**3GPP TSG-SA WG2 Meeting #163S2-240xxxx**

**Jeju, Korea, May 27 – May 31, 2024**

**Source: Samsung, Sateliot, NOVAMINT, DISH Network, EchoStar, Inmarsat, Viasat, Intel, SHARP, Orange**

**Title: KI#2: Conclusions.**

**Document for: Approval**

**Agenda Item: 19.1**

**Work Item / Release: FS\_5GSAT\_ARCH\_Ph3 / Rel-19**

*Abstract of the contribution: This contribution proposes conclusions for KI#2.*

# 1 Discussion

This paper proposes conclusion principles to support the important evaluation criteria as agreed in clause 7.

# 2 Proposal

It is proposed to agree below proposed changes to 23.700-29.

\*\*\* Next Change \*\*\*

# 8 Conclusions

## 8.2 KI #2: Conclusions for Support of Store and Forward Satellite operation

The following is agreed for supporting Store and Forward operation with a Split MME architecture with the following (informative) principles:

1) In the Split MME architecture, HSS is on the ground.

2) MME functionality is split into two parts: MME-onboard - the MME part which is onboard the satellite and MME-ground – the MME part which is on the ground network with an interface out of scope of 3GPP.

3) The MO data is stored in the MME-onboard and transferred to the ground and the MT data is stored in the MME-onground or in S-GW and transferred to the MME-onboard when the feeder link is available. The MT data is stored in the MME-onboard and transferred to the UE when service link is available. All types of data traffic (e.g. IP etc) can be supported and transferred using the existing user plane and control plane procedures defined in EPS

With the following normative impacts:

NOTE 1: SA2 will align further based on agreements in SA3 on secure authentication and Attach/TAU procedures.

1) When feeder link is not available and the network supports S&F operation, the network shall be able to inform UE(s) whether S&F Satellite operation is applied, (e.g. eNB broadcast support of S&F operation as part of System Information).

NOTE 2: The trigger for the eNB to broadcast support of S&F operation is based on the decision of RAN WGs. From system perspective the expectation is that if the network does not support S&F operation and the feeder link is not available then eNB switches off and does not broadcast any signal.

2) When UE initiates Attach or TAU procedure, it indicates support for S&F mode to the MME following existing NAS capability, the MME sends Attach or TAU Reject message to the UE if these procedures cannot be completed due to S&F operation. The Attach or TAU Reject message includes:

a) A new information indicating the UE that attach or TAU procedure cannot be completed because of the S&F operation and that the UE can re-attempt the attach or TAU in this PLMN in a next satellite pass. This indicates to the UE that the information contained in the Attach or TAU Request message is stored by the MME and the network will be available to the UE after interaction with ground network.

b) Wait timer: Indicates to the UE the time it should wait before re-attempting the Attach/TAU procedure in the current or another satellite of the same PLMN.

c) Optionally, The list of Satellite IDs over which the UE may re-attempt the Attach/TAU procedure, after wait timer expires. The Satellite IDs are based on the Satellite IDs available in SIB3 and SIB32.

3) How the UE process this information is up to UE implementation and during the wait timer the UE can search for another terrestrial or satellite PLMN to get normal service.

NOTE 3: The LI issues (if any) of this solution are in the scope of SA3-LI.

4) MME may indicate to HSS the "Request Time", allowing the HSS to check that no other (e.g., terrestrial) MME has sent an Update Location Request after the "Request Time", and fetches the authentication vector and other details from HSS following current Authentication and security procedures. The MME may triggers Update location with the HSS and Update location ACK is received by MME. i.e. all the subscription details are retrieved by MME-ground. The Update Location Request includes an indication that this location update is provisional i.e. the HSS must not consider the UE as registered until it receives the final Update Location Request.

5) When the wait timer has expired given to the UE in step 2, if the UE has not successfully attached to another PLMN and the UE finds the cell which broadcast the Satellite ID valid to re-attempt the attach procedure, the UE re-sends the Attach or TAU Request message.

6) During the Attach or TAU procedure with the UE, The MME may also provide a list of Satellite IDs over which the UE may exchange the signalling and data, and a wait-timer that indicates to the UE the time UE it should wait before attempting signalling and data exchanges in those satellites.

7) Optionally for MO SMS, upon reception of the MO SMS the MME-onboard may store the MO-SMS and immediately sends the delivery report to the UE i.e. as if the MO-SMS has already been successfully delivered to the Service Centre (SC).

NOTE 3: If the MME-onboard does not send immediately the Delivery report, the UE might need to be paged later only for sending of the Delivery report (e.g. potentially delayed by several hours).

8) The MME may indicate to UE the estimated delivery time in NAS messages (Attach accept or TAU accept message or service accept). How UE uses this information is left for UE implementation.

 NOTE 4: The estimated delivery time is the estimated time to send data from the UE to Gateway.

9) The core network can indicate to external SCS/AS whether UE is registered in S&F Mode and the estimated delivery time.

NOTE 5: Whether any existing monitoring events or procedures can be used or enhanced to achieve above will be determined during normative phase.

The split MME architecture will be described in informative annex.