**3GPP TSG SA WG5 Meeting #156 S5-244189**

**Maastricht, The Netherlands, 19 - 23 August 2024**

**Source: CATT**

**Title: Add the background for FS\_5GSAT\_Ph3\_CH to TR 28.846**

**Document for: Approval**

**Agenda Item: 7.5.1**

# 1 Decision

***The group is asked to discuss and agree on the proposal.***

# 2 References

[1] S5- 241830 “New Study on charging aspects of satellite access Phase 3”

[2] S5-241873 “Discussion paper on charging aspects of satellite aceess Phase 3”

# 3 Rationale

This paper proposes to add Background for the study on charging aspects of satellite access Phase 3.

# 4 Detailed proposal

The following changes are proposed to be incorporated into the new TR.

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| **1st Modified Section** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[x] 3GPP TR 22.844: "Study on charging aspects of satellite in the 5G System"

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| **2nd Modified Section** |

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

S&F Store and Forward

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| **3rd Modified Section** |

# 4 Background

## 4.1 General

For Rel-19, SA1 has specified the following requirements on charging aspects for satellite access Phase 3 in the TS 22.261[2]:

* A 5G system with satellite access supporting Store and Forward (S&F) Satellite operation shall be able to collect charging information per UE or per application (e.g., number of UEs, data volume, duration, involved satellites).
* A 5G system with satellite access shall be able to collect charging information for a UE registered to a HPLMN or a VPLMN, for UE-Satellite-UE communication.
* In a 5G system with satellite access, charging data records associated with satellite access(es) shall include the location of the associated UE(s) with satellite access.

## 4.2 Regenerative-based satellite access

As introduced in the clause 4.5 of TR 28.844[x], the regenerative-based satellite access architecture involves deploying some 5GC network functions on the satellites. The following from figure 6.2.1-1 of TR 23.700-29[3] shows the high-level 5G network architecture for the regenerative-based satellite access.



Figure 4.2-1: Regenerative-based satellite access

## 4.3 Store and Forward Satellite operation

As specified in the TS 22.261[2], the new capability that S&F operation is an operation mode of a 5G system with satellite-access, allows the satellite to store and forward data when satellite connectivity is intermittently/temporarily unavailable(e.g. when the satellite is not connected via a feeder link or via ISL to the ground network). The following from Figure J-1 of TS 22.261[2] shows the high-level network architecture for S&F operation.



Figure 4.3-1: Illustration of "S&F Satellite operation" modes in a 5G system with satellite access

According to the conclusion of the 5GSAT\_ph3 in the TR 23.700-29 [3], SA2 have approved two optional architectures to support the S&F operation:

* Split MME architecture
* full CN onboard the satellite architecture

For split MME architecture, the eNB and part of MME functions on the satellite, and all the other network functions including the other part of MME functions and HSS are deployed on the ground. The example of the S&F architecture based on MME split is shown in the Figure 4.3-2：



Figure 4.3-2: S&F architecture based on MME split

For full CN onboard the satellite architecture, the whole CN including eNB, MME, SGW, PGW, HSS, E-SMLC, SMSC etc are on board each satellite. Proxies deployed on the satellite and the ground for application traffic, including support of MT traffic, MO traffic, SMS, etc. Each satellite includes an endpoint proxy function that emulates the behaviour of a real endpoint (e.g. an AF) from the perspective of a UE.



Figure 4.3-2: S&F architecture based on full CN onboard the satellite

Editor's note: SA5 will align with the architecture and procedure for supporting S&F operation specified by SA2.

## 4.4 UEs- SAT- UEs communications on satellite

As specified in the TS 22.261[2], a 5G system with satellite access shall support UE-Satellite-UE communication regardless of whether the feeder link is available or not. The UE-satellite-UE communication scenario is that UEs can communicate using satellite access without the user plane traffic going to the ground network. The following from Figure 6.28.1-1 of TR 23.700-29[3] shows the high-level network architecture for UE-satellite-UE communication.



Figure 4.4-1: UEs- SAT- UEs communications on satellite in same cell with ISL

Editor's note: SA5 will align with the architecture and procedure for supporting UEs- SAT- UEs communications specified by SA2.

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| **End of Modified Sections** |