**3GPP TSG-WG SA2 Meeting #162S2-240xxxx**

**15 – 19 April 2024, Changsha, CN (revision of S2-2402027)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **23.501** | **CR** | **-** | **rev** | **-** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Indirect Network Sharing | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson, China Unicom, Tencent, Tencent Cloud, Nokia, Nokia Shanghai Bell, vivo, OPPO | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI19\_NetShare | | | | |  | ***Date:*** | | | 2024-04-05 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Currently, only 5G MOCN network sharing mechanism has been supported in the existing 5G specification. However the challenge for the network operators is the maintenance generated by the “direct” interfaces (e.g., a large number of N2 and N3 interfaces) between the shared RAN and two or more participating operators’ core networks, if using 5G MOCN, especially for a large number of shared 5G base stations. It is valuable to introduce a newly supported network sharing mechanism based on the operators' agreement.  Based on the approved TEI19 WI paper of SP-240488, this new network sharing mechanism named as Indirect Network Sharing needs to be specified.  Therefore, the basic definition, architecture and functionality of Indirect Network Sharing are proposed in this paper. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. The basic definition and architecture of Indirect Network Sharing are proposed.  2. The functionality of “the AMF of hosting operator selects the SMF of participating operator (i.e., H-SMF) considering the UE location information” is added in the clause of the AMF function and SMF discovery.  3. The new Annex of 5GS support for Indirect Network Sharing deployment is added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | This new network sharing mechanism cannot be specified and the corresponding operator requirements cannot be satisfied. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.18.1, 5.18.2, 5.18.3, 6.2.1, 6.3.2, Annex XY(new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \* \*

### 5.18.1 General concepts

A network sharing architecture shall allow multiple participating operators to share resources of a single shared network according to agreed allocation schemes. The shared network includes a radio access network. The shared resources include radio resources.

The shared network operator allocates shared resources to the participating operators based on their planned and current needs and according to service level agreements.

In this Release of the specification, the 5G Multi-Operator Core Network (5G MOCN) network sharing architecture, in which only the RAN is shared in 5G System, is supported. The 5G System may also support Indirect Network Sharing deployment between hosting operator (i.e., shared network operator) and participating operator (see clause 6.21 of TS 22.261 [2], Figure 5.18.1-2 and Annex XY), in which the RAN is shared. The communication between the shared RAN and the core network of the participating operator (i.e. which is represented by a PLMN ID of the participating operator) is routed through the core network of the hosting operator (i.e. which is represented by a PLMN ID of the hosting operator) owning the shared RAN.

5G MOCN for 5G System, including UE, RAN and AMF, shall support operators' ability to use more than one PLMN ID (i.e. with same or different country code (MCC) some of which is specified in TS 23.122 [17] and different network codes (MNC)) or combinations of PLMN ID and NID. 5G MOCN supports NG-RAN Sharing with or without multiple Cell Identity broadcast as described in TS 38.300 [27]. Indirect Network Sharing for 5G system, including UE, shared RAN and CP NFs of hosting operator, shall support operators’ ability to use more than one PLMN ID.

For Indirect Network Sharing, the shared RAN same as for MOCN is broadcasting multiple PLMN IDs, including the PLMN ID which represents the hosting operator and the PLMN IDs which represent participating operators. Multiple PLMN IDs are supported by the serving AMF (i.e. the AMF in the core network of the PLMN representing the hosting operator). A UE from participating operator selects PLMN ID representing the participating operator in the shared RAN area based on existing procedures specified in TS 23.122 [17]. The serving AMF selects core network functions in the PLMN of the participating operator (i.e. which is represented by a PLMN ID of the participating operator) for the UE, based on home routed roaming architecture principle as specified in clause 4.2.4. In addition, the serving AMF selects the SMF of participating operator possibly considering UE location information and also selects a V-SMF in its own network during the PDU session establishment procedure.

NOTE X1: In this Release of specification, the Indirect Network Sharing is only applicable for NR with 5GC of hosting operator and 5GC of participating operator. There are maximum of two SMFs (V-SMF of the hosting operator and SMF of the participating opeartor) controlling a PDU session.

