**SA WG2 Meeting #165 S2-240XXXX**

**October 14 – 18, 2024, Hyderabad, India**

**Source: Nokia**

**Title: On the handling of request time in S&F**

**Document for: Approval**

**Agenda Item: 9.1.2**

**Work Item / Release: 5GSAT\_Ph3\_ARCH / Rel-19**

*Abstract of the contribution: This contribution discusses topics related to the timestamp information in provisional location update.*

# Introduction

In the study conclusion of FS\_5GSAT\_Ph3 SID, the following behaviour of MME and HSS are concluded to avoid any location cancellation due to inherent delay in receiving location update via S&F satellite access:

*“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.”*

At SA2#164 (Maastricht), there was offline discussions on the possible problems in the above approach. This paper highlights those issues and its probable solutions.

# Discussion

#### Current conclusion and its limitations:

As per the agreed conclusion stated above, the call flow will look somewhat below:



Figure 1: Call flow for Authentication and provisional location update

**Observation: Unnecessary authentication procedure, even if the location update might fail latter**

The MME is adding timestamp information into provisional location update to gain access to subscription data in advance (even before authenticating the UE), to save some crucial satellite iteration/passes. The timestamp helps in avoiding any cancellation of UE which might have been recent than the attempt made towards S&F access.

But the Authentication and Location updates are separate procedures, and it is not possible to time synch them. E.g. if the authentication procedure succeeds, the UE authentication procedure and security mode procedure might get triggered at MME, even before receiving provisional update location response. Now, if the provisional location update response is negative, the authentication/security mode procedure will be an waste of satellite resources and time.

#### Alternative ways forward:

##### Adding timestamp to Authentication Request as well:



**Figure 2: Call flow for Authentication and provisional location update (timestamp info in both)**

By sending the timestamp information in authentication data request, the HSS can deny the request by checking the timestamp information against the last location update for the UE. In this case, there will not be any false positive which will avoid MME going through authentication/security mode procedure, if the UE has a latest location update than the S&F access attach request.

##### Only using Authentication request to fetch subscription and avoid any provisional location update



**Figure 3: Call flow for Authentication with timestamp info and request for subscription info**

By sending the timestamp information and S&F indication flag in authentication data request, the HSS can validate the request against the last location update context and provide response along with subscription data. This will avoid provisional update location and hence any race condition associated with two independent procedures.

# Proposal

It is preferable to apply 2nd option, as it avoids impacting 2 procedures and avoid any race condition between 2 procedures (authentication and location update). It also avoids the unnecessary authentication/security mode procedure, in case of mismatch of timing between two procedures. Also, by receiving subscription data along with AV, the MME can make an decision whether to reject the request or continue with the authentication procedure. The subscription data checking even before authentication procedure will save satellite resource and time.