**3GPP TSG-RAN3 Meeting #123 R3-240705**

**Athens, Greece, 26th February – 1st March 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.300** | **CR** | **Draft** | **rev** | **-** | **Current version:** | **18.0.0** |  |
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| *For* [***HELP***](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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Resource handling for Alternative S-NSSAIs | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson, Deutsche Telekom, ZTE | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eNS\_Ph3-NR-Core | | | | |  | ***Date:*** | | | 2024-02-18 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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)* | |
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| ***Reason for change:*** | | RAN3 has received reply LSs from SA2 and SA5 in R3-235030 and R3-240020 concerning how to handle resources for Alternative S-NSSAIs. SA2 and SA5 have identified that the following approaches are feasible, have no system impacts and are supported by legacy specifications.  **Approach 1:** The resources associated to the RRMPolicyRatio(s) (See TS28.541) of which the alternative S-NSSAI is member are adjusted (by OAM) in order to take into account the additional load potentially generated by remapping one or more slices into the alternative S-NSSAI.  **Approach 3:** Coordination is taken to ensure that both the original slice and the one or more potential remapped slices are member of the same RRMPolicyRatio(s) (See TS28.541). This ensures that the resources that would have been used at RAN for the original slice may be used instead for the alternative slice.  It is therefore needed to capture such approaches in the Stage 2 description for Network Slice Replacement. | | | | | | | | |
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| ***Summary of change:*** | | Capture a description of resource handling for network slice replacement cases. | | | | | | | | |
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| ***Consequences if not approved:*** | | The specifications do not provide guidance on how to handle slice resources in case of network slice replacement. | | | | | | | | |
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| ***Clauses affected:*** | | 16.3.1 | | | | | | | | |
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|  | | **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:*** | |  | | | | | | | | |

*START OF CHANGE*

### 16.3.1 General Principles and Requirements

In this clause, the general principles and requirements related to the realization of network slicing in the NG-RAN for NR connected to 5GC and for E-UTRA connected to 5GC are given.

A network slice always consists of a RAN part and a CN part. The support of network slicing relies on the principle that traffic for different slices is handled by different PDU sessions. Network can realise the different network slices by scheduling and also by providing different L1/L2 configurations.

Each network slice is uniquely identified by a S-NSSAI, as defined in TS 23.501 [3]. NSSAI (Network Slice Selection Assistance Information) includes one or a list of S-NSSAIs (Single NSSAI) where a S-NSSAI is a combination of:

- mandatory SST (Slice/Service Type) field, which identifies the slice type and consists of 8 bits (with range is 0-255);

- optional SD (Slice Differentiator) field, which differentiates among Slices with same SST field and consist of 24 bits.

The list includes at most 8 S-NSSAI(s).

The UE provides NSSAI (Network Slice Selection Assistance Information) for network slice selection in *RRCSetupComplete*, if it has been provided by NAS (see clause 9.2.1.3). While the network can support large number of slices (hundreds), the UE need not support more than 8 slices simultaneously. A BL UE or a NB-IoT UE supports a maximum of 8 slices simultaneously.

Network Slicing is a concept to allow differentiated treatment depending on each customer requirements. With slicing, it is possible for Mobile Network Operators (MNO) to consider customers as belonging to different tenant types with each having different service requirements that govern in terms of what slice types each tenant is eligible to use based on Service Level Agreement (SLA) and subscriptions.

The following key principles apply for support of Network Slicing in NG-RAN:

**RAN awareness of slices**

- NG-RAN supports a differentiated handling of traffic for different network slices which have been pre-configured. How NG-RAN supports the slice enabling in terms of NG-RAN functions (i.e. the set of network functions that comprise each slice) is implementation dependent.

**Selection of RAN part of the network slice**

- NG-RAN supports the selection of the RAN part of the network slice, by NSSAI provided by the UE or the 5GC which unambiguously identifies one or more of the pre-configured network slices in the PLMN.

**Resource management between slices**

- NG-RAN supports policy enforcement between slices as per service level agreements. It should be possible for a single NG-RAN node to support multiple slices. The NG-RAN should be free to apply the best RRM policy for the SLA in place to each supported slice.

**Support of QoS**

- NG-RAN supports QoS differentiation within a slice, and per Slice-Maximum Bit Rate may be enforced per UE, if feasible. How NG-RAN enables UE-Slice-MBR enforcement and rate limitation (see TS 23.501 [3]) is up to network implementation.