5G MOCN also supports the following sharing scenarios involving non-public networks, i.e.NG-RAN can be shared by any combination of PLMNs, PNI-NPNs (with CAG), and SNPNs (each identified by PLMN ID and NID).

NOTE 1: PNI-NPNs (without CAG) are not explicitly listed above as it does not require additional NG-RAN sharing functionality compared to sharing by one or multiple PLMNs.

In all non-public network sharing scenarios, each Cell Identity as specified in TS 38.331 [28] is associated with one of the following configuration options:

- one or multiple SNPNs;

- one or multiple PNI-NPNs (with CAG); or

- one or multiple PLMNs only.

NOTE 2: This allows the assignment of multiple cell identities to a cell and also allows the cell identities to be independently assigned, i.e. without need for coordination, by the network sharing partners, between PLMNs and/or non-public networks.

NOTE 3: Different PLMN IDs (or combinations of PLMN ID and NID) can also point to the same 5GC. When same 5GC supports multiple SNPNs (identified by PLMN ID and NID), it is up to the operator's policy whether they are used as equivalent SNPNs for a UE.

NOTE 4: There is no standardized mechanism to avoid paging collisions if the same 5G-S-TMSI is allocated to different UEs by different PLMNs or SNPNs of the shared network, as the risk of paging collision is assumed to be very low. If such risk is to be eliminated then PLMNs and SNPNs of the shared network needs to coordinate the value space of the 5G-S-TMSI to differentiate the PLMNs and SNPNs of the shared network.



Figure 5.18.1-1: A 5G Multi-Operator Core Network (5G MOCN) in which multiple CNs are   
connected to the same NG-RAN

### 

Figure 5.18.1-2: Indirect Network Sharing in which multiple participating operators’ CNs connect to hosting operator’s CN to share NR

NOTE X2: Not all interfaces (e.g., N8/N14) between the hosting operator and the participating operator are depicted in the Figure 5.18.1-2 for the sake of simplicity.

### 5.18.2 Broadcast system information for network sharing

If a shared NG-RAN is configured to indicate available networks (PLMNs and/or SNPNs) for selection by UEs, each cell in the shared radio access network shall in the broadcast system information include available core network operators in the shared network, including the PLMN IDs which represent the participating operators in case of Indirect Network Sharing as specified in clause 5.18.1.

The Broadcast System Information broadcasts a set of PLMN IDs and/or PLMN IDs and NIDs and one or more additional set of parameters per PLMN e.g. cell-ID, Tracking Areas, CAG Identifiers. All 5G System capable UEs that connect to NG-RAN support reception of multiple PLMN IDs and per PLMN specific parameters. All SNPN-enabled UEs support reception of multiple combinations of PLMN ID and NID and SNPN-specific parameters.

The available core network operators (PLMNs and/or SNPNs) shall be the same for all cells of a Tracking Area in a shared NG-RAN network.

UEs not set to operate in SNPN access mode decode the broadcast system information and take the information concerning available PLMN IDs into account in PLMN and cell (re-)selection procedures. UEs set to operate in SNPN access mode decode the broadcast system information and take the information concerning available PLMN IDs and NIDs into account in network and cell (re-)selection procedures. Broadcast system information is specified in TS 38.331 [28] for NR, TS 36.331 [51] for E-UTRA and related UE access stratum idle mode procedures in TS 38.304 [50] for NR and TS 36.304 [52] for E-UTRA.

NOTE X: In the case of Indirect Network Sharing, the PLMN ID representing the participating operator which is broadcasted in the Broadcast System Information can be equivalent PLMN ID of participating operator.

### 5.18.3 Network selection by the UE

NOTE: This clause applies to UEs not operating in SNPN access mode. Network selection for UEs set to operate in SNPN access mode is described in clause 5.30.2.4.

A UE that has a subscription to one of the sharing core network operators shall be able to select this core network operator while within the coverage area of the shared network and to receive subscribed services from that core network operator.

NOTE X1: For Indirect Network Sharing as specified in clause 5.18.1, the hosting operator acquires the user subscription data from the participating operator as described in Registraiton procedure in clause 4.2.2.2.2 of TS 23.502 [3].

