolved to an IP address;

(ii) for SNPNs that have dedicated N3IWFs in the country, the DNS response contains the identities of the SNPN's N3IWFs in the visited country;

(iii) for SNPNs that are exempt from the requirement to select an N3IWF in the visited country, the DNS response contains no records.

NOTE 4: Self-assigned NIDs are not supported, since a DNS cannot be properly configured for multiple SNPNs using the same self-assigned NID (i.e. in collision scenarios). If the visited country mandates the selection of an N3IWF in the same country, the NAPTR record(s) associated to the Visited Country FQDN of SNPNs that use a self-assigned NID can be provisioned with the replacement field containing an FQDN that cannot be resolved to an IP address.

NOTE 5: The identity of an SNPN's N3IWF in the visited country can be any FQDN, i.e. is not required to include the SNPN ID.

NOTE 6: It is assumed that the AMF, SMF, UPF are located in the same country as the N3IWF.

#### 6.3.6.3 Combined N3IWF/ePDG Selection

When the UE wants to select a non-3GPP access node (either an N3IWF or an ePDG), the UE shall perform the following procedure:

1) The UE shall attempt to determine the country it is located in. This is determined by implementation-specific methods not defined in this specification. If the UE cannot determine the country it is located in, the UE shall stop the non-3GPP access node selection.

2) If the UE determines to be located in its home country, then:

a) The UE shall select the HPLMN. If the UE fails to connect to an ePDG/N3IWF in the HPLMN, then the UE shall stop the non-3GPP access node selection.

3) If the UE determines to be located in a country other than its home country (called the visited country), then:

a) If the UE is registered via 3GPP access to a PLMN and this PLMN is included in the Non-3GPP access node selection information, then the UE shall select this PLMN. If the UE fails to connect to an ePDG/N3IWF in this PLMN, the UE shall select another PLMN by performing the DNS procedure specified in bullet 3c) below.

b) In all other cases, (e.g. when the UE is not configured with the Non-3GPP access node selection information, or the UE is registered via 3GPP access to a PLMN but this PLMN is not included in the Non-3GPP access node selection information, or the UE is not registered via 3GPP access to any PLMN), the UE shall select a PLMN by performing the DNS procedure specified in bullet 3c) below.

c) The UE shall select a PLMN as follows:

i) The UE shall determine if the non-3GPP access node selection is required for an IMS service or for a non-IMS service. The means of that determination are implementation specific.

ii) If the UE determines that the non-3GPP access node selection is required for a non-IMS service, the UE shall select a PLMN as specified in clause 6.3.6.2. As defined below, if the UE fails to connect to an N3IWF in any PLMN, the UE may attempt to select an ePDG according to the procedure specified in clause 4.5.4.5 of TS 23.402 [43].

iii) If the UE determines that the non-3GPP access node selection is required for an IMS service, the UE shall select a PLMN as follows:

- First, the UE shall perform a DNS query using the Visited Country FQDN for N3IWF, as specified in TS 23.003 [19] to determine if the visited country mandates the selection of N3IWF in this country. The DNS response received by the UE may be empty or may contain the identities of one or more PLMNs in the visited country, which may be used for N3IWF selection, if the UE decides to select an N3IWF, as specified below. For example, the DNS response may contain the identity of PLMN-1 and the identity of PLMN-2.

- Then, the UE shall perform a DNS query using the Visited Country FQDN for ePDG, as specified in TS 23.003 [19] to determine if the visited country mandates the selection of ePDG in this country. The DNS response received by the UE may be empty or may contain the identities of one or more PLMNs in the visited country, which may be used for ePDG selection, if the UE decides to select an ePDG, as specified below. For example, the DNS response may contain the identity of PLMN-1 and the identity of PLMN-3.

- If the UE does not receive a DNS response in none of the above two DNS queries, then the UE shall stop the non-3GPP access node selection. Otherwise, the next steps are executed.

- The UE shall consolidate the PLMN identities received in the above two DNS responses and shall construct a candidate list of PLMNs. For example, the candidate list of PLMNs may contain the identities of PLMN-1, PLMN-2, PLMN-3.

- If the candidate list of PLMNs is empty, then:

- If the Non-3GPP access node selection information contains one or more PLMNs in the visited country, the UE shall select one of these PLMNs based on their priorities in the Non-3GPP access node selection information. If the UE fails to connect to a non-3GPP access node in any of these PLMNs, the UE shall select the HPLMN.

