**3GPP TSG-WG SA2 Meeting #161 S2-2403577**

**26 Feb – 01 Mar 2024, Athens, Greece (revision of S2-2403133)**

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**Title: (KI#1) Solution for handling Feeder link Unavailability event**

**Document for: Approval**

**Agenda Item: 19.1**

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

*Abstract: This paper proposes a new Sol#X for KI#1 to resolve open issues for handling feederlink unavailability event for TR23.700-29.*

# 1. Discussion

This PCR proposes a new solution for Key Issue #1: to resolve the open issues for feeder link unavailability event.

When a RAN node (eNB or gNB) on boarding regenerative based satellite (denoted as RAN-Sat) flies from service area A associated to ES1 to service area B associated to ES2, the feeder link of the satellite with NTN gateway on the ground may be unavailable while the UE is still with service link. Due to the change of service areas, the serving AMF/MME on the ground may be different after feeder link unavailability event is finished. In this case, the UE needs to perform registration request for mobility registration update.

To allow the UE preparing for such service interruption, the UEs accessing regenerative based satellite needs to be aware of such feeder link unavailability event especially when it would result in AMF/MME changes.

# 2. Proposal

It is proposed to capture the following changes vs. TR 23.700-29.

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

## 6.0 Mapping of Solutions to Key Issues

Table 6.0-1: Mapping of Solutions to Key Issues

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Key Issues | | | |
| Solutions | 1 | 2 | 3 |  |
| 1 | X |  |  |  |
| 2 | X |  |  |  |
| 3 | X |  |  |  |
| 4 | X |  |  |  |
| 5 | X |  |  |  |
| 6 | X |  |  |  |
| 7 | X |  |  |  |
| 8 | X |  |  |  |
| 9 | X |  |  |  |
| 10 | X |  |  |  |
| 11 |  | X |  |  |
| 12 |  | X |  |  |
| 13 |  | X |  |  |
| 14 |  | X |  |  |
| 15 |  | X |  |  |
| 16 |  | X |  |  |
| 17 |  | X |  |  |
| 18 |  | X |  |  |
| 19 |  | X |  |  |
| 20 |  | X |  |  |
| 21 |  | X |  |  |
| 22 |  | X |  |  |
| 23 |  | X |  |  |
| 24 |  | X |  |  |
| 25 |  | X |  |  |
| 26 |  | X |  |  |
| 27 |  | X |  |  |
| 28 |  |  | X |  |
| 29 |  |  | X |  |
| 30 |  |  | X |  |
| 31 |  |  | X |  |
| 32 |  |  | X |  |
| 33 |  |  | X |  |
| X | X |  |  |  |

\* \* \* \* Second change (All new text)\* \* \* \*

## 6.X Solution #X: Support of Feeder link Unavailability Period

### 6.X.1 Description

When a UE accessing RAN node (eNB or gNB) on boarding regenerative based satellite (denoted as RAN-Sat) flies from service area A associated to ES1 at time T1 to service area B associated to ES2 at time T3, the feeder link of the satellite with NTN gateway on the ground is unavailable for a period of time, in which the feeder link may need to switchover from ES1 to ES2 as in Figure 6.X.1-1. The following 5GS/EPS enhancement are needed for handling feeder link unavailability event.

* During RAN-Sat mobility, the UE having service link with RAN-Sat may suffer service interruption due to several reasons, e.g. RAN-Sat does not support S&F operation mode, UE does not need delay tolerant services provided by RAN-Sat in S&F mode, etc.
* For transparent payload-based satellite access, the UE enters CM-idle state due to unavailable service link when moving out of coverage. However, for regenerative payload-based satellite access, feeder link unavailability event may occur in RAN-Sat access coverage, the UE with available service link would be in CM-connected state during feeder link unavailability event.
* Due to the change of service areas, the serving AMF/MME on the ground may be different after regaining feeder link or feeder link switchover is completed. In this case, the UE needs to perform registration request for mobility registration update.

To allow the UE preparing for such service interruption, e.g. requesting Unavailability Period Duration for saving UE power consumption, the UEs accessing regenerative based satellite needs to be aware of such feeder link unavailability event especially when it would result in AMF/MME changes.

Editor’s Note: It is FFS whether feeder link switchover event would result in service interruption due to long delay for



Figure 6.X.1-1: Feeder link Uavailablile Event for UE having service link with RAN on boarding satellite mobility

The principle of this solution is to treat the unavailability of the feeder link as similar to the UE being under discontinuous coverage as described in clause 5.4.13 of TS 23.501 and clause 4.13.8 of TS 23.401.

Editor’s Note: It is FFS whether feeder link unavailability and service link unavailability needs to be distinguished. If yes, how the support for discontinuous coverage in UE and AMF/MME is FFS.

### 6.X.2 Procedures

There are no impacts to 3GPP procedures.

### 6.X.3 Impacts to Services, Entities and Interfaces

UE and AMF/MME implementations need to incorporate feeder link unavailability in their support for discontinuous coverage.

\* \* \* \*End change \* \* \* \*