Each cell in shared NG-RAN shall in the broadcast system information include the PLMN-IDs concerning available core network operators in the shared network.

When a UE performs an Initial Registration to a network, one of available PLMNs shall be selected to serve the UE. UE uses all the received broadcast PLMN-IDs in its PLMN (re)selection processes which is specified in TS 23.122 [17]. UE shall inform the NG-RAN of the selected PLMN so that the NG-RAN can route correctly to the serving AMF. The NG-RAN shall inform the core network of the selected PLMN.

NOTE X2: For Indirect Network Sharing as specified in clause 5.18.1, the broadcasted PLMN IDs include the PLMN IDs representing participating operators and a UE from participating operator selects a PLMN ID representing the participating operator. The serving AMF is in the hosting operator’s network.

In this Release of the specification, in the case of Indirect Network Sharing, when an inbound roaming UE moves to the shared area (i.e. the home network operator of the UE is different from the hosting operator or the participating operator) and if the UE selects PLMN ID representing the participating operator to access the shared network, the serving AMF rejects UE Registration with the existing cause value. The UE then can select PLMN ID based on existing procedures specified in TS 23.122 [17].

As per any network, after Initial Registration to the shared network and while remaining served by the shared network, the network selection procedures specified in TS 23.122 [17] may cause the UE to perform a reselection of another available PLMN.

UE uses all of the received broadcast PLMN-IDs in its cell and PLMN (re)selection processes.

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

### 6.2.1 AMF

The Access and Mobility Management function (AMF) includes the following functionality. Some or all of the AMF functionalities may be supported in a single instance of an AMF:

- Termination of RAN CP interface (N2).

- Termination of NAS (N1), NAS ciphering and integrity protection.

- Registration management.

- Connection management.

- Reachability management.

- Mobility Management.

- Lawful intercept (for AMF events and interface to LI System).

- Provide transport for SM messages between UE and SMF.

- Transparent proxy for routing SM messages.

- Access Authentication.

- Access Authorization.

- Provide transport for SMS messages between UE and SMSF.

- Security Anchor Functionality (SEAF) as specified in TS 33.501 [29].

- Location Services management for regulatory services.

- Provide transport for Location Services messages between UE and LMF as well as between RAN and LMF.

- EPS Bearer ID allocation for interworking with EPS.

- UE mobility event notification.

- S-NSSAIs per TA mapping notification.

- Support for Control Plane CIoT 5GS Optimisation.

- Support for User Plane CIoT 5GS Optimisation.

- Support for restriction of use of Enhanced Coverage.

- Provisioning of external parameters (Expected UE Behaviour parameters or Network Configuration parameters).

- Support for Network Slice-Specific Authentication and Authorization.

- Support for charging.

- Controlling the 5G access stratum-based time distribution based on UE's subscription data.

- Controlling the gNB's time synchronization status reporting and subscription.

NOTE 1: Regardless of the number of Network functions, there is only one NAS interface instance per access network between the UE and the CN, terminated at one of the Network functions that implements at least NAS security and Mobility Management.

In addition to the functionalities of the AMF described above, the AMF may include the following functionality to support non-3GPP access networks:

- Support of N2 interface with N3IWF/TNGF. Over this interface, some information (e.g. 3GPP Cell Identification) and procedures (e.g. Handover related) defined over 3GPP access may not apply, and non-3GPP access specific information may be applied that do not apply to 3GPP accesses.

- Support of NAS signalling with a UE over N3IWF/TNGF. Some procedures supported by NAS signalling over 3GPP access may be not applicable to untrusted non-3GPP (e.g. Paging) access.

- Support of authentication of UEs connected over N3IWF/TNGF.

- Management of mobility, authentication, and separate security context state(s) of a UE connected via a non-3GPP access or connected via a 3GPP access and a non-3GPP access simultaneously.

- Support as described in clause 5.3.2.3 a co-ordinated RM management context valid over a 3GPP access and a Non 3GPP access.

- Support as described in clause 5.3.3.4 dedicated CM management contexts for the UE for connectivity over non-3GPP access.

- Determine whether the serving N3IWF/TNGF is appropriate based on the slices supported by the N3IWFs/TNGFs as specified in clause 6.3.6 and clause 6.3.12 respectively.