- Otherwise, the UE shall select the HPLMN.

- If the candidate list of PLMNs is not empty, then:

- If the UE is registered via 3GPP access to a PLMN which is included in the candidate list of PLMNs, then the UE shall select this PLMN. If the UE fails to connect to a non-3GPP access node in this PLMN, then the UE shall select a different PLMN included in the candidate list of PLMNs as specified in the next bullet.

- If the UE is registered via 3GPP access to a PLMN which is not included in the candidate list of PLMNs, or the UE is not registered via 3GPP access to any PLMN, or the UE fails to connect to a non-3GPP access node according to the previous bullet, then the UE shall select one of the PLMNs included in the candidate list of PLMNs based on the prioritized list of PLMNs in the Non-3GPP access node selection information (i.e. the UE shall select first the highest priority PLMN in the Non-3GPP access node selection information that is contained in the candidate list of PLMNs). If the Non-3GPP access node selection information does not contain any of the PLMNs in the candidate list of PLMNs, or the UE is not configured with the Non-3GPP access node selection information, or the UE was not able to connect to a non-3GPP access node in any of the PLMNs included in the Non-3GPP access node selection information and in the candidate list of PLMN, then the UE shall select a PLMN included in the candidate list of PLMNs based on its own implementation means.

- If the UE cannot select a non-3GPP access node in any of the PLMNs included in the candidate list of PLMNs, then the UE shall stop the non-3GPP access node selection.

In the selected PLMN the UE shall attempt to select a non-3GPP access node as follows:

1. The UE shall determine if the non-3GPP access node selection is required for an IMS service or for a non-IMS service. The means of that determination are implementation-specific.

2. When the selection is required for an IMS service, the UE shall choose a non-3GPP access node type (i.e. ePDG or N3IWF) based on the "Preference" parameter specified in clause 6.3.6.1, unless the UE has its 5GS capability disabled in which case it shall choose an ePDG independent of the "Preference" parameter setting.

If the "Preference" parameter for the selected PLMN indicates that ePDG is preferred, the UE shall attempt to select an ePDG. If the "Preference" parameter for the selected PLMN indicates that N3IWF is preferred, the UE shall attempt to select an N3IWF.

If the selection fails, including the case when, during the registration performed over either 3GPP or non-3GPP access, the UE receives the IMS Voice over PS session Not Supported over Non-3GPP Access indication (specified in clause 5.16.3.2a), the UE shall attempt selecting the other non-3GPP access node type in the selected PLMN, if any. If that selection fails too, or it is not possible, then the UE shall select another PLMN, according to the procedure specified bullet 3c) above.

3. When the selection is required for a non-IMS service, the UE shall perform the selection by giving preference to the N3IWF independent of the "Preference" parameter setting. If the N3IWF selection fails, or it is not possible, the UE should select another PLMN based on the procedure specified in clause 4.5.4.4 of TS 23.402 [43], and shall attempt to select an N3IWF in this PLMN. If the UE fails to select an N3IWF in any PLMN, the UE may attempt to select an ePDG according to the procedure specified in clause 4.5.4.5 of TS 23.402 [43].

In the above procedure, when the UE attempts to construct a Tracking/Location Area Identifier FQDN either for ePDG selection or for N3IWF selection, the UE shall use the Tracking Area wherein the UE is located and shall construct either:

- an ePDG or N3IWF TAI FQDN based on the 5GS TAI, when the UE is registered to the 5GS; or

- an ePDG or N3IWF TAI FQDN based on the EPS TAI, when the UE is registered to EPS.

NOTE: A UE performing both a selection for an IMS service and a selection for a non-IMS service could get simultaneously attached to a N3IWF and to an ePDG in the same PLMN or in different PLMNs.

#### 6.3.6.X N3IWF selection to support the slices needed by the UE

This clause describes N3IWF selection based on the additional information listed in the previous clause as delta on top of the existing N3IWF selection.

- UE is located in its home country:

- The procedures described in Rel-17 clauses 7.2.4.3 and 7.2.4.4 of TS 24.502 [8] are applied with the following changes:

- If the UE is configured with Extended Home N3IWF identifier configuration, then the UE uses the Extended Home N3IWF identifier configuration:

- UE uses the FQDN or IP address from the Extended Home N3IWF identifier configuration that matches all (or most, in case there is no full match) of the S-NSSAIs that the UE is going to request in the subsequent Registration.

