**3GPP TSG-WG SA2 Meeting #140E e-meeting *S2-200xxxx***

**Elbonia, August 19 – September 1, 2020 (revision of S2-200xxxx)**

**Source: Huawei, HiSilicon**

**Title: KI#4, evaluations and conclusions on boarding and provisioning for SNPN subscription**

**Document for: Approval**

**Agenda Item: [Agenda Item]**

**Work Item / Release: [FS\_eNPN] / [Rel-17]**

*Abstract: This contribution introduces…*

# 1. Introduction/Discussion

This contribution aims to provide the evaluations and conclusions for the Solution #5, #6, #27, #29, #30, #31, #33, #34, #35, #36, #37, #39 and #40. These solutions address the key issue #4, especially for provisioning of NPN credentials (i.e. for primary authentication) and other information to enable SNPN access. The following table provides an overall analysis and comparison for these solutions in the following dimensions:

* UP based solution or CP based solution or support both
* Primary authentication and authorization: whether this is specified and if yes, which entity is responsible for the primary AA
* Onboarding registration: whether the registration is specified to restrict only for onboarding and remote provisioning
* Configuration PDU session: whether the PDU session is specified to provide restricted connectivity to the PS
* O-SNPN discovery: whether discovery and selection of the onboarding SNPN is specified
* subscription provisioning at UE: whether this is specified
* subscription provisioning at SNPN: whether subscription at UDM of the SO-SNPN is specified

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution | UP or CP based or both | primary AA | Onboarding registration | configuration PDU Session | O-SNPN discovery | subscription provisioning at UE | subscription provisioning at SNPN | remark |
| Sol#5: UE Onboarding and provisioning for an SNPN | UP-based solution | By DCS | Support | Support | Support | Support | Not specified |  |
| Sol#6: Control Plane-Based UE Onboarding and Provisioning Solution | CP-based solution | Not specified | Support | NA | Not specified | Support | Support |  |
| Sol#27: Common UP/CP onboarding solution for SNPN | both | By DCS/PS | Support | Support | Not specified | Support | Support | **UP or CP decision made by SO-SNPN** |
| Sol#29: Discovery of the Onboarding Network | Not specified | Not specified | Not specified | Not specified | Support | Not specified | Not specified |  |
| Sol#30: UE Onboarding via Control Plane | CP-based solution | By DCS | Support | NA | Not specified | Support | Support | **PS needs subscribe to UE events at O-SNPN** |
| Sol#31: UE onboarding and provisioning for SNPN subscription | UP-based solution. | By DCS or PLMN | Support | Support | Support | Support | Not specified | **the non-3GPP Identities/credentials are provisioned** |
| Sol#33: UE Onboarding and remote provisioning based on eSIM | UP-based solution | By PLMN | Support | Support | NA | Support | Not specified | UICC is used at UE |
| Sol#34: PLMN assisted On-boarding Procedures | CP-based solution | By PLMN | NA | NA | NA | Support | NA | SNPN subscription is updated at the PLMN UDM, this is trigged by UE location event |
| Sol#35: Solution for On Boarding for SNPN Compatible with SO's Existing Provisioning Server | both | By SO-SNPN | Support | Support | Support | Support | Support |  |
| Sol#36: Providing provisioning details to UEs using local and central provisioning server | Not specified | Not specified | Not specified | Not specified | Not specified | Not specified | Not specified | Architecture for PS (Local PS, Central PS) |
| Sol#37: UE Onboarding and remote provisioning for SNPN | Not specified | Not specified | Not specified | Not specified | Not specified | Not specified | Not specified | Architecture for OPF (merging PS and DCS) (vOPF, default OPF, target OPF) |
| Sol#39: UE onboarding using PLMNs | UP-based solution | By PLMN | Support | Support | NA | Support | Support | eSIM is used at UE |
| Sol#40: Solution for UE onboarding and remote provisioning | UP-based solution | Not specified | Not specified | Support | Not specified | Support | Support |  |

**Proposal:** two kinds of scenarios are supported, i.e. the ON can be a PLMN or a SNPN.

In case the UE is registered to PLMN, the credential/configuration can be transmitted over PLMN to UE using CP or UP based procedure.

In case the UE is registered to SNPN, the credential/configuration can be transmitted over O-SNPN to UE.

* O-SNPN can be same as SO-SNPN or different from SO-SNPN based on specific scenario.
* The UE shall select the O-SNPN (which supports on-boarding) and the SO-SNPN (which serves the UE) based on the broadcast information. This need to be confirmed by RAN2.
* DCS, which verifies whether the UE is allowed to access the O-SNPN for on-boarding purpose based on default UE credentials, should belong to SO-SNPN domain or a dedicated DCS domain based on specific scenario. This needs to be confirmed by SA3 for security consideration.

Note1: SO-SNPN may only contain part of the elements in 5GC, i.e. it may not deploy AMF, SMF, etc.

Note2: UDM may act as DCS function based on deployment.

Common aspects:

* UE performs onboarding registration, which is restricted only for onboarding service. A validity timer can be configured to restrict the Onboarding registration. Upon the validity timer expired, the ON initiates the de-registration procedure. In case of UP based solution, UE establishes the configuration PDU Session only for purpose of remote provisioning.
* On the issue of remote provisioning,
	+ In case GSMA RSP is used, PS can provision the credential and the configuration parameters (PLMN or NPN list used to connect to SNPN) to UE over either CP or UP.
	+ In case Non-3GPP credential is used, the credential can be transmitted to UE over either UP or CP based solution and configuration parameters (NSSAI, DNN used to connect to SNPN) should be transmitted over CP to UE.
* Subscription data in UDM may be updated accordingly when SNPN on-boarding is successfully performed, e.g. allowed DNN, allowed NSSAI.
* UE re-registers to SNPN with the received credential and configuration parameters.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.xxx.

