**3GPP TSG-CT WG1 Meeting #125-eC1-20xxxx**

**Electronic meeting, 20-28 August 2020**

**Source: China Mobile**

**Title: Discussion paper on consideration of NSSAIs for NSSAA not supported UE in roaming scenarios**

**Agenda item: 16.2.6**

**Document for: Discussion**

# 1 Introduction

As discussed in CT1#123-e and CT1#124-e meetings, under the following conditions：

1. If a VPLMN S-NSSAI is mapped into more than one HPLMN S-NSSAIs, while at least one of the HPLMN S-NSSAIs is subject to NSSAA; and
2. if the UE indicate NSSAA not supported , and
3. if the UE requests for the HPLMN S-NSSAIs is subject to NSSAA;

AMF cannot simply use a VPLMN S-NSSAI with the rejection cause "S-NSSAI not available in the current PLMN or SNPN". The reason is that the same VPLMN S-NSSAI is included both in the allowed NSSAI and the rejected NSSAI, which could impact the allowed NSSAI (i.e. Removing the same VPLMN and the mapped HPLMN S-NSSAIs from the allowed NSSAI.)

This paper attempts to analyse the NSSAIs in the REGISTRATION ACCEPT message, and proposed possible solutions.

# 2 Discussion

An example of the S-NSSAI mapping and NSSAA requirement for a UE may be as follows:

**Table 1. An example of the S-NSSAI mapping and NSSAA requirement for a UE**

|  |  |  |  |
| --- | --- | --- | --- |
|  | VPLMN S-NSSAI | subscribed S-NSSAIs/  Mapped HPLMN S-NSSAI | Subject to NSSAA |
| 1 | S-NSSAI M(visitor S-NSSAI) | S-NSSAI 1 | No |
| 2 | S-NSSAI M(visitor S-NSSAI) | S-NSSAI 2 | No |
| 3 | S-NSSAI M(visitor S-NSSAI) | S-NSSAI 3 | Yes |
| 4 | S-NSSAI M(visitor S-NSSAI) | S-NSSAI 4 | Yes |
| 5 | S-NSSAI N | S-NSSAI 5(default **,**standard S-NSSAI) | No |

1. **The allowed NSSAI**

According to TS 23.501 and TS 24.501, the allowed NSSAI can be considered on following aspects:

1. When establishing a PDU Session in a network slice, UE only cares about the allowed NSSAI.
2. the allowed NSSAI in the REGISTRATION ACCEPT message contains the subscribed S-NSSAIs marked as default or the mapped S-NSSAI(s) which are not subject to NSSAA.
3. the allowed NSSAI can be updated by a new allowed NSSAI or the rejected NSSAI.

Table 2 shows the Allowed NSSAI in this example if subscribed S-NSSAI are requested. As long as the mapped S-NSSAI(s) not subject to NSSAA are included in the allowed NSSAI and not updated by the rejected NSSAI, the home routed services related to those S-NSSAI(s) are not impacted.

**Table 2. The Allowed NSSAI in this example if subscribed S-NSSAI are requested**

|  |  |  |
| --- | --- | --- |
|  | VPLMN S-NSSAI | Mapped HPLMN S-NSSAI |
| 1 | S-NSSAI M(visitor S-NSSAI) | S-NSSAI 1 |
| 2 | S-NSSAI M(visitor S-NSSAI) | S-NSSAI 2 |
| 3 | S-NSSAI N | S-NSSAI 5 |

1. **The rejected NSSAI**

The comparison of 3 types of the rejected NSSAI are as follows:

**Table 3. The comparison of 3 types of the rejected NSSAI**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type | The rejected NSSAI | The rejected NSSAI of in this example | Network impact | UE impact |
| 1 | Including VPLMN S-NSSAI mapped HPLMN S-NSSAI subject to NSSAA with the rejection cause "S-NSSAI not available in the current PLMN or SNPN" | S-NSSAI M | No new requirement | 1. UE needs to add new logic on NSSAI updating (i.e. to avoid removing the same VPLMN and the mapped HPLMN S-NSSAIs from the allowed NSSAI.) 2. UE needs to add new logic on requested NSSAI creation. |
| 2 | Including HPLMN S-NSSAI subject to NSSAA with a new cause value”S-NSSAI not available due to NSSAA not supported. ”  (C1-20xxxx) | S-NSSAI 3  S-NSSAI 4 | Needs to add a new logic for roaming, using the new cause for NSSAA not supported. | 1. R16 UE needs to know a new cause. 2. R15 UE needs to ignore the new cause and the associated Rejected S-NSSAI. |
| 3 | Not including VPLMN S-NSSAI mapped HPLMN S-NSSAI subject to NSSAA with the rejection cause "S-NSSAI not available in the current PLMN or SNPN" | Does not send the rejected S-NSSAI | Need to add new logic to judge if it is a 1:N mapping case. | UE may request HPLMN S-NSSAI subject to NSSAA since it is not in the rejected NSSAI. |

We can see from the comparison that:

1. type 2 :

* can help the network retain the ability to reject a home S-NSSAI due to NSSAA not supported, as it does for non-roaming scenarios.
* can help the UE know the certain state of S-NSSAI in requested NSSAI.( Be allowed or be rejected).
* Suitable for both 1:N and 1:1 mapping cases.
* R15 UE may requested HPLMN S-NSSAI subjected to NSSAA(S-NSSAI 3/4) (Depend on UE implementation .e.g. If it does not only use the allowed NSSAI for the requested NSSAI. )

1. type 3
   * has no compatible problem and no requirement for UE.
   * provide a special treatment for 1:N mapping case.

* UE may requested HPLMN S-NSSAI subjected to NSSAA(S-NSSAI 3/4) (Depend on UE implementation .e.g. If it does not only use the allowed NSSAI for the requested NSSAI. )

1. **The configured NSSAI**

According to TS 24.501, The configured NSSAI is not mandatory for AMF.

The AMF may include a new configured NSSAI in the REGISTRATION ACCEPT message if UE doesn’t provide the requested NSSAI or requests default configured NSSAI(The case is the UE accesses the VPMN for the first time.).

If so, there are 2 types of the configured NSSAI showed in Table 4.

**Table 4. The comparison of 2 types of the configured NSSAI**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type | The configured NSSAI | The configured NSSAI of in this example | Network impact | UE impact |
| 1 | Including subscribed NSSAI | S-NSSAI M+ S-NSSAI 1  S-NSSAI M+ S-NSSAI 2  S-NSSAI M+ S-NSSAI 3  S-NSSAI M+ S-NSSAI 4  S-NSSAI N+ S-NSSAI 5 | No new requirement | UE may requested HPLMN S-NSSAI subject to NSSAA, if the configured NSSAI contains them and the requested NSSAI created by the allowed NSSAI and S-NSSAIs from the configured NSSAI. |
| 2 | Including subscribed S-NSSAIs without which is subject to NSSAA. | S-NSSAI M+ S-NSSAI 1  S-NSSAI M+ S-NSSAI 2  S-NSSAI N+ S-NSSAI 5 | add new requirement: need to consider the UE’s NSSAA capability and roaming scenarios. | No impact. |

We can see from the comparison that:

Type 1 : No new logic for NSSAA or roaming scenarios.

* AMF doesn’t need to send a Configured NSSAI for this case, which is not mandatory.
* AMF doesn’t need to send a Configured NSSAI by considering the UE’s NSSAA capability.

# 3 Conclusion

We propose the following considerations:

1. In accordance to the logic of NSSAIs handling in TS 23.501:

* For the configured NSSAI, focus on the subscription;
* For the allowed NSSAI and the rejected NSSAI, consider UE’s capability and roaming scenarios.

1. For roaming scenarios, using the same idea for NSSAA relevant requirement for NSSAA supported/not supported UE:

* Indicate home S-NSSAI in the rejected NSSAI.
* Distinguish the cause value from “S-NSSAI not available in the current PLMN or SNPN.”

1. Not including VPLMN S-NSSAI mapped HPLMN S-NSSAI subject to NSSAA with the rejection cause "S-NSSAI not available in the current PLMN or SNPN", for basic requirement.
2. Including HPLMN S-NSSAI subject to NSSAA with a new cause value “S-NSSAI not available due to NSSAA not supported.” , for the enhancement.

The proposal is covered in C1-20xxxx for TS 24.501.