NOTE 2: Not all of the functionalities are required to be supported in an instance of a Network Slice.

In addition to the functionalities of the AMF described above, the AMF may include policy related functionalities as described in clause 6.2.8 of TS 23.503 [45].

The AMF uses the N14 interface for AMF re-allocation and AMF to AMF information transfer. This interface may be either intra-PLMN or inter-PLMN (e.g. in the case of inter-PLMN mobility).

In addition to the functionality of the AMF described above, the AMF may include the following functionality to support monitoring in roaming scenarios:

- Normalization of reports according to roaming agreements between VPLMN and HPLMN (e.g. change the location granularity in a report from cell level to a level that is appropriate for the HPLMN); and

- Generation of charging/accounting information for Monitoring Event Reports that are sent to the HPLMN.

In addition to the functionality of the AMF described above, the AMF may provide support for Network Slice restriction and Network Slice instance restriction based on NWDAF analytics.

In addition to the functionalities of the AMF described above, the AMF may provide support for the Disaster Roaming as described in clause 5.40.

In addition to the functionalities of the AMF described above, the AMF may also include following functionalities to support Network Slice Admission Control:

- Support of NSAC for maximum number of UEs as defined in clauses 5.15.11.1 and 5.15.11.3.

In addition to the functionality of the AMF described above, the AMF may include the following functionality to support SNPNs:

- Support for Onboarding of UEs for SNPNs.

In addition to the functionalities of the AMF described above, the AMF may also include following functionalities to support satellite backhaul:

- Support for reporting satellite backhaul category and its modification based on AMF local configuration to SMF as defined in clause 5.43.4.

In addition to the functionalities of the AMF described above, the AMF may provide support for Network Slice instance change for PDU sessions as defined in clause 5.15.5.3.

In addition to the functionalities of the AMF described above, the AMF may also support functionalities for Partial Network Slice support in a Registration Area as described in clause 5.15.17.

In addition to the functionalities of the AMF described above, the AMF may also include functionalities to support NS-AoS not matching deployed Tracking Areas as described in clause 5.15.18.

In addition to the functionalities of the AMF described above, the AMF may also include functionalities to support Network Slice Replacement as described in clause 5.15.19.

In addition to the functionalities of the AMF described above, the AMF may also include functionalities to enforce the LADN Service Area per LADN DNN and S-NSSAI for a UE as described in clause 5.6.5a, as well as to enforce the LADN Service Area per LADN DNN for a UE in clause 5.6.5.

In addition to the functionalities of the AMF described above, the AMF may also include following functions to support Indirect Network Sharing:

- Support for selecting the SMF of participating operator (H-SMF) possibly considering the related location information based on UE location as specified in clause 6.3.2.

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

### 6.3.2 SMF discovery and selection

The SMF selection functionality is supported by the AMF and SCP and is used to allocate an SMF that shall manage the PDU Session. The SMF selection procedures are described in clause 4.3.2.2.3 of TS 23.502 [3].

The SMF discovery and selection functionality follows the principles stated in clause 6.3.1.

If the AMF does discovery, the AMF shall utilize the NRF to discover SMF instance(s) unless SMF information is available by other means, e.g. locally configured on AMF. The AMF provides UE location information to the NRF when trying to discover SMF instance(s). The NRF provides NF profile(s) of SMF instance(s) to the AMF. In addition, the NRF also provides the SMF service area of SMF instance(s) to the AMF. The SMF selection functionality in the AMF selects an SMF instance and an SMF service instance based on the available SMF instances obtained from NRF or on the configured SMF information in the AMF.

NOTE 1: Protocol aspects of the access to NRF are specified in TS 29.510 [58].

The SMF selection functionality is applicable to both 3GPP access and non-3GPP access.

The SMF selection for Emergency services is described in clause 5.16.4.5.

The following factors may be considered during the SMF selection:

a) Selected Data Network Name (DNN). In the case of the home routed roaming, the DNN is not applied for the V-SMF selection.

b) S-NSSAI of the HPLMN (for non-roaming and home-routed roaming scenarios), and S-NSSAI of the VPLMN (for roaming with local breakout and home-routed roaming scenarios).

c) NSI-ID.