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

## 7.X Key issue #4: UE Onboarding and remote provisioning

Editor's note: This clause will provide a general evaluation and comparison of the solutions per Key Issue #<X>.

This part provides evaluations on solutions that address provisioning of NPN credentials (i.e. for primary authentication) and other information to enable SNPN access

Sol#5: FFS

Sol#6: FFS

Sol#27: FFS

Sol#29: FFS

Sol#30: FFS

Sol#31: this solution proposes to use the UP-based approach and allows the UEs without subscription to the desired SNPN to temporarily register to a 5G network that supports UE onboarding and to establish a restricted PDU Session for provisioning of NPN credentials (i.e. for primary authentication) and other information to enable SNPN access. In the case of onboarding 5G is PLMN or PNI-NPN, UE selects and registers to the onboarding PLMN using default operator profile (subscription and credentials to the onboarding PLMN for the UE to be "uniquely identifiable and verifiably secure"), and the AMF restricts this registration only for onboarding service only based on UDM indication, SMF restricts the PDU session for remote provisioning only. In the case of onboarding 5G is SNPN, UE selects and registers to the onboarding SNPN using broadcast system information and default configuration (including default UE credentials for the UE to be "uniquely identifiable and verifiably secure"), and the AMF restricts this registration only for onboarding service only based on local configuration and UE indication, SMF restricts the PDU session for remote provisioning only based on local configuration. In both cases, the UE initiates the de-registration at onboarding 5G network after finishing the remote provisioning or the onboarding 5G network initiates the de-registration, e.g. when the time is up.

Sol#33: FFS

Sol#34: FFS

Sol#35: this solution has following benefits for on-boarding participants:

* For device vendor: The solution does not mandatory ask for a DCS built by device vendor which reduces cost for device vendor. The solution supports DCS if device vendor has capability to maintain it, device vendor only need to have an agreement with SO-SNPN and does not need an agreement with O-SNPN. The solution support manual or automatic network selection without limitation of terminal model, the UEs could have input interface or not.
* For O-SNPN: The solution has little impact on RAN side for broadcasting on-boarding information. The solution has little configuration on core network for restrict PDU session establishment.
* For SO-SNPN: If DCS is maintained by device vendor, the SO-SNPN has interface with DCS, the architecture is similar with architecture of key issue#1. Thus, the similar logic can be reused. If DCS is co-located in SO-UDM, the similar logic for primary authentication can be reused. The SO-SNPN provides configuration to the UE via CP using UPU which reuses existing R15 method, since the configuration is protected by AUSF located in SO-SNPN, the O-SNPN cannot modify that.
* For vertical side: Vertical can reuse existing IT PS (e.g. CA), and can reuse existing CMPv2 protocol to provide non-3GPP credential to the UE via UP without update of existing IT network entity.

Sol#36: FFS

Sol#37: FFS

Sol#39: FFS

Sol#40: FFS

\* \* \* \* Second change \* \* \* \*

## 8.X Key issue #4: UE Onboarding and remote provisioning

Editor's note: This clause will capture conclusions for Key Issue #<X>.

For provisioning of NPN credentials (i.e. for primary authentication) and other configuration information to enable SNPN access, two kinds of scenarios are supported, i.e. the ON can be a PLMN or a SNPN, and the following bullets are adopted as the way forward:

* In case the UE is registered to PLMN, the credential/configuration can be transmitted over PLMN to UE using CP or UP based procedure.
* In case the UE is registered to SNPN, the credential/configuration can be transmitted over O-SNPN to UE, and
	+ O-SNPN can be same as SO-SNPN or different from SO-SNPN based on specific scenario.
	+ The UE shall select the O-SNPN (which supports on-boarding) and the SO-SNPN (which serves the UE) based on the broadcast information. This need to be confirmed by RAN2.
	+ DCS, which verifies whether the UE is allowed to access the O-SNPN for on-boarding purpose based on default UE credentials, should belong to SO-SNPN domain or a dedicated DCS domain based on specific scenario. This needs to be confirmed by SA3 for security consideration.

Note1: SO-SNPN may only contain part of the elements in 5GC, i.e. it may not deploy AMF, SMF, etc.

Note2: UDM may act as DCS function based on deployment.

Moreover, the following aspects are common for the two kinds of scenarios:

* Support On-boarding registration to restrict this only for on-boarding service, e.g., based on UDM indication or UE indication or local policy. If the registration is restricted, the UE initiates the de-registration at on-boarding 5G network after finishing the remote provisioning or the on-boarding 5G network initiates the de-registration, e.g. when the time is up. If UP-based solution is used, based on local configuration or UDM subscription the configuration can be supported via a PDU session dedicated to the remote provisioning or via a PDU session used also for other purposes.
* On the issue of remote provisioning:
	+ In case GSMA RSP is used, PS can provision the credential and the configuration parameters (PLMN or NPN list used to connect to SNPN) to UE over either CP or UP.
	+ In case Non-3GPP credential is used, the credential can be transmitted to UE over either UP or CP based solution and configuration parameters (NSSAI, DNN used to connect to SNPN) should be transmitted over CP to UE.
* Subscription data in UDM may be updated accordingly when SNPN on-boarding is successfully performed, e.g. allowed DNN, allowed NSSAI.
* UE re-registers to SNPN with the received credential and configuration parameters.

\* \* \* \* Third change \* \* \* \*

\* \* \* \* Fifth change \* \* \* \*

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