**RAN selection of CN entity**

- For initial attach, the UE may provide NSSAI to support the selection of an AMF. If available, NG-RAN uses this information for routing the initial NAS to an AMF. If the NG-RAN is unable to select an AMF using this information or the UE does not provide any such information the NG-RAN sends the NAS signalling to one of the default AMFs.

- For subsequent accesses, the UE provides a Temp ID, which is assigned to the UE by the 5GC, to enable the NG-RAN to route the NAS message to the appropriate AMF as long as the Temp ID is valid (NG-RAN is aware of and can reach the AMF which is associated with the Temp ID). Otherwise, the methods for initial attach applies.

**Resource isolation between slices**

- The NG-RAN supports resource isolation between slices. NG-RAN resource isolation may be achieved by means of RRM policies and protection mechanisms that should avoid that shortage of shared resources in one slice breaks the service level agreement for another slice. It should be possible to fully dedicate NG-RAN resources to a certain slice. Some RACH resources can be associated to specific NSAG(s). Other aspects how NG-RAN supports resource isolation is implementation dependent.

**Access control**

- By means of the unified access control (see clause 7.4), operator-defined access categories can be used to enable differentiated handling for different slices. NG-RAN may broadcast barring control information (i.e. a list of barring parameters associated with operator-defined access categories) to minimize the impact of congested slices.

**Slice Availability**

- Some slices may be available only in part of the network. A slice is considered available in a cell if it is supported by the TA comprising the cell and the slice is not configured with zero resources, as specified in TS 23.501 [3]. A slice is supported within a TA if it is included in the slice support list for the TA signalled from the NG-RAN to the AMF. The NG-RAN supported S-NSSAI(s), NSAG(s) and NSAG related information such as NSAG associated Cell Reselection Priority and/or NSAG associated RACH resources are configured by OAM. Awareness in the NG-RAN of the slices supported in the cells of its neighbours may be beneficial for inter-frequency mobility in connected mode. In order to support the NSAG, the NG-RAN provides the AMF with the NSAG information per TA in the appropriate NG interface management procedures, as specified in TS 38.413 [26]. Awareness in the NG-RAN of the NSAG information supported in the list(s) of neighbour cells may be configured by OAM, or exchanged with neighbour NG-RAN nodes.

- The NG-RAN and the 5GC are responsible to handle a service request for a slice that may or may not be available in a given area. Admission or rejection of access to a slice may depend by factors such as support for the slice, availability of resources, support of the requested service by NG-RAN.

- The NG-RAN may be signalled with the Partially Allowed NSSAI from the AMF as specified in TS 23.501 [3]. The NG-RAN may decide to use the Partially Allowed NSSAI for mobility decision.

- Support for Network Slices with Network Slice Area of Service not matching deployed Tracking Areas is specified in TS 23.501 [3]. NG-RAN cells that are outside the Area of Service may be configured with zero resources for the concerned slice(s). The concerned slice(s) cannot use any dedicated, prioritized nor any shared resources of that cell. Awareness of zero resources configured for a slice in one or more cells may be exchanged with neighbour NG-RAN nodes for mobility reasons.

**Support for UE associating with multiple network slices simultaneously**

- In case a UE is associated with multiple slices simultaneously, only one signalling connection is maintained and for intra-frequency cell reselection, the UE always tries to camp on the best cell. For inter-frequency cell reselection, dedicated priorities can be used to control the frequency on which the UE camps.

**Granularity of slice awareness**

- Slice awareness in NG-RAN is introduced at PDU session level, by indicating the S-NSSAI corresponding to the PDU Session, in all signalling containing PDU session resource information.

**Validation of the UE rights to access a network slice**

- It is the responsibility of the 5GC to validate that the UE has the rights to access a network slice. Prior to receiving the Initial Context Setup Request message, the NG-RAN may be allowed to apply some provisional/local policies, based on awareness of which slice the UE is requesting access to. During the initial context setup, the NG-RAN is informed of the slice for which resources are being requested.

**Network slice replacement**

- NG-RAN may support network slice replacement for a PDU session as defined in TS 23.501 [3].

- The resources used to serve the alternative S-NSSAI may be adjusted by the OAM in order to take into account the additional load potentially generated by remapping one or more slices into the alternative S-NSSAI. Alternatively, the OAM may configure both the original slice and the one or more potential remapped slices to be member of the same RRMPolicyRatio, see TS 28.541 [49].

*END OF CHANGE*