- If the UE is not configured with Extended Home N3IWF identifier configuration and not configured with Rel-17 Home N3IWF identifier configuration but configured with slice-specific N3IWF prefix information for the HPLMN:

- Whenever the UE constructs an N3IWF FQDN according to clauses 7.2.4.3 and 7.2.4.4 of TS 24.502 [8], the UE first selects the Slice-specific N3IWF prefix information for the HPLMN that matches the S-NSSAIs the UE is going to request in the subsequent Registration procedure and adds the prefix to the Rel-17 TA or OI format FQDNs as follows:

- <Prefix>.tac-lb<TAC-low-byte>.tac-hb<TAC-high-byte>.tac.n3iwf.5gc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org.

- <Prefix>.n3iwf.5gc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org.

NOTE 1: Which FQDN format (TA or OI) to construct follows the existing description in clauses 7.2.4.3 and 7.2.4.4 of TS 24.502 [8].

- If the UE has constructed an N3IWF FQDN including a prefix but the DNS does not return an IP address, then the UE attempts the same FQDN without the prefix.

- If the UE is not configured with Extended Home N3IWF identifier configuration and not configured with Slice-specific N3IWF prefix information, then the existing procedures in Rel-17 clauses 7.2.4.3 and 7.2.4.4 of TS 24.502 [8] apply.

- UE is not located in its home country:

- The procedures described in Rel-17 clauses 7.2.4.3 and 7.2.4.4 of TS 24.502 [8] are applied with the following changes:

- If the UE is configured with slice-specific N3IWF prefix information for the selected VPLMN:

- Whenever the UE constructs an N3IWF FQDN according to clauses 7.2.4.3 and 7.2.4.4 of TS 24.502 [8], the UE first selects the slice-specific N3IWF prefix information for the VPLMN that matches the S-NSSAIs the UE is going to request in the subsequent Registration procedure and adds the prefix to the Rel-17 TA or OI format FQDNs as follows:

- <Prefix>.tac-lb<TAC-low-byte>.tac-hb<TAC-high-byte>.tac.n3iwf.5gc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org

- <Prefix>.n3iwf.5gc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org

NOTE 2: Which FQDN format (TA or OI) to construct follows the existing description in clauses 7.2.4.3 and 7.2.4.4 of TS 24.502 [8].

- For selecting the slice-specific N3IWF prefix information for the VPLMN, the UE applies the S-NSSAIs valid in the VPLMN.

- If the UE has constructed an N3IWF FQDN including a prefix but the DNS does not return an IP address, then the UE attempts the same FQDN without the prefix.

- If the UE determines that the visited country does not mandate the selection of N3IWF or ePDG in the visited country and if the N3AN node configuration information is not provisioned or the N3AN node configuration information is provisioned and the N3AN node selection information of the N3AN node configuration information excluding any PLMN in the list of "forbidden PLMNs for non-3GPP access to 5GCN" contains no PLMN in the visited country and the UE is configured with Extended Home N3IWF identifier configuration, then the UE uses the IP address or FQDN from the Extended Home N3IWF identifier configuration that matches the S-NSSAIs the UE is going to request in the subsequent Registration.

*NEXT CHANGE (5)*

##### 5.15.5.2.1 Registration to a set of Network Slices

When a UE registers over an Access Type with a PLMN, if the UE has either or both of:

- a Configured NSSAI for this PLMN;

- an Allowed NSSAI for this PLMN and Access Type;

the UE shall provide to the network, in AS layer under the conditions described in clause 5.15.9 and in NAS layer, a Requested NSSAI containing the S-NSSAI(s) corresponding to the Network Slice(s) to which the UE wishes to register, unless they are stored in the UE in the Pending NSSAI.

The Requested NSSAI shall be one of:

- the Default Configured NSSAI, i.e. if the UE has no Configured NSSAI nor an Allowed NSSAI for the serving PLMN;

- the Configured-NSSAI, or a subset thereof as described below, e.g. if the UE has no Allowed NSSAI for the Access Type for the serving PLMN;

- the Allowed-NSSAI for the Access Type over which the Requested NSSAI is sent, or a subset thereof; or

- the Allowed-NSSAI for the Access Type over which the Requested NSSAI is sent, or a subset thereof, plus one or more S-NSSAIs from the Configured-NSSAI not yet in the Allowed NSSAI for the Access Type as described below.

