# FS\_eNPN - SA2 Open issues related to KI#1 and KI#4 and questions for resolving the open issues – moderated e-mail discussion…

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These questions and answers will be used to progress the SA2 work for FS\_eNPN KI#1 and KI#4.

Questions for open issues that require SA3 input has so far been excluded.

Ver2 includes changes addressing comments to the questions from Convida, Orange, Qualcomm, OPPO, Huawei and Futurewei.

As questions are added and changed, please re-send your proposed answers.

# Question KI#1-Q1: Service Providers

**Question**: What different types of service providers can be supported and what network functions can be assumed that these different types of service providers have?

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| **Company** | **Comments** |
| Intel | SP can be an SNPN or a PLMN.  The SNPN can either have a full-fledged 5GC or only have AAA architecture. In the latter case there may be a need for protocol interworking between SBA and Radius/Diameter interfaces.  “Home routed”-like architecture (as in Solution #1) should be supported to enable session continuity as UE moves between the SNPN and the PLMN. |
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# Question KI#1-Q2: Architectures

Several solutions exist proposing different existing or enhanced architectures to support KI#1 and we need to come to conclusions on which of these architectures we should agree on in this study. Example "architectures" proposed are e.g. MOCN, roaming like architecture, and AUSF connecting to "AAA".

**Question**: What existing architectures can be used to support KI#1 and what enhancements are needed on top of these architectures?

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| **Company** | **Comments** |
| Intel | Architecture similar to roaming architecture (Solution #1) is sufficient.  In our view, MOCN is not a solution for KI#1 because implying that RAN is owned by one administration while the 3rd party is the 5GC is a stretch.  Assume a shared RAN provides access to 5GC from MNO A, B and C, while the RAN is owned (administered) by MNO A. The MOCN solution implies that all subscribers of MNO B or C are in a situation of “credentials being owned by a 3rd party”, which is in our view not the problem that needs to be solved. |
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# Question KI#1-Q3: Identifying the Service Providers

A separate entity providing the subscription can according to existing solutions be PLMNs or verticals that don't have a PLMN id. We should agree on how to identify these separate entities also called Service Providers

**Question**: How to identify the separate entity providing the subscription?

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| **Company** | **Comments** |
| Intel | We believe there is no need for any SP-ID to be broadcasted on Uu.  An “SP-ID” is only used in the UE configuration (refer to Solution #1) and can be either a PLMN ID or a (PLMN ID + NID) pair (for PLMN and SNPN, respectively). Also, the realm part of the Network Specific Identifier (encoded as user@realm) may be encoded in a way that uniquely identifies the SP’s realm. |
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# Question KI#1-Q4: SNPN selection

In release 16 the UE had a subscription tied directly to the SNPN identity so that UE could read SIB1 network identities and directly know that it can register to a network with matching SNPN identity. In this key issue the subscription is owned by a separate entity with an identity according to question 1. There needs to be a mechanism to enable the UE to make an efficient network selection so that it selects a suitable SNPN.

## Question KI#1-Q4.1: SNPN selection based on UE pre-configuration

**Question**: Should it be possible to pre-configure the UE with the preferred SNPNs to select?

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| **Company** | **Comments** |
| Intel | Yes. UE pre-configuration with network lists in priority order should be the default.  Today the pre-configured lists in the UE or USIM (e.g. “Operator Controlled PLMN Selector” list or “Equivalent Home PLMN” list) are the fundamental ingredients that drive network selection when UE’s Home PLMN is not advertised on the radio.  In our view pre-configured network lists shall remain the fundamental mechanism that drives network selection even when the serving network is an SNPN.  To support all possible cases (e.g. SP is a PLMN, SP is another SNPN, service continuity, etc.) a common network selection mechanisms is used based on UE configuration (refer to Solution #1) regardless whether the UE has PLMN or SNPN subscription.  If UE has multiple subscriptions, we expect that the user needs to activate the subscription(s) they wish to use simultaneously and the network selection is performed separately for each activated subscription (similar to a Multi-USIM device). |
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## Question KI#1-Q4.2: Support for SNPN selection in case UE does not have correct or sufficient information for SNPN selection

**Question**: Are there scenarios where the stored configuration information in the UE may not be sufficient to select the suitable SNPN and should those scenarios be supported?

