**3GPP TSG-SA WG2 Meeting #13xS2-20XXXXX**

**Source: Apple**

**Title: Solution for Key Issue#7: Including supported operating frequency bands in Allowed NSSAIDocument for: Approval**

**Agenda Item: 8.8**

**Work Item / Release: FS\_eNS\_Ph2 / Rel-17**

*Abstract: This contribution proposes a solution for 5GC assisted cell selection to access network slice. The solution is based on the assumption that UE may simultaneously register on slices that are* ***not*** *all accessible on the same operating frequency band and the UE may simultaneously establish PDU sessions on slices that are not all supported on the same operating frequency band.*

# 1. Introduction

As highlighted in this key issue, an operator may only support certain network slices on certain operating frequency bands. One registration area may consist of multiple NG-RAN cells belonging to different operating bands and thus it is possible that support for a particular S-NSSAI in a registration area is non-homogenous.

In this paper, we propose to provide the UE assistance in Configuration Update/Registration procedure so the UE is aware about which slice is supported on which operating bands or frequency ranges. UE may use this information to reselect to a new operating band which supports the S-NSSAI user is interested in accessing and initiate radio connection with NG-RAN.

Alternatively, NG-RAN may steer the UE to appropriate frequency band which supports the S-NSSAI the UE includes in the RRC Connection Setup procedure.

*START of CHANGE*

## 6.0 Mapping Solutions to Key Issues

Table 6.0-1: Mapping of Solutions to Key Issues

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| --- | --- | --- |
| Solution#'s | Solution Titles | Key Issue#'s |
| 1 | PCF measurement based Network Slice SLA control for Maximum Number of UEs parameter | 1 |
| 2 | Max number of UEs per Network Slice control at registration | 1 |
| 3 | AMF/NSSF based counting of UEs in a Network Slice | 1 |
| 4 | NWDAF enhancements for supporting of network slice quota on the maximum number of UEs | 1 |
| 5 | NWDAF enhancements for supporting of network slice quota on the maximum number of PDU Sessions | 2 |
| 6 | PCF-based counting of PDU Sessions in a Network Slice | 2 |
| 7 | Support of Network Slice SLA for Maximum Number of PDU sessions parameter | 2 |
| 8 | AMF and O&M based solution | 1, 2 & 4 |
| 9 | Monitoring multiple quotas of number of UEs/PDU Sessions per S-NSSAI at NWDAF | 1, 2 & 4 |
| 10 | Max number of PDU Sessions per Network Slice control via NSQ function | 2 |
| x | Including supported operating frequency bands in Allowed NSSAI  | 7 |

*NEXT CHANGE (All text is new)*

## 6.X Solution #x: Including supported operating frequency bands in Allowed NSSAI

### 6.X.1 Introduction

This solution is for Key Issue #7, "Support of 5GC assisted cell selection to access network slice". The solution is based on the following architectural assumptions:

- The UE may simultaneously register to slices that are not all accessible on the same operating band(s). In other words, the UE may have S-NSSAIs in the Allowed NSSAI that are not all available in a common operating band.

- The UE may simultaneously establish and access PDU sessions on slices that are not all supported on the same operating band.

### 6.X.2 High Level Description

As part of the Registration procedure, UE and NG-RAN shall be provided with the list of supported operating bands for each allowed NSSAI. In the case where the operator slice deployment is governed by frequency ranges (e.g. FR1 and FR2), the AMF may indicate that an S-NSSAI is supported on [FR1 only], [FR2 only] or [FR1+FR2] instead of explicitly listing out all the operating bands where each S-NSSAI is supported.

The UE may receive S-NSSAIs in the Allowed NSSAI that are not all supported on the same operating frequency band.

Based on the slice the user is interested in accessing, UE may either continue to operate on the current operating band or be steered to operate on a new operating band by NG-RAN.

Editor’s Note: How the NG-RAN steers the UE (e.g. handover, configuring dual connectivity to simultaneously access two operating bands, etc.) will be defined in RAN WGs.

### 6.X.3 Procedures

1. As part of the Registration Request, UE shall include all the NSSAIs it is interested in as part of "Requested NSSAI".

2. In addition to the procedures in TS 23.501 [2], clause 5.15.5.2.1, for each allowed S-NSSAI, NSSF shall also determine the supported operating frequency bands, and pass this along with the Allowed NSSAI to the AMF.

3. The Registration Accept message and UE Configuration Update Command from the AMF to the UE in TS 23.502 [6] are updated to include permissible operating frequency band(s) of each S-NSSAI in the Allowed NSSAI. Alternatively, AMF may indicate whether each S-NSSAI in the Allowed NSSAI is supported on: [FR1 only], [FR2 only] or [FR1+FR2].

4. Additionally, as part of the N2 message sent during the Registration procedure to NG-RAN as specified in TS 23.502 [6] clause 4.2.2.2.2, the AMF may update NG-RAN about the supported operating frequency band for each allowed S-NSSAI for the UE.

5. As part of the allowed NSSAI list in Registration Accept, AMF may include NSSAIs which are not all supported on the same operating band.

6. UE may initiate PDU session establishment procedure on the slice user is interested in accessing. If the S-NSSAI associated with the PDU session establishment procedure is not supported on the current operating band, then:

6a. UE may choose to reselect to a new operating band which supports the S-NSSAI user is interested in accessing, and initiate radio connection with NG-RAN; or

6b. UE may initiate radio connection on the current operating band and include the S-NSSAI in the RRC Connection establishment procedure with NG-RAN. Based on the S-NSSAI included in the RRC connection procedure, NG-RAN may steer the UE to access the new operating band which supports the S-NSSAI user is interested in accessing.

Editor’s Note: How the NG-RAN steers the UE (e.g. handover, configuring dual connectivity to simultaneously access two operating bands, etc.) should be defined in RAN WGs.

### 6.X.4 Impacts on existing entities and interfaces

- NSSF shall be able to provide the supported operating frequency band(s) for each allowed S-NSSAI(s) to the AMF.

- AMF shall be able to provide supported operating frequency band(s) for each allowed S-NSSAI(s) to the UE as part of Configuration Update/Registration procedure.

- AMF shall be able to provide supported operating frequency band(s) for each allowed S-NSSAI(s) to NG-RAN as part of N2 message.

 - NG-RAN shall be able to steer the UE to appropriate operating frequency band which supports the S-NSSAI included in the RRC connection setup procedure.

- UE shall be able to include the S-NSSAI in the RRC Connection establishment procedure with NG-RAN.

- UE shall be able to re-select to appropriate operating frequency band which supports the S-NSSAI the UE is interested to access.

*End of CHANGES*