NOTE 1: If the UE wishes to register only a subset of the S-NSSAIs from the Configured NSSAI or the Allowed NSSAI, to be able to register with some Network Slices e.g. to establish PDU Sessions for some application(s), and the UE uses the URSP rules (which includes the NSSP) or the UE Local Configuration as defined in clause 6.1.2.2.1 of TS 23.503 [45], then the UE uses applicable the URSP rules or the UE Local Configuration to ensure that the S-NSSAIs included in the Requested NSSAI are not in conflict with the URSP rules or with the UE Local Configuration.

The subset of S-NSSAIs in the Configured-NSSAI provided in the Requested NSSAI consists of one or more S-NSSAI(s) in the Configured NSSAI applicable to this PLMN, if one is present, and for which no corresponding S-NSSAI is already present in the Allowed NSSAI for the access type for this PLMN. The UE shall not include in the Requested NSSAI any S-NSSAI that is currently rejected by the network (i.e. rejected in the current registration area or rejected in the PLMN). For the registration to a PLMN for which neither a Configured NSSAI applicable to this PLMN or an Allowed NSSAI are present, the S-NSSAIs provided in the Requested NSSAI correspond to the S-NSSAI(s) in the Default Configured NSSAI unless the UE has HPLMN S-NSSAI for established PDU Session(s) in which case the HPLMN S-NSSAI(s) shall be provided in the mapping of Requested NSSAI in the NAS Registration Request message, with no corresponding VPLMN S-NSSAI in the Requested NSSAI. If the UE has been provided with NSSRG information together with the Configured NSSAI, the UE only includes in the Requested NSSAI S-NSSAIs that share a common NSSRG, see clause 5.15.12.2.

When a UE registers over an Access Type with a PLMN, the UE shall also indicate in the Registration Request message when the Requested NSSAI is based on the Default Configured NSSAI.

The UE shall include the Requested NSSAI in the RRC Connection Establishment and in the establishment of the connection to the N3IWF/TNGF (as applicable) and in the NAS Registration procedure messages subject to conditions set out in clause 5.15.9. However, the UE shall not indicate any NSSAI in RRC Connection Establishment or Initial NAS message unless it has either a Configured NSSAI for the corresponding PLMN, an Allowed NSSAI for the corresponding PLMN and Access Type, or the Default Configured NSSAI. If the UE has HPLMN S-NSSAI(s) for established PDU Session(s), the HPLMN S-NSSAI(s) shall be provided in the mapping of Requested NSSAI in the NAS Registration Request message, independent of whether the UE has the corresponding VPLMN S-NSSAI. The (R)AN shall route the NAS signalling between this UE and an AMF selected using the Requested NSSAI obtained during RRC Connection Establishment or connection to N3IWF/TNGF respectively. If the (R)AN is unable to select an AMF based on the Requested NSSAI, it routes the NAS signalling to an AMF from a set of default AMFs. In the NAS signalling, if available, the UE provides the mapping of each S-NSSAI of the Requested NSSAI to a corresponding HPLMN S-NSSAI.

When a UE registers with a PLMN, if for this PLMN the UE has not included a Requested NSSAI nor a GUAMI while establishing the connection to the (R)AN, the (R)AN shall route all NAS signalling from/to this UE to/from a default AMF. When receiving from the UE a Requested NSSAI and a 5G-S-TMSI or a GUAMI in RRC Connection Establishment or in the establishment of connection to N3IWF/TNGF, if the 5G-AN can reach an AMF corresponding to the 5G-S-TMSI or GUAMI, then 5G-AN forwards the request to this AMF. Otherwise, the 5G-AN selects a suitable AMF based on the Requested NSSAI provided by the UE and forwards the request to the selected AMF. If the 5G-AN is not able to select an AMF based on the Requested NSSAI, then the request is sent to a default AMF.

When the AMF selected by the AN during Registration Procedure receives the UE Registration request, or after an AMF selection by MME (i.e. during EPS to 5GS handover) the AMF receives S-NSSAI(s) from SMF+PGW-C in 5GC:

- As part of the Registration procedure described in clause 4.2.2.2.2 of TS 23.502 [3], or as part of the EPS to 5GS handover using N26 interface procedure described in clause 4.11.1.2.2 of TS 23.502 [3], the AMF may query the UDM to retrieve UE subscription information including the Subscribed S-NSSAIs.

