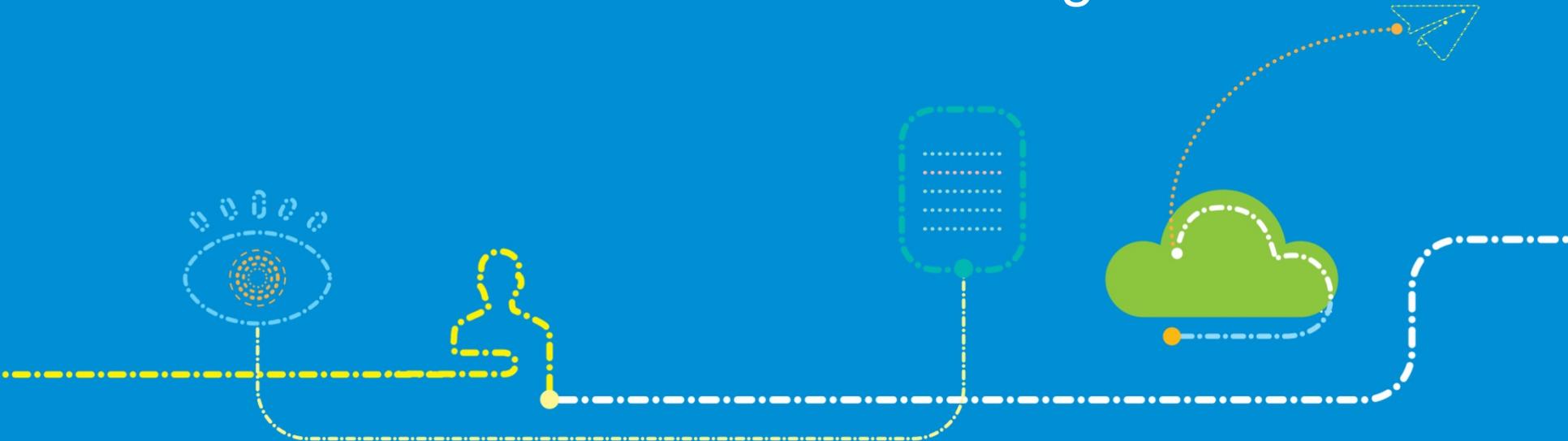


Source: ZTE, Sanechips
Agenda: 9.0.3

Further enhancement of RAN slicing in Rel-18



Further enhancement of RAN slicing in Rel-18

- **New requirement from SA with potential RAN impact**
- Left over issues from R17 RAN slicing
- Objectives for RAN slicing enhancement in R18



New requirement from SA1 with potential RAN impact (1)

New requirements identified by SA1 SI FS_EASNS	Potential RAN impact
<p>[CPR-001] For a UE authorized to access multiple network slices of one operator which cannot be simultaneously used by the UE (e.g. due to radio frequency restrictions), the 5G system shall be able to support the UE to access the most suitable network slice in minimum time (e.g. based on the location of the UE, ongoing applications, UE capability, frequency configured for the network slice).</p>	<p>Slice specific Random access for MT triggered access with the intended slice information indicated to UE [RAN2]</p>
<p>[CPR-002] For a UE authorized to access to multiple network slices of one operator which cannot be simultaneously used by the UE (e.g. due to radio frequency restrictions), the 5G system shall minimize service interruption time when the UE changes the access from one network slice to another network slice. (e.g. based on changes of active applications).</p>	<p>Potential RAN enhancement for UE to access another slice not supported in the current PCell</p> <ul style="list-style-type: none"> • MO triggered cell selection/reselection [RAN2] • CA/DC enhancement[RAN3,RAN2]
<p>[CPR-003] 5G system shall minimize signaling exchange and service interruption time for a network slice, e.g. when restrictions related to radio resources change (e.g., frequencies, RATs).</p>	<p>Slice remapping [RAN3]</p>
<p>[CPR-004] For a roaming UE activating a service/application requiring a network slice not offered by the serving network but available in the area from other network(s), the HPLMN shall be able to provide the UE with prioritization information of the VPLMNs with which the UE may register for the network slice.</p>	<p>/</p>
<p>[CPR-005] The 5G system shall be able to generate charging information regarding the used radio resources e.g. used frequency bands.</p>	<p>/</p>
<p>[CPR-006] The 5G system shall be able to minimize power consumption of a UE (e.g. reduce unnecessary cell measurements), in an area where no authorized network slice is available.</p>	<p>Provision of the availability area of slices and RRM relaxation [RAN2]</p>
<p>[CPR-007] When a UE moves out of the service area of a network slice for an active application, the 5G system shall be able to minimize impact on the active applications (e.g., providing early notification).</p>	<p>Provision of early notification or slice remapping [RAN2, RAN3]</p>

New requirement from SA1 with potential RAN impact (2)