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| **Company** | **Comments** |
| Intel | No.  Today, if during network selection the UE has exhausted all the PLMN IDs in the configured list without finding a match with the information advertised on the radio interface, the UE will nevertheless attempt to register with one of the detected PLMNs.  However, for SNPN subscribers there is the following stage 1 requirement in 22.261: “*The 5G system shall support a mechanism to prevent a UE with a subscription to a non-public network from automatically selecting and attaching to a PLMN or non-public network it is not authorized to select.*”  Because of this requirement we think that the UE must stop the network selection if the information advertised on the radio does not match any of the configured lists. |
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## Question KI#1-Q4.3: SNPN selection in case UE does not have correct or sufficient information for SNPN selection

**Question**: If there is a need to support scenarios where the UE is not pre-configured with the correct and sufficient information about which specific SNPN to select, is it sufficient that the UE selects (in any order) an available SNPN that supports accessing using credentials from a separate entity or should there be support to guide the UE which SNPN or PLMN to select?

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| **Company** | **Comments** |
| Intel | No, there is no need to support such scenarios. See answer to Question KI#1-Q4.2. |
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# Question KI#1 – (new) Q5: Mobility and service continuity

For KI#1, TR mentions for mobility and service continuity

- UE moving from SNPN#1 with separate entity#1 to SNPN#2 with separate entity#1 available; and

- UE moving between SNPN#1 (where separate entity=PLMN) and PLMN.

However, some of the present available solutions are unclear on how such mobility and service continuity requirements are met. Are clarifications required before evaluation of solutions are done or will work be done in normative phase or is it not necessary to work on these requirements in this release.

**Question**: Should mobility and service continuity scenarios be studied and detailed in this study phase?

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| **Company** | **Comments** |
| Intel | Yes, service continuity (actually – session continuity) should be studied for the case described in the second bullet above.  Solution #1 clearly describes how service continuity requirements are met:  *- When the service provider of the UE is a PLMN, the standalone non-public network selects the session management function and PDU Session Anchor (PSA) in the PLMN to support PDU sessions that require service continuity using the home-routed roaming architecture.*  *- Mobility in the absence of the N14 interface between SNPN and PLMN is handled by the "Existing PDU Session" indication in the PDU Session Establishment Request.*  The description focuses only on the case where the SP is a PLMN (i.e. second bullet above) because we are not sure if there is a requirement to handle the case described in the first bullet, but the principle would be the same. |
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# Question KI#4-Q1: Credentials in scope of provisioning

SA1, in [S1-201087](http://www.3gpp.org/ftp/TSG_SA/WG1_Serv/TSGS1_89e_ElectronicMeeting/Docs/S1-201087.zip), replied to the SA2 question whether provisioning requirement applies to SNPNs for:

1. IMSI accompanied by AKA credentials, both used for SNPN authentication
2. IMSI accompanied by AKA credentials, the IMSI being used to derive a Network Specific Identifier that will be used for SNPN authentication with the AKA credentials

SA1 reply:

"*A1) The quoted requirement applies to non-3GPP identities and credentials only, while SA2’s question refers to 3GPP identities and credentials. As such, the answer is no, the above-quoted requirement does not include provisioning of the mentioned identities and credentials to SNPNs. However, SA1 would like to point out that a requirement for remote provisioning has been included in TS 22.261, clause 6.14.2, since Release 15:*

*The 5G system shall support a secure mechanism for a home operator to remotely provision the 3GPP credentials of a uniquely identifiable and verifiably secure IoT device.*

This requirement was acknowledged as being part of "Existing features partly or fully covering the use case functionality" during FS\_AVPROD study (see TR 22.827)."