- The AMF verifies whether the S-NSSAI(s) in the Requested NSSAI or the S-NSSAI(s) received from SMF+PGW-C are permitted based on the Subscribed S-NSSAIs (to identify the Subscribed S-NSSAIs the AMF may use the mapping to HPLMN S-NSSAIs provided by the UE, in the NAS message, for each S-NSSAI of the Requested NSSAI).

- When the UE context in the AMF does not yet include an Allowed NSSAI for the corresponding Access Type, the AMF queries the NSSF (see (B) below for subsequent handling), except in the case when, based on configuration in this AMF, the AMF is allowed to determine whether it can serve the UE (see (A) below for subsequent handling). The IP address or FQDN of the NSSF is locally configured in the AMF.

NOTE 2: The configuration in the AMF depends on operator's policy.

- When the UE context in the AMF already includes an Allowed NSSAI for the corresponding Access Type, based on the configuration for this AMF, the AMF may be allowed to determine whether it can serve the UE (see (A) below for subsequent handling).

- AMF or NSSF may have previously subscribed to slice load level and/or Observed Service Experience and/or Dispersion Analytics related network data analytics for a Network Slice from NWDAF, optionally for an Area of Interest composed of one or several TAIs. If AMF subscribes to analytics, AMF may determine that it cannot serve the UE based on received analytics (see (A) below). If AMF subscribes to notifications on changes on the Network Slice or Network Slice instance availability information from NSSF optionally indicating a list of supported TAIs, it may determine that it cannot serve the UE after the restriction notification is received (see (A) below). If AMF does not subscribe to notifications on changes on the availability information from NSSF, NSSF may take the analytics information into account when AMF queries NSSF (see (B) below).

NOTE 3: The configuration in the AMF depends on the operator's policy.

**(A)** Depending on fulfilling the configuration as described above, the AMF may be allowed to determine whether it can serve the UE, and the following is performed:

- For the mobility from EPS to 5GS, the AMF first derives the serving PLMN value(s) of S-NSSAI(s) based on the HPLMN S-NSSAI(s) in the mapping of Requested NSSAI (in CM-IDLE state) or the HPLMN S-NSSAI(s) received from SMF+PGW-C (in CM-CONNECTED state). After that the AMF regards the derived value(s) as the Requested NSSAI.

- For the inter PLMN within 5GC mobility, the new AMF derives the serving PLMN value(s) of S-NSSAI(s) based on the HPLMN S-NSSAI(s) in the mapping of Requested NSSAI. After that the AMF regards the derived value(s) as the Requested NSSAI.

- AMF checks whether it can serve all the S-NSSAI(s) from the Requested NSSAI present in the Subscribed S-NSSAIs (potentially using configuration for mapping S-NSSAI values between HPLMN and Serving PLMN), or all the S-NSSAI(s) marked as default in the Subscribed S-NSSAIs in the case that no Requested NSSAI was provided or none of the S-NSSAIs in the Requested NSSAI are permitted, i.e. do not match any of the Subscribed S-NSSAIs or not available at the current UE's Tracking Area (see clause 5.15.3).

- If AMF has subscribed to slice load level and/or Observed Service Experience and/or Dispersion Analytics related network data analytics for a Network Slice from NWDAF, or if AMF had received a Network Slice restriction from NSSF that applies to the list of TAIs supported by the AMF, it may use that information to determine whether the AMF can serve the UE on the S-NSSAI(s) in the Requested NSSAI.