New requirements identified by SA1 SI FS_EASNS	Potential RAN impact
<p>[CPR-008] The 5G system shall support a mechanism for a UE to select and access network slice(s) based on UE capability, ongoing application, radio resources assigned to the slice, and policy (e.g., application preference).</p>	<p>Evaluate whether the R17 slice based cell reselection and RACH can meet such requirement or new enhancement needed. [RAN2]</p>
<p>[CPR-009] The 5G system shall support a mechanism to optimize resources of network slices (e.g., due to operator deploying different frequency to offer different network slices) based on network slice usage patterns and policy (e.g., application preference) of a UE or group of UEs</p>	<p>Slice remapping [RAN3]</p>
<p>[CPR-010] For traffic pertaining to a network slice offered via a relay node, 5G system shall use only radio resources (e.g. frequency band) allowed for the network slice.</p>	<p>/</p>
<p>[CPR-011] For UEs that have the ability to obtain service from more than one VPLMN simultaneously, the following requirements apply:</p> <ul style="list-style-type: none">-When a roaming UE with a single PLMN subscription requires simultaneous access to multiple network slices and the network slices are not available in a single VPLMN, the 5G system shall enable the UE to:<ul style="list-style-type: none">- be registered to more than one VPLMN simultaneously; and- use network slices from more than one VPLMN simultaneously-The HPLMN shall be able to authorise a roaming UE with a single PLMN subscription to be registered to more than one VPLMN simultaneously in order to access network slices of those VPLMNs.<ul style="list-style-type: none">-The HPLMN shall be able to provide a UE with permission and prioritisation information of the VPLMNs the UE is authorised to register to in order to use specific network slice	<p>UE capability [RAN2]</p>

Enhancement of NW slicing under SA2 discussion (1)

Enhancement of NW slicing under SA2 discussion	Potential RAN impact
Study how the deployments can be improved for the following scenario: an existing slice cannot serve the PDU session in current cell (due to OAM reasons) or target cell (due to mobility), or a slice was not allowed due to NSAC, or if the existing slice cannot meet the performance requirements of the applications, If existing mechanisms are concluded to be not sufficient, study whether and how to (continue) support the session continuity and minimize the impact on applications, and study whether and how to expose this capability to third party.	Slice remapping [RAN3]
Study how networks deployments can be done using existing mechanisms, in order to avoid situations where not all subscribed and requested slices are supported by a single AMF ("Disjoint Network Slices"). If existing mechanisms are concluded to be not sufficient to achieve the scenarios, study whether and how additional mechanisms can resolve the analysed gap.	/
Study whether and how to enable a UE to initiate a registration for a rejected S-NSSAI that was rejected in a first TA of the RA but may be available in another TA of the RA.	/
Study whether and how to enhance availability of slices in roaming scenarios to allow the UE to select and obtain services from one or multiple VPLMNs supporting the network slices which UE may wish to use when the UE is roaming according to these requirements in TS 22.261clause 6.1.2.1	/
Study whether and how to enable the network to control the UE behaviour in registering and deregistering with network slices and establishing/releasing PDU sessions taking into account the running applications using the slice.	/
Study whether and how to allow the AMF to be provisioned with TA topology information in a more optimal way (e.g. by using a control plane approach similarly to gathering the S-NSSAI support per TA)	Provision of TA topology [RAN3]

Enhancement of NW slicing under SA2 discussion (2)

Enhancement of NW slicing under SA2 discussion	Potential RAN impact
Study whether and how to support the provisioning of the priority information regarding (some of) the S-NSSAI, e.g. for service continuity decisions or Allowed NSSAI decisions	Slice remapping [RAN3]
Study deployment considerations for optimising the temporary deployment of services in an area, and how existing mechanisms including network slicing can help support such scenarios (e.g. the service supported by a network slice may have a limited lifetime or a time of day lifetime). If existing mechanisms are concluded to be not sufficient to achieve the scenarios, study whether and how additional mechanisms can resolve the analysed gap.	Evaluate whether the R17 slice based cell reselection and RACH can meet such requirement or new enhancement needed. [RAN2]
Study deployment considerations when a service provided by existing network slices has a Service Area that does not overlap with the already deployed Tracking Areas, and how existing mechanisms including network slicing can help support such scenarios. If existing mechanisms are concluded to be not sufficient to achieve the scenarios, study whether and how additional mechanisms can resolve the analysed gap.	Evaluate whether the R17 slice based cell reselection and RACH can meet such requirement or new enhancement needed. [RAN2]
Study whether and how to enhance the paging procedure taking the slice information into account in order to ensure that the UE can provide proper Requested S-NSSAI in the Paging Response to the RAN node so the RAN node can enforce proper admission control for the slice.	Slice specific Random access for MT triggered access with the intended slice information indicated to UE [RAN2]
Study how to support the identification by a human user of the slices available to the UE (pending completion of requirements in SA1)	Broadcasting human readable name of slices in system information [RAN2]

New requirement from SA with potential RAN impact

- Although the study in SA has not been finalized, clear impact on RAN can be seen from the new requirement identified in FS_EASNS, which is captured as potential consolidated requirements in 22.835.
- To address the requirement from SA, a new RAN WI with study phase is required in Rel-18 accordingly to study the RAN impact.