The KI#4 describes provisioning of e.g. "information" and "NPN subscription".

**Question**: Is there a need to accommodate the Key Issue description for Onboarding?

Answers:

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| **Company** | **Comments** |
| Intel | The KI description is generic i.e. it allows any type of credentials to be provisioned (i.e. as per SA1 requirements - 3GPP and non-3GPP credentials). There is therefore no need to amend the KI description. |
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# Question KI#4-Q2: Provisioning for PNI-NPN

SA2 also asked about provisioning for PNI-NPN and SA1, in [S1-201087](http://www.3gpp.org/ftp/TSG_SA/WG1_Serv/TSGS1_89e_ElectronicMeeting/Docs/S1-201087.zip), provided answers to the SA2 questions as follows:

*Q2) SA2 would like to verify with SA1 whether the above-quoted requirement applies to PNI-NPN, which is the NPN “hosted by a PLMN” as described in TS 22.261 clause 6.25.1, or not, and what would be the corresponding use cases.*

*A2) SA1 requests clarification on the question from SA2, specifically, is SA2 asking if the above quoted question is related to primary or secondary authentication for the PNI-NPN.*

*Q3) If SA1 confirm the above-quoted requirement applies to PNI-NPN in Q2, SA2 have further Q3 as below.*

*For PNI-NPN, a UE may perform secondary PDU session authentication using 3rd party credentials, if the NPN is integrated in PLMN by means of dedicated DNNs, and/or a UE may perform Network specific slice authentication and authorisation (NSSAA) using 3rd party credentials if the NPN is integrated in PLMN by means of network slice. Given the authentication procedures already specified in TS 23.501, TS 24.501 and TS 33.501, SA2 would also like to ask whether provisioning for identities and credentials used for Network specific slice authentication and authorisation (NSSAA) and secondary PDU session authentication should be considered to be covered as part of NPN service requirement for onboarding and remote provisioning solution.*

*A3) SA1 requests clarification on the question from SA2, specifically, is SA2 asking whether 3rd party credentials may be used for secondary network slice authentication and authorization or*

*Is SA2 asking whether these 3rd party credentials for secondary authentication can be provisioned via the 3GPP system, or is SA2 asking something else.*

**Question**: is it in scope of the study to provision identities and credentials for PNI-NPN (e.g. used for NSSAA or secondary authentication)?

Answers:

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| **Company** | **Comments** |
| Intel | In our view this is not part of the UE onboarding proper. PNI-NPN related information can be configured either over the top or using UE Configuration Update. |
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# Question KI#4-Q3: AS impacts to support UE Onboarding

Question: What impacts do you foresee needed to the AS (Access Stratum) to support UE Onboarding?

Answers:

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| **Company** | **Comments** |
| Intel | A new 1-bit SIB indication (“Support for Onboarding”) broadcasted by the NG-RAN indicates that the SNPN provides access to onboarding service. The UE determines that the cell supports onboarding service over NG-RAN via the broadcast indicator in AS and subsequently initiates the Registration procedure. During the registration procedure, the UE provides information in both RRC and NAS registration request indicating that the registration is only for restricted onboarding service based on which the NG-RAN selects an AMF in the O-SNPN. |
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# Question KI#4-Q4: Assumptions regarding DCS

To address some solutions for KI#4, a DCS has been "defined" as:

**Default Credential Server (DCS)**: The server that can authenticate a UE with default credentials or provide means to another entity to do it.

The ownership of the DCS is FFS e.g. it can be owned by the device manufacturer or a 3rd party affiliated with the device manufacturer or by the ON. The ownership may imply a need for certain functionality or interfaces.

Also, the interfaces used by the DCS is FFS e.g. if SBA services can be assumed to be used by the DCS.

**Question**: In the solutions making use of a DCS, what assumptions can be made with regards to the DCS e.g. ownership and type of interfaces/protocols supported?