- If the AMF can serve the S-NSSAIs in the Requested NSSAI, the AMF remains the serving AMF for the UE. The Allowed NSSAI is then composed of the list of S-NSSAI(s) in the Requested NSSAI permitted based on the Subscribed S-NSSAIs and/or the list of S-NSSAI(s) for the Serving PLMN which are mapped to the HPLMN S-NSSAI(s) provided in the mapping of Requested NSSAI permitted based on the Subscribed S-NSSAIs, or, if neither Requested NSSAI nor the mapping of Requested NSSAI was provided or none of the S-NSSAIs in the Requested NSSAI are permitted, all the S-NSSAI(s) marked as default in the Subscribed S-NSSAIs and taking also into account the availability of the Network Slice instances as described in clause 5.15.8 that are able to serve the S-NSSAI(s) in the Allowed NSSAI in the current UE's Tracking Areas in addition to any Network Slice instance restriction for the S-NSSAI(s) in the Allowed NSSAI provided by the NSSF. If the AMF has received NSSRG Information for the Subscribed S-NSSAIs as part of the UE subscription information, it shall only include in the Allowed NSSAI S-NSSAIs that all share a common NSSRG (see clause 5.15.12). If at least one S-NSSAI in the Requested NSSAI is not available in the current UE's Tracking Area, then either the AMF may determine a Target NSSAI or step (B) is executed. The AMF also determines the mapping if the S-NSSAI(s) included in the Allowed NSSAI needs to be mapped to Subscribed S-NSSAI(s) values. If no Requested NSSAI is provided, or the mapping of the S-NSSAIs in Requested NSSAI to HPLMN S-NSSAIs is incorrect, or the Requested NSSAI includes an S-NSSAI that is not valid in the Serving PLMN, or the UE indicated that the Requested NSSAI is based on the Default Configured NSSAI, the AMF, based on the Subscribed S-NSSAI(s) and operator's configuration, may also determine the Configured NSSAI for the Serving PLMN and, if applicable, the associated mapping of the Configured NSSAI to HPLMN S-NSSAIs, so these can be configured in the UE. Then Step (C) is executed.

- Else, the AMF queries the NSSF (see (B) below).

**(B)** When required as described above, the AMF needs to query the NSSF, and the following is performed:

- The AMF queries the NSSF, with Requested NSSAI, Default Configured NSSAI Indication, mapping of Requested NSSAI to HPLMN S-NSSAIs, the Subscribed S-NSSAIs (with an indication if marked as default S-NSSAI), NSSRG Information (if provided by the UDM, see clause 5.15.12), any Allowed NSSAI it might have for the other Access Type (including its mapping to HPLMN S-NSSAIs), PLMN ID of the SUPI and UE's current Tracking Area.

- Based on this information, local configuration, and other locally available information including RAN capabilities in the current Tracking Area for the UE or load level information for a Network Slice instance provided by the NWDAF, the NSSF does the following:

- It verifies which S-NSSAI(s) in the Requested NSSAI are permitted based on comparing the Subscribed S-NSSAIs with the S-NSSAIs in the mapping of Requested NSSAI to HPLMN S-NSSAIs. It considers the S-NSSAI(s) marked as default in the Subscribed S-NSSAIs in the case that no Requested NSSAI was provided or no S-NSSAI from the Requested NSSAI are permitted i.e. are not present in the Subscribed S-NSSAIs or not available e.g. at the current UE's Tracking Area. If NSSRG information is provided, the NSSF only selects S-NSSAIs that share a common NSSRG (see clause 5.15.12).

- If AMF has not subscribed to notifications on changes on the Network Slice or Network Slice instance availability information from NSSF and NSSF has subscribed to slice load level and/or Observed Service Experience and/or Dispersion Analytics related network data analytics for a Network Slice from NWDAF, NSSF may use the analytics information for the determination of the (Network Slice instance(s) and the) list of S-NSSAI(s) in the Allowed NSSAI(s) to serve the UE.

- It selects the Network Slice instance(s) to serve the UE. When multiple Network Slice instances in the UE's Tracking Area are able to serve a given S-NSSAI, based on operator's configuration, the NSSF may select one of them to serve the UE, or the NSSF may defer the selection of the Network Slice instance until a NF/service within the Network Slice instance needs to be selected.

- It determines the target AMF Set to be used to serve the UE, or, based on configuration, the list of candidate AMF(s), possibly after querying the NRF.

NOTE 4: If the target AMF(s) returned from the NSSF is the list of candidate AMF(s), the Registration Request message can only be redirected via the direct signalling between the initial AMF and the selected target AMF as described in clause 5.15.5.2.3. The NSSF does not provide the target AMF(s), when it provides a Target NSSAI in order to redirect or handover the UE to a cell of another TA as described in clause 5.3.4.3.3.

- It determines the Allowed NSSAI(s) for the applicable Access Type, composed of the list of S-NSSAI(s) in the Requested NSSAI permitted based on the Subscribed S-NSSAIs and/or the list of S-NSSAI(s) for the Serving PLMN which are mapped to the HPLMN S-NSSAIs provided in the mapping of Requested NSSAI permitted based on the Subscribed S-NSSAIs, or, if neither Requested NSSAI nor the mapping of Requested NSSAI was provided or none of the S-NSSAIs in the Requested NSSAI are permitted, all the S-NSSAI(s) marked as default in the Subscribed S-NSSAIs, and taking also into account the availability of the Network Slice instances as described in clause 5.15.8 that are able to serve the S-NSSAI(s) in the Allowed NSSAI in the current UE's Tracking Areas. If NSSRG information applies, the NSSF only selects S-NSSAIs that share a common NSSRG (see clause 5.15.12).

