**3GPP TSG-WG SA2 Meeting #153E e-meeting *S2-220xxxx***

**Elbonia, October 10 – 17, 2022 (revision of S2-220xxxx)**

**Source: Thales**

**Title: Evaluation Update**

**Document for: Approval**

**Agenda Item: 9.24**

**Work Item / Release: FS\_5GSAT\_Ph2 / Rel-18**

*Abstract: The evaluation of coverage information provisioning to the core network is updated.*

# 1. Introduction/Discussion

In the current version of the TR23.700-28 (V1.0.0), in the evaluation part, the chapter 7.4.2 is dedicated to evaluation of coverage information provisioning to the core network (AMF/MME).

There is an editor’s note:

Editor's note: This clause aims to elaborate on advantages of different possibilities to determine the system assumption(s) and will need further updates.

This pCR proposes to remove the EN by providing furthers considerations on preferable system assumptions.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-28.

\* \* \* \* First change \* \* \* \*

### 7.4.2 To Core Network (AMF/MME)

Solutions #1, #2, #4, #5, #6, #9 and #11 assume that the CN (e.g. an MME or AMF) has access to coverage information allowing the CN to know when UEs will be in or out of coverage. There are several mechanisms supporting the provision/acquisition of coverage information. From RAN, from pre-configuration, from NWDAF, from 5G dedicated coverage provision network function, from AF and from 3rd party server.

Solution #1, Solution #4 and Solution #5 propose methods to address the acquisition of coverage information from RAN. Solution #1 suggests that the coverage information may be derived by the AMF based on the satellite assistance information from RAN, e.g. satellite id, satellite ephemeris. Solution #4 and Solution #5 both suggest to enable the provision of satellite coverage information to the AMF by RAN via existing UE Location Reporting procedures. However, all these solutions have RAN dependency.

Solution #15 (S2-2206932) proposes to pre-configure the coverage information on AMF.

Solution #21 (S2-2207185) proposes to utilize NWDAF.

Solution #17 (S2-2207182) proposes to utilize a new 5G NF.

Solution #19 (S2-2206701) proposes to obtain from AF.

Solution #22 (S2-2206924) proposes to obtain from a 3rd party server via NF/NEF.

To determine the best possible architecture in between all of these possibilities, the following considerations are proposed, together with corresponding preferable system assumption [SYSA]:

To predict if a UE will be under satellite coverage or not at a given location, given time it is necessary to determine future location(s) for UE(s), future satellite footprint on earth (with satellites ephemeris , identification , status and characterization of beams..) and do the comparison between both.

In this process:

* The satellite constellation data are initially provided by Satellite Network Center that should act as centralized and single source of information to provide satellite data to RAN and CN if requested. Any transfer of satellite data in between RAN and CN, in addition of introducing RAN dependency, might be a source of de-synchronization and error.
	+ [SYSAx]: AMF/MME shall be in relation with satellite constellation data without RAN dependency, nor indirection trough NGAP.
* As evocated in several solutions, AMF/MME are aware of (future) UE positions, obtained via NAS from UE, via NEF/SCEF for external AS or via NWDAF. These positions need to be compare with computed future satellite footprint on earth, based on Satellite Network Center data. Eventually a mapping of CN logical identifiers (e.g.: Tracking Areas) on earth surface is necessary. This processing (comparison, mapping) could be imagined in several places:

-Directly in AMF/MME: this solution would add complexity in AMF/MME design.

-In Application Server outside of CN: This solution requires that UE location / logical Ids information are sent out of CN, which is not preferable solution for user privacy concern

-In a Network Function inside CN: this solution is preferred for above reasons.

* + [SYSAy]: AMF/MME shall remain a simple state machine and processing for comparison logic between UE positions and satellite footprint on earth shall be done in Network Function inside CN for privacy considerations, but not directly inside/by AMF/MME.
* For future satellite footprint on earth determination: this footprint is evolving in time and shall be reevaluated periodically, based on satellite ephemeris and other information (beam characteristics and status …) gathered from Satellite Network Center data. This precludes solutions based on configuration inside CN and request dedicated computation in dedicated server in relation with Satellite Network Center. Because satellite coverage map can be considered as sensible information, it is recommended to use SCEF/NEF to interface external Application Server rather than direct AMF-MME/AS interface.
	+ [SYSAz]: satellite coverage map related information shall be exchanged between CN and external world through NEF/SCEF interface.
* To determine if satellite footprint evaluation and extrapolation by itself shall be done inside CN (and how) or outside CN, in dedicated AS via SCEF/NEF interface, the proposed criteria is to consider as best solution the solution minimizing the impacts on existing interfaces.
	+ [SYSAzz]: satellite footprint evaluation and extrapolation shall be done in a way minimizing impacts on existing interfaces.

\* \* \* \* End of changes \* \* \* \*