**3GPP TSG-SA3 Meeting #107-e *draft\_S3-221024-r1***

e-meeting, 16 - 20 May 2022 (revision of S3-yyxxxx)

**Source: Xiaomi, China Mobile, China Telecom**

**Title: New SID on Security Aspects of Satellite Access**

**Document for: Approval**

**Agenda Item: 6**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>   
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Study on Security Aspects of Satellite Access

Acronym: FS\_5GSAT\_Sec

Unique identifier: TBD

Potential target Release: Rel-18

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | X | X | X |  |
| No |  |  |  |  |  |
| Don't know | X |  |  |  | X |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Feature |
|  | Building Block |
|  | *Work Task* |
| X | Study Item |

## 2.2 Parent Work Item

|  |  |  |  |
| --- | --- | --- | --- |
| Parent Work / Study Items | | | |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
|  |  |  |  |

### 2.3 Other related Work Items and dependencies

|  |  |  |
| --- | --- | --- |
| Other related Work /Study Items (if any) | | |
| Unique ID | Title | Nature of relationship |
| 770002 | Study on using Satellite Access in 5G | SA1 preceding study item (Rel-16) on use cases and requirements for satellite access in 5G |
| 800048 | Stage 1 of 5GSAT | SA1 preceding work item (Rel-17) on service requirements of satellite access in 5G |
| 860010 | Guidelines for Extra-territorial 5G Systems | SA1 preceding study item (Rel-18) on new regulatory requirements |
| 890022 | Study on vehicle-mounted relays | SA1 preceding study item (Rel-18) containing service requirements related to satellite access |
| 800026 | Study on architecture aspects for using satellite access in 5G | SA2 preceding study item (Rel-17) on architecture aspects for using satellite access in 5G |
| 860005 | (Stage 2 of) Integration of satellite components in the 5G architecture | SA2 preceding work item (Rel-17) for integrating satellite systems in 5G architecture |
| 940074 | Study on satellite access Phase 2 | SA2 study item (Rel-18) on 5GC enhancement for satellite access Phase 2 |
| 941006 | NR NTN (Non-Terrestrial Networks) enhancements | RAN work item (Rel-18) on NR enhancements for satellite access |

# 3 Justification

SA2 has developed 5GSAT\_ARCH in Rel-17 to address service requirements of satellite access in 5G, in addition to which discontinuous coverage proposed in RAN WG is a feature which has architecture impact. Dynamic support of discontinuous coverage is required for initial NGSO constellation deployment but as well to support evolution of the constellations such as loss of satellites, different releases supported in a given constellation. UE may have access to satellite service coverage only at specific time and places due to sparse constellation. UE location may not be made aware by the network timely to enable efficient paging, due to which mobility management mechanism needs to be enhanced. Moreover, UE may not always have to stay awake for the sake of power efficiency, especially for MIoT UE. Hence, the prediction, mechanisms on awareness & notification of UE wake-up time and data storage & forwarding for UEs temporarily out of coverage may be needed.

To address the above concerns, an SA2 Rel-18 study item “Study on 5GC enhancement for satellite access Phase 2” (SP-211651) was approved with the following objectives:

*- Architectural enhancements to support discontinuous coverage for mobility enhancement (e.g. paging enhancement)*

*- Architectural enhancements considering prediction, awareness & notification of UE wake-up time, power saving optimizations.*

In support of achieving them, security aspects are tasked to SA3 as stated in SP-211651.

The SA2 study is being well progressed in TR 23.700-28 with 2 key issues and 6 solutions. All the solutions require the satellite coverage information (in form of satellite ephemeris data or unreachability information) to be made aware of by the core network, with which the core network is then able to set power saving parameters or mobility management parameters properly for the UE. Meanwhile, according to TS 36.331, the satellite coverage information is also sent by the RAN to the UE via SIB information so that the UE can deactivate its Access Stratum functions in order to optimise power consumption until coverage returns. As SIB information is broadcast and not protected, the satellite coverage information carried in the broadcast messages could be easily tampered by attackers. If the tampered satellite coverage information distorts the actual satellite coverage, the UE may be misled to deactivate its AS functions when it is still in network coverage; or it may be misled to keep active with AS functions when it is already out of coverage, leading to unnecessary power consumption. Both cases are a type of DoS attack on the UE. Therefore, how the UE verifies the authenticity and integrity of the satellite coverage information, probably with assistance of the network, needs to be studied. Furthermore, some of the SA2 solutions require the UE’s current accurate position and/or UE’s extrapolated locations during PSM to be sent in mobility management messages to the network. Then the privacy issue in such cases also needs to be studied.

In RAN WG, a work item in Rel-17 has been developed for enabling New Radio and NG-RAN to support Non-Terrestrial Networks (NTN), based on which a RAN Rel-18 work item (RP-213690) was approved to define enhancements for NG-RAN based NTN. According to RP-213690, the objective of studying and evaluating solutions for network to verify UE reported location information (for e.g. lawful interception, emergency call, Public Warning System) will need cooperation with other WGs including SA3.

In addition, SA3 is aware that UE location or NTN-GW/gNB position has been considered and may be used by RAN1 and RAN2 to facilitate radio network operations. That means, there are privacy and security concerns specific to NTN which need to be addressed for potential solutions using locations of the UE or NTN-GW/gNB.

Based on the satellite access/NTN related work in SA2 and RAN as introduced above, it is identified that there is a need for SA3 to investigate security and privacy issues for 3GPP system with satellite access.

# 4 Objective

This study item aims at investigating the security and privacy aspects of satellite access/NTN, based on what are being studied during Rel-18 in SA2 and RAN, with the following objectives:

- Identify security and privacy key issues and study potential solutions for protecting the UE in the enhanced architecture supporting discontinuous coverage with satellite access;

- Identify security and privacy key issues and study potential solutions for network verification of UE location information reported with satellite access during initial access or idle/connected mode;

- Study protection mechanisms for potential SA2/RAN solutions utilizing privacy related information of the UE or the position information of NTN-GW/gNB.

NOTE: Timely liaison with SA2 / RAN WGs needs to be considered.

# 5 Expected Output and Time scale

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| New specifications {One line per specification. Create/delete lines as needed} | | | | | |
| Type | TS/TR number | Title | For info  at TSG# | For approval at TSG# | Rapporteur |
| Internal TR | 33.XXX | Study on Security Aspects of Satellite Access | SA#98 (Dec. 2022) | SA#99 (March 2023) | Wei Lu, Xiaomi, luwei10@xiaomi.com |
|  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} | | | |
| TS/TR No. | Description of change | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |

# 6 Work item Rapporteur(s)

Wei Lu, Xiaomi, luwei10@xiaomi.com

# 7 Work item leadership

SA3

# 8 Aspects that involve other WGs

Potential interaction with SA2 WG for architecture aspects, with RAN WG for RAN dependent issues.

# 9 Supporting Individual Members

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| Supporting IM name |
| Xiaomi |
| China Mobile |
| China Telecom |
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