NOTE 2: The use of NSI -ID in the network is optional and depends on the deployment choices of the operator. If used, the NSI ID is associated with S-NSSAI.

d) Access technology being used by the UE.

e) Support for Control Plane CIoT 5GS Optimisation.

f) Subscription information from UDM, e.g.

- per DNN: whether LBO roaming is allowed.

- per DNN: whether HR-SBO roaming is allowed.

- per S-NSSAI: the subscribed DNN(s).

- per (S-NSSAI, subscribed DNN): whether LBO roaming is allowed.

- per (S-NSSAI, subscribed DNN): whether HR-SBO roaming is allowed.

- per (S-NSSAI, subscribed DNN): whether EPC interworking is supported.

- per (S-NSSAI, subscribed DNN): whether selecting the same SMF for all PDU sessions to the same S-NSSAI and DNN is required.

- per (S-NSSAI, DNN) associated with 5G VN group: Service Area (LADN service area) for the 5G VN group. In the case of SMF selection for a PDU Session targeting 5G VN group, the AMF may prefer candidate SMF(s) that have an intersection with the LADN service area of the 5G VN group.

g) Void.

h) Local operator policies.

NOTE 3: These policies can take into account whether the SMF to be selected is an I-SMF or a V-SMF or a SMF.

i) Load conditions of the candidate SMFs.

j) Analytics (i.e. statistics or predictions) for candidate SMFs' load as received from NWDAF (see TS 23.288 [86]), if NWDAF is deployed.

k) UE location (i.e. TA).

l) Service Area of the candidate SMFs or serving scope/preferred locality (which may be formulated by AMF as specified in TS 29.510 [58] based on UE location) of the candidate SMFs.

m) Capability of the SMF to support a MA PDU Session.

n) If interworking with EPS is required.

o) Preference of V-SMF support. This is applicable only for V-SMF selection in the case of home routed roaming.

p) Target DNAI.

q) Capability of the SMF to support User Plane Remote Provisioning (see clause 5.30.2.10.4.3).

r) Supported DNAI list.

s) HR-SBO support (according to clause 6.7 of TS 23.548 [130]).

t) Capability of the SMF (V-SMF and H-SMF) to support non-3GPP access path switching.

To support the allocation of a static IPv4 address and/or a static IPv6 prefix as specified in clause 5.8.2.2.1, a dedicated SMF may be deployed for the indicated combination of DNN and S-NSSAI and registered to the NRF, or provided by the UDM as part of the subscription data.

In the case of delegated discovery, the AMF, shall send all the available factors a)-d), k) and n) to the SCP.

In addition, the AMF may indicate to the SCP which NRF to use (in the case of NRF dedicated to the target slice).

If there is an existing PDU Session and the UE requests to establish another PDU Session to the same DNN and S-NSSAI of the HPLMN, and the UE subscription data indicates the support for interworking with EPS for this DNN and S-NSSAI of the HPLMN or UE subscription data indicates the same SMF shall be selected for all PDU sessions to the same S-NSSAI, DNN, the same SMF in non roaming and LBO case or the same H-SMF in home routed roaming case, shall be selected. In addition, if the UE Context in the AMF provides a SMF ID for an existing PDU session to the same DNN, S-NSSAI, the AMF uses the stored SMF ID for the additional PDU Session. In any such a case where the AMF can determine which SMF should be selected, if delegated discovery is used, the AMF shall indicate a desired NF Instance ID so that the SCP is able to route the message to the relevant SMF. Otherwise, if UE subscription data does not indicate the support for interworking with EPS for this DNN and S-NSSAI, a different SMF in non roaming and LBO case or a different H-SMF in home routed roaming case, may be selected. For example, to support a SMF load balancing or to support a graceful SMF shutdown (e.g. a SMF starts to no more take new PDU Sessions).

In the home-routed roaming case, the SMF selection functionality selects an SMF in VPLMN based on the S-NSSAI of the VPLMN, as well as an SMF in HPLMN based on the S-NSSAI of the HPLMN. This is specified in clause 4.3.2.2.3.3 of TS 23.502 [3].