- It also determines the mapping of each S-NSSAI of the Allowed NSSAI(s) to the Subscribed S-NSSAIs if necessary.

- Based on operator configuration, the NSSF may determine the NRF(s) to be used to select NFs/services within the selected Network Slice instance(s).

- Additional processing to determine the Allowed NSSAI(s) in roaming scenarios and the mapping to the Subscribed S-NSSAIs, as described in clause 5.15.6.

- If no Requested NSSAI is provided or the Requested NSSAI includes an S-NSSAI that is not valid in the Serving PLMN, or the mapping of the S-NSSAIs in Requested NSSAI to HPLMN S-NSSAIs is incorrect, or the Default Configured NSSAI Indication is received from AMF, the NSSF based on the Subscribed S-NSSAI(s) and operator configuration may also determine the Configured NSSAI for the Serving PLMN and, if applicable, the associated mapping of the Configured NSSAI to HPLMN S-NSSAIs, so these can be configured in the UE.

- If at least one S-NSSAI in the Requested NSSAI is not available in the current UE's Tracking Area, the NSSF may provide a Target NSSAI for the purpose of allowing the NG-RAN to redirect the UE to a cell of a TA in another frequency band supporting network slices not available in the current TA as described in clause 5.3.4.3.3.

- The NSSF returns to the current AMF the Allowed NSSAI for the applicable Access Type, the mapping of each S-NSSAI of the Allowed NSSAI to the Subscribed S-NSSAIs if determined and the target AMF Set, or, based on configuration, the list of candidate AMF(s). The NSSF may return the NRF(s) to be used to select NFs/services within the selected Network Slice instance(s), and the NRF to be used to determine the list of candidate AMF(s) from the AMF Set. The NSSF may return NSI ID(s) to be associated to the Network Slice instance(s) corresponding to certain S-NSSAIs. NSSF may return the rejected S-NSSAI(s) as described in clause 5.15.4.1. The NSSF may return the Configured NSSAI for the Serving PLMN and the associated mapping of the Configured NSSAI to HPLMN S-NSSAIs. The NSSF may return Target NSSAI as described in clause 5.3.4.3.3.

- Depending on the available information and based on configuration, the AMF may query the appropriate NRF (e.g. locally pre-configured or provided by the NSSF) with the target AMF Set. The NRF returns a list of candidate AMFs.

- If AMF Re-allocation is necessary, the current AMF reroutes the Registration Request or forwards the UE context to a target serving AMF as described in clause 5.15.5.2.3.

- Step (C) is executed.

**(C)** The serving AMF shall determine a Registration Area such that all S-NSSAIs of the Allowed NSSAI for this Registration Area are available in all Tracking Areas of the Registration Area (and also considering other aspects as described in clause 5.3.2.3 and clause 5.3.4.3.3) and then return to the UE this Allowed NSSAI and the mapping of the Allowed NSSAI to the Subscribed S-NSSAIs if provided. The AMF may return the rejected S-NSSAI(s) as described in clause 5.15.4.1.

NOTE 5: The S-NSSAIs in the Allowed NSSAI for Non-3GPP access are available homogeneously “in the PLMN” for the N3IWF case as a N3IWF can be reached from any IP location in a country. For other types of Non-3GPP access the S-NSSAIs in the Allowed NSSAI for Non-3GPP access can be not available homogeneously, for example different W-AGFs /TNGF(s) can be deployed in different locations and support different TAIs that support different network slices.

When either no Requested NSSAI was included, or the mapping of the S-NSSAIs in Requested NSSAI to HPLMN S-NSSAIs is incorrect, or a Requested NSSAI is not considered valid in the PLMN and as such at least one S-NSSAI in the Requested NSSAI was rejected as not usable by the UE in the PLMN, or the UE indicated that the Requested NSSAI is based on the Default Configured NSSAI, the AMF may update the UE slice configuration information for the PLMN as described in clause 5.15.4.2.

If the Requested NSSAI does not include S-NSSAIs which map to S-NSSAIs of the HPLMN subject to Network Slice-Specific Authentication and Authorization and the AMF determines that no S-NSSAI can be provided in the Allowed NSSAI for the UE in the current UE's Tracking Area and if no default S-NSSAI(s) could be added as described in step (A), the AMF shall reject the UE Registration and shall include in the rejection message the list of Rejected S-NSSAIs, each of them with the appropriate rejection cause value.