Answers:

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| **Company** | **Comments** |
| Intel | The standard should be defined for the most generic case where each of the logical entities can be owned by a different administration. For instance, a device manufacturer may own the DCS, but it might as well delegate the ownership to a major consumer electornics vendor. The interface between 5GC and DCS does not need to be service-based. |
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# Question KI#4-Q5: Assumptions regarding Provisioning Server

A PS has been "defined" as:

**Provisioning Server:** The server that will provision the UE.

The ownership of the Provisioning Server is FFS, e.g. it can be owned by the device manufacturer or a 3rd party affiliated with the device manufacturer or by the ON.

**Question**: What assumptions can be made with regards to the PS e.g. ownership and type of interfaces/protocols supported? How do we consider the compatibility with existing Provisioning Servers?

Answers:

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| **Company** | **Comments** |
| Intel | The standard should be defined for the most generic case where each of the logical entities can be owned by a different administration. The Provisoning Server may be owned e.g. by the O-SNPN operator, by the SNPN owning the subscription or by a 3rd party. |
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# Question KI#4-Q6: UP or CP used for provisioning?

Solutions for UP and for CP have been discussed and added to the TR.

**Question**: Should UP or CP be used for provisioning, or both be possible? Is there any other potential provisioning mechanism?

Answers:

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| **Company** | **Comments** |
| Intel | Focus on UP in Rel-17. |
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# Question KI#4-Q7: Assumption of subscription in the network

It is FFS whether PEI or another UE identifier is used to identify a subscription that needs to be provisioned in the UE and how the list of UE identifiers is provisioned in the SNPN owning the subscription.

**Question**: How is the subscription that needs to be provisioned in the UE identified and how is it provisioned in the network.

Answers:

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| **Company** | **Comments** |
| Intel | There are two cases to consider:  A) UE is a truly “off-the-shelf” device that has no configuration other than the default credential. In this case the user enters the PS identifier (and optionally the SO identifier). The PS selects the SO as follows:  A1) PS uses the SO identifier provided by the UE to select the SO.  A2) PS is provisioned with a list of UE identifiers for onboarding on per-SO basis; the UE identifier indirectly points to the SO.  B) There is an agreement in place between the UE vendor and the SNPN owning the subscription, so that the device is provisioned with some additional information (e.g. PS identity, SO identity). In this case the additional configured information is used to select the PS and the SO. |
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# Question KI#4-Q8: pre-configured information in the device

The device (UE) may have been pre-configured with information e.g. to ensure requirement "uniquely identifiable and verifiably secure" is satisfied and information related to e.g. Onboarding Network or Subscription Owner.

**Question**: What information is required to be available in the device prior to onboarding and what information *may* be available?

Answers:

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| **Company** | **Comments** |
| Intel | The default credential shall be available in the UE.  Additional information (e.g. PS and/or SO identity) may be configured or may be entered by the user. |
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# Question KI#4-Q9: 3GPP connectivity used for UE Onboarding

**Question**: Is the 3GPP connectivity used for UE Onboarding restricted in some way and if yes, how is it ensured that it is restricted such that it only can be used for onboarding?

NOTE: KI#4-Q3 addressed AS impacts to support UE Onboarding in general i.e. this question is related to mechanisms to potentially restrict the use of the 3GPP connectivity for only UE Onboarding purposes, i.e. if restriction is seen needed.

Answers:

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| **Company** | **Comments** |
| Intel | The Configuration PDU Session is monitored by the O-SNPN so that it can only provide access to selected set of PSs. |
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# Question KI#4-Q10: Determination of Subscription Owner, DCS and Provisioning Server

**Question**: Who needs to determine the SO, DCS and the PS (UE and/or ON)? How is the SO, DCS and the PS determined?

Answers:

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| **Company** | **Comments** |
| Intel | There are two cases to consider:  A) UE is a truly “off-the-shelf” device that has no configuration other than the default credential. In this case the user enters the PS identifier (and optionally the SO identifier). The PS selects the SO as follows:  A1) PS uses the SO identifier provided by the UE to select the SO.  A2) PS is provisioned with a list of UE identifiers for onboarding on per-SO basis; the UE identifier indirectly points to the SO.  B) There is an agreement in place between the UE vendor and the SNPN owning the subscription, so that the device is provisioned with some additional information (e.g. PS identity, SO identity). In this case the additional configured information is used to select the PS and the SO. |
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# Question KI#4-Q11: Duration of connectivity

**Question**: Is the time duration of the 3GPP connectivity used for UE Onboarding controlled by some means that requires standardization?