In the case of Indirect Network Sharing, the SMF selection functionality selects an SMF of participating operator considering the location information based on currently UE location. The selection procedure of SMF in HPLMN for home-routed roaming can be reused.

If the HR-SBO roaming is allowed for the PDU Session, the DNN is also considered for V-SMF selection.

When the UE requests to establish a PDU Session to a DNN and an S-NSSAI of the HPLMN, if the UE MM Core Network Capability indicates the UE supports EPC NAS and optionally, if the UE subscription indicates the support for interworking with EPS for this DNN and S-NSSAI of the HPLMN, the selection functionality (in AMF or SCP) selects a combined SMF+PGW-C. Otherwise, a standalone SMF may be selected.

If the UDM provides a subscription context that allows for handling the PDU Session in the VPLMN (i.e. using LBO) for this DNN and S-NSSAI of the HPLMN and, optionally, the AMF is configured to know that the VPLMN has a suitable roaming agreement with the HPLMN of the UE, the following applies:

- If the AMF does discovery, the SMF selection functionality in AMF selects an SMF from the VPLMN.

- If delegated discovery is used, the SCP selects an SMF from the VPLMN.

If an SMF in the VPLMN cannot be derived for the DNN and S-NSSAI of the VPLMN, or if the subscription does not allow for handling the PDU Session in the VPLMN using LBO, then the following applies:

- If the AMF does discovery, both an SMF in VPLMN and an SMF in HPLMN are selected, and the DNN and S-NSSAI of the HPLMN is used to derive an SMF identifier from the HPLMN.

- If delegated discovery is used:

- The AMF performs discovery and selection of H-SMF from NRF. The AMF may indicate the maximum number of H-SMF instances to be returned from NRF, i.e. SMF selection at NRF.

- The AMF sends Nsmf\_PDUSession\_CreateSMContext Request to SCP, which includes the endpoint (e.g. URI) of the selected H-SMF, and the discovery and selection parameters as defined in this clause, i.e. parameter for V-SMF selection. The SCP performs discovery and selection of the V-SMF and forwards the request to the selected V-SMF.

- The V-SMF sends the Nsmf\_PDUSession\_Create Request towards the H-SMF via the SCP; the V-SMF uses the received endpoint (e.g. URI) of the selected H-SMF to construct the target destination to be addressed. The SCP forwards the request to the H-SMF.

- Upon reception of a response from V-SMF, based on the received V-SMF ID the AMF obtains the Service Area of the V-SMF from NRF. The AMF uses the Service Area of the V-SMF to determine the need for V-SMF relocation upon subsequent UE mobility.

If the initially selected SMF in VPLMN (for roaming with LBO) detects it does not understand information in the UE request, it may reject the N11 message (related with a PDU Session Establishment Request message) with a proper N11 cause triggering the AMF to select both a new SMF in the VPLMN and a SMF in the HPLMN (for home routed roaming).

The AMF selects SMF(s) considering support for CIoT 5GS optimisations (e.g. Control Plane CIoT 5GS Optimisation).

In the case of onboarding of UEs for SNPNs, when the UE is registered for SNPN onboarding the AMF selects SMF(s) of Onboarding Network considering the Capability of SMF to support User Plane Remote Provisioning.

Additional details of AMF selection of an I-SMF are described in clause 5.34.

In the case of home routed scenario, the AMF selects a new V-SMF if it determines that the current V-SMF cannot serve the UE location. The selection/relocation is same as an I-SMF selection/relocation as described in clause 5.34.

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

Annex XY (Informative):  
5GS support for Indirect Network Sharing deployment

# XY.1 General

This annex provides guidance on how 5GS features and capabilities can be used to support Indirect Network Sharing deployment option specified in clause 6.21 of TS 22.261 [2] and clause 5.18.

The Indirect Network Sharing deployment option is illustrated with the Figure 5.18.1-2.

For the UE mobility and related restrictions, considering the shared RAN area and network configuration based on agreement between operators are assumed and existing mobility restriction mechanisms specified in clause 5.3.4.1 can be applied.

For the mobility management, the related procedures (e.g., handover, mobility registration update) specified in the clause 4.23 of TS 23.502 [3] can be reused.

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