**3GPP SA WG2 Meeting #153E**  **S2-22XXXXX**

**Elbonia, October 10-14, 2022 (was S2-22xxxx)**

**Source: Ericsson**

**Title: KI#4: Proposal for Evaluation Conclusion on KI #4**

**Document for: Discussion/Approval**

**Agenda Item: 9.14**

**Work Item / Release: FS\_eNS\_PH3**

*Abstract of the contribution: This contribution provides an interim conclusion for KI#4.*

# 1. Discussion

Solution 14 deploys a single NSACF per PLMN to handle admission for all slices regardless of the number of service areas. It is simple and ensures complete support for mobility of UEs between service areas if applicable, as well as roaming scenarios. It is backward compatible to Release 17 with additional attribute extension in case of multiple service areas.

Solution 13 deploys a hierarchical NSACF architecture when the PLMN has multiple service areas. It uses a PLMN reserved quota mechanism, as well as dynamic real-time re-distribution quota mechanism to aim for supporting Session Continuity for UEs that cant be admitted locally due to local quota exhaustion at time of UE registration even though they have been successfully admitted in a previous service area.

There are few issues with the quota approach:

* There is no guarantee that the PLMN reserved quota in central NSACF can handle all situations and indeed this quota can also be fully exhausted. This is clearly demonstrated by the bullet 6 listed below in section 6.13.3.1:

If the Primary NSACF has allocated the complete range of the global maximum number ***, then the UE cannot be granted admission. However SC can still be supported if the UE ID was managed by the primary N***SACF when the UE first registered for admission in an old SA served by a local NSACF that forwarded the requested to the primary NSACF.

In addition, the solution 13 approach was the same approach taken in Release 17 and where each local NSACF can hold a reserved quota for granting admission to UEs that moved from an old service area, similar to the central NSACF role in solution 13. As such, solution 13 is similar in performance to the existing Release 17 functionality notwithstanding the added complexity.

* Using dynamic real-time quota re-distribution to control admission can be quite unpredictable as it is rather difficult to take away quota that is granted to a local NSACF any time, if for some reason, some quota needs to be given to some other local NSACF or even the central NSACF.

Hence solution 13 on its own is insufficient to fully address the session continuity issue.

It is thus proposed to support an additional mechanism, in addition to the quota, that provides more flexibility and avoid using quota solely to control admission. This new mechanism enables a central NSACF to return to a local NSACF a maximum occupancy threshold. Admission of new UEs are accepted only below that maximum occupancy threshold. This provides greater control to a central NSACF as it focuses on prioritizing admission in local NSACFs (admitting UEs that have been admitted in old service areas vs new UEs) as means of control rather than quota. In this case quota is initially provisioned in local NSACF using O&M systems as in Release 17. Quota can be adjusted as deemed necessary.

Local NSACFs can be configured for using either of the above mechanisms, i.e. quota or occupancy threshold or both. A central NSACF must support both mechanisms.

Finally, to enable local NSACFs to be dynamically updated by the central NSCACF depending on the configured option in the local NSACF, it is proposed that a new event is created for that purpose and that local NSACF subscribe to such an event This enables continuous updates to be sent to local NSACF should the central NSACF deem this needed depending on actual conditions.

It is thus proposed to include support for both schemes in Release 18.

# 2. Proposal

It is proposed to accept the following changes to TR 23.700-741

**FIRST CHANGE**

### 7.X.4 Conclusion for KI#4

For PLMNs with multiple service areas, not deploying a hierarchal NSACF, solution 14 can be applied where a single NSACF is responsible for all admissions.

For PLMNs deploying a hierarchal NSACF architecture, a single central NSACF node per PLMN is introduced, in addition to distinct local NSACFs per service area, The central NSACF handles requests from local NSACFs when local NSACFs are unable to admit UEs registering for an S-NSSAI for the first time.

The Central NSACF supports the following capabilities depending on the local NSACF configuration it interacts with:

* Returning the maximum occupancy threshold if the local NSACF is configured to support that feature. Admission of new UEs are accepted only below that maximum occupancy threshold. It is assumed in this case that the local NSACF is provisioned/updated with the local quota via O&M system.
* Returning a new updated quota for the local NSACF if the local NSACF is configured to support that feature.
* Returning both of the above if the local NSACF is configured to support both capabilities.

Central NSACF handles and stores entries only related to UEs that are already admitted in an existing service area but cant be admitted in the new service area due to congestion.

NOTE : The reason restricting the central NSACF role to handle UEs that have been admitted in an existing service area but cant be admitted in the new service is 2 folds:- first if central NSACF can update the quota than this implicitly delegates that responsibility to local NSACF configured with that option. If the central NSACF limits the returned threshold, then this implicitly assumes that the quota provisioned via the O&M system cant be updated anymore and there is a need to prioritize admissions based on current conditions for local NSACFs configured with that option. The second fold is simplicity; this limits the possible results returned from interaction between local and central NSACF. This now is reduced from 4 possible results to only 2 possible results. It also reduces interactions with the central NSACF for UEs, if their entries are not located in the local NSACF.

To enable central NSACF to update the quota for local NSCAFs configured with this option, local NSCFs subscribes to central NSCAF for that purpose.

To enable central NSACF to update the occupancy threshold for local NSCAFs configured with this option, local NSCFs subscribes to central NSCAF for that purpose

**END OF CHANGES**