Further enhancement for RAN slicing

- New requirement from SA with potential RAN impact
- **Left over issues from R17 RAN slicing**
- Objectives for RAN slicing enhancement in R18



Left over issues from R17 RAN slicing

- Besides the new requirement identified by SA, some leftover enhancement from RAN slicing can be considered as well.
 - ◆ Left over issues in RAN2
 - Slice based cell selection or reselection for MO
 - Enhancement to slice based cell reselection (e.g. Different RSRP/RSRQ thresholds or Qoffsets)
 - Slice based random access for MT
 - ◆ Left over issues in RAN3
 - Service continuity for inter-RA mobility due to non-supported slices, e.g. slice remapping by NG-RAN
 - Further enhancement of network slicing on MR-DC

Left over issues in RAN2

■ Slice based cell selection or reselection for MO

- ◆ Cell selection after release with redirection: UE continue to access the serving cell even though the intended slice is not supported and get released with redirection to a cell supporting the intended slice. For release with redirection, the existing redirection info only includes the frequencies without indicating a certain cell. Considering that different cells in the same frequency may support different slices, the target cell supporting the intended slice should be indicate to UE.
- ◆ MO triggered cell reselection: UE trigger cell reselection when the slice associated with the MO service is not supported by the serving cell.

■ Enhancement to slice based cell reselection

- ◆ Different offsets or RSRP/RSRQ thresholds for inter and intra-frequency slice based cell reselection can be studied as a supplement to the slice specific reselection priority in R17.

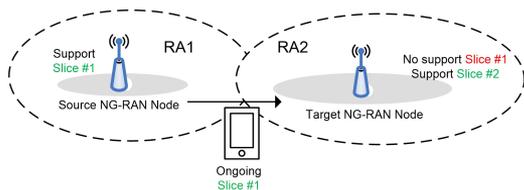
■ Slice based random access for MT

- ◆ Slice based random access for MO case is supported in R17 while no enhancement has been specified for MT case. Initiating the slice info to assist UE to select a suitable slice and initiate random access can be considered for MT case, which also meets the SA1 requirement for selecting a suitable slice.

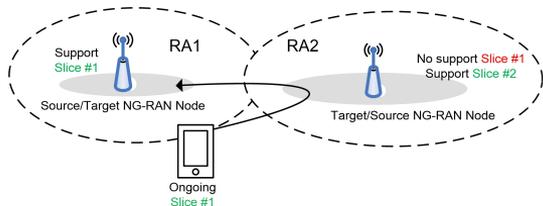
Left over issues in RAN3

■ Slice remapping by NG-RAN

- ◆ In Rel-17, Service interruption due to slice not supported (e.g the UE is moving towards/fallback an area that does not support at least one of UE's ongoing slices) in TR 38.832 (as shown in the figure) has been identify as valid scenario in RAN3 and SA2. RAN3 has already provided candidate solutions for these scenarios in the TR. Solutions identified for these scenarios in Study Item (FS_NR_Slice) can be continue in Rel-18.



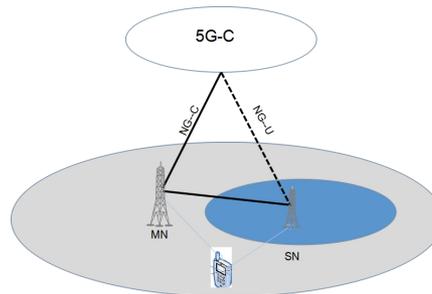
Scenario: Service interruption due to slice not supported



Scenario: Moving back for non-supported slice in case of Inter-RA mobility

■ Network slicing on MR-DC

- ◆ The scenario where the SN and MN supports different slices need to be investigated.
- ◆ The supported slice information of SN can be indicated to core network and taken into consideration when the allowed S-NSSAI is configured.



Scenario: SN supports different Slice from MN

Further enhancement for RAN slicing

- New requirement from SA with potential RAN impact
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- Objectives for RAN slicing enhancement in R18



Objectives for RAN slicing enhancement in R18

- Study RAN impact of new use cases and requirements from SA1 and SA2 [RAN2, RAN3]
- Rel-17 left over issues
 - Slice based cell selection or reselection for MO [RAN2]
 - Enhancement to slice based cell reselection (e.g. Different RSRP/RSRQ thresholds or Qoffsets) [RAN2]
 - Slice based random access for MT [RAN2]
 - Service continuity for inter-RA mobility due to non-supported slices, e.g. slice remapping by NG-RAN [RAN3]
 - CA DC enhancement for UE to access the slice not available in the current PCell via CA or DC, e.g. report the supported slice information of SN/SCell to core network [RAN3]

Thanks



Tomorrow never waits