Answers:

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| **Company** | **Comments** |
| Intel | O-SNPN should monitor the time duration of the Configuration PDU Session. No need for standardization. |
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# Question KI#4-Q12: UDM for Onboarding

A UE is assumed to be able to perform some kind of registration for the purpose of getting connectivity for UE onboarding.

**Question**: Is there a UDM used during the onboarding procedure and what is then the role(s) of such UDM?

Answers:

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| **Company** | **Comments** |
| Intel | Since UDM is subscription oriented, and in the case of onboarding, there is not yet a subscription provisioned in the UE, our proposal is that UDM plays no role in onboarding procedures within SA2 scope. |
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# Question KI#4-Q13: Slicing considerations

It is FFS whether any specific slicing considerations are needed.

**Question**: Are there any slicing considerations needed?

Answers:

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| **Company** | **Comments** |
| Intel | A reasonable requirement is for operators to enable a specific network slice for onboarding procedures, so that the onboarding procedure is as much as possible isolated from regular traffic. Therefore, it should not be precluded the onboarding procedure to be executed through an onboarding network slice.  We don't see the need for any additional standardization to enable the above. |
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# Question KI#4-Q14: Assumptions regarding IMS subscription

KI#3 scope is to enable IMS services.

If 5GS level credentials are not available in the UE, then the UE might not have any IMS level credentials either.

**Question**: Can provisioning of IMS level credentials be regarded as in scope of KI#4, and if yes, what additional mechanisms are required to support the envisioned scenarios of IMS deployments?

Answers:

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| **Company** | **Comments** |
| Intel | It can. The onboarding solution should focus on provisioning the UE with IMS credentials. Whether the 5GS and IMS provider is the same or not should be discussed as part of KI#3 on support of voice.  For Rel-17, we are also fine to restrict the provisioning of IMS credentials for the case where the 5GS and IMS provider is the same. |
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# Question KI#4-Q15: Need for de-registration after provisioning?

It is FFS whether in case the ON and the SNPN owning the subscription are the same, there is a need for the UE to de-register, then select the SNPN and re-register or whether other procedures that does not result in de-registering would suffice

**Question**: Is there a need for de-registration after the UE been provisioned with a new subscription?

Answers:

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| **Company** | **Comments** |
| Intel | Yes. At the end of onboarding the UE should deregister and subsequently register using the assigned network credentials. Given that the onboarding procedure is performed infrequently, we don’t see the need for achieveing signalling savings by trying to re-use the same registration. |
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# Question KI#4-Q16: PNI-NPN

Update of PLMN subscription by adding NPN parts of the PLMN subscription may be envisioned as per TS 22.263 requirement:

"*Based on MNO and NPN policy, the 5G system shall support a mechanism to enable MNO to update the subscription of an authorized UE in order to allow the UE to connect to a desired NPN. This on-demand mechanism should enable means for a user to request on-the-spot network connectivity which is authorized by its MNO.*".

**Question**: What interactions between UE and network is required for adding or updating NPN parts of PNI-NPN subscription? What procedures in the network are required that are in SA2 scope?

Answers:

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| **Company** | **Comments** |
| Intel | We assume that updates of PLMN subscription in UDM/UDR is not in SA2 scope i.e. once PLMN subscription is updated based on input from NPN customer then SA2 can assume it is seen as subscription already been updated in UDM. |
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# Rapporteur Summary

# Proposed Conclusions

The proposed conclusions will be used to identify solutions for the conclusions of the TR.

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