If the Requested NSSAI includes S-NSSAIs which map to S-NSSAIs of the HPLMN subject to Network Slice-Specific Authentication and Authorization, the AMF shall include in the Registration Accept message an Allowed NSSAI containing only those S-NSSAIs that are not to be subject to Network Slice-Specific Authentication and Authorization and, based on the UE Context in AMF, those S-NSSAIs for which Network Slice-Specific Authentication and Authorization for at least one of the corresponding HPLMN S-NSSAIs succeeded previously regardless the Access Type, if any.

The AMF shall also provide the list of Rejected S-NSSAIs, each of them with the appropriate rejection cause value.

If the AMF determined the Target NSSAI or received a Target NSSAI from the NSSF, the AMF should provide the Target NSSAI to the PCF for retrieving a corresponding RFSP as described in clause 5.3.4.3.1 or, if the PCF is not deployed, the AMF should determine a corresponding RFSP based on local configuration. Then the AMF provides the Target NSSAI and the corresponding RFSP to the NG-RAN as described in clause 5.3.4.3.3. The S-NSSAIs which map to S-NSSAIs of the HPLMN subject to an ongoing Network Slice-Specific Authentication and Authorization shall be included in the Pending NSSAI and removed from Allowed NSSAI. The Pending NSSAI may contain a mapping of the S-NSSAI(s) for the Serving PLMN to the HPLMN S-NSSAIs, if applicable. The UE shall not include in the Requested NSSAI any of the S-NSSAIs from the Pending NSSAI the UE stores, regardless of the Access Type.

If:

- all the S-NSSAI(s) in the Requested NSSAI are still to be subject to Network Slice-Specific Authentication and Authorization; or

- no Requested NSSAI was provided or none of the S-NSSAIs in the Requested NSSAI matches any of the Subscribed S-NSSAIs, and all the S-NSSAI(s) marked as default in the Subscribed S-NSSAIs are to be subject to Network Slice-Specific Authentication and Authorization;

the AMF shall provide a "NSSAA to be performed" indicator and no Allowed NSSAI to the UE in the Registration Accept message. Upon receiving the Registration Accept message, the UE is registered in the PLMN but shall wait for the completion of the Network Slice-Specific Authentication and Authorization without attempting to use any service provided by the PLMN on any access, except e.g. emergency services (see TS 24.501 [47]), until the UE receives an allowed NSSAI.

Then, the AMF shall initiate the Network Slice-Specific Authentication and Authorization procedure as described in clause 5.15.10 for each S-NSSAI that requires it, except, based on Network policies, for those S-NSSAIs for which Network Slice-Specific Authentication and Authorization have been already initiated on another Access Type for the same S-NSSAI(s). At the end of the Network Slice-Specific Authentication and Authorization steps, the AMF by means of the UE Configuration Update procedure shall provide a new Allowed NSSAI to the UE which also contains the S-NSSAIs subject to Network Slice-Specific Authentication and Authorization for which the authentication and authorization is successful. The AMF may perform AMF selection when NSSAA completes for the S-NSSAIs subject to NSSAA. If an AMF change is required, this shall be triggered by the AMF using the UE Configuration Update procedure indicating a UE re-registration is required. The S-NSSAIs which were not successfully authenticated and authorized are not included in the Allowed NSSAI and are included in the list of Rejected S-NSSAIs with a rejection cause value indicating Network Slice-Specific Authentication and Authorization failure.

Once completed the Network Slice-Specific (re-)Authentication and (re-)Authorization procedure, if the AMF determines that no S-NSSAI can be provided in the Allowed NSSAI for the UE, which is already authenticated and authorized successfully by a PLMN, and if no default S-NSSAI(s) could be added as described in step (A), the AMF shall execute the Network-initiated Deregistration procedure described in clause 4.2.2.3.3 of TS 23.502 [3] and shall include in the explicit De-Registration Request message the list of Rejected S-NSSAIs, each of them with the appropriate rejection cause value.

If an S-NSSAI is rejected with a rejection cause value indicating Network Slice-Specific Authentication and Authorization failure or revocation, the UE can re-attempt to request the S-NSSAI based on policy, local in the UE.

*END OF CHANGES*