**3GPP TSG-SA5 Meeting #156 *S5-244129rev1***

Maastricht, Netherlands, 19 - 23 August 2024

**Source: CSCN**

**Title: pCR TR28.846 Charging for satellite resource rental between satellite network operator and terrestrial network operator**

**Document for: Approval**

**Agenda Item: 7.5.1**

# 1 Decision/action requested

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

# 2 References

[1] 3GPP TS 23.501 V19.0.0 System architecture for the 5G System (5GS)

[2] 3GPP TS 32.255 V18.4.0 5G data connectivity domain charging

[3] S5-243007 DP on business scenarios and charging requirements for satellite resource rental between satellite network operator and terrestrial network operator

[4] 3GPP TR 23.700-27 V18.0.0 Study on 5G System with Satellite Backhaul

# 3 Rationale

#### 3.1Business scenario for satellite resource rental.

As discussed in S5-243007[3], Satellite network operator can lease satellite resources to a terrestrial network operator, Satellite network operator and terrestrial operator should be able to generate billing information based on different rental arrangements.

3.1.1Satellite Backhaul

Terrestrial operators rent satellites which are to be used as a part of the backhaul between (R)AN and 5GC.



Figure 3.1.1-1: Example scenario that gNB has multiple candidate satellite backhauls

3.1.2Edge computing via UPF deployed on the satellite

In order to enable GEO satellite edge computing, a UPF can be deployed on a satellite. Following figure shows a high level architecture of Satellite Edge Computing via UPF on board.



Figure 3.1.2-1: Satellite Edge Computing via UPF on-board

3.1.3Local switch via UPF deployed on the satellite

For UEs in a communication that is served by satellite backhaul, if local data switching via UPF on-board can be enabled, then the communication path between two UEs can be significantly shortened by avoiding using ISL and feeder link on the way towards the PSA on the ground.



Figure 3.1.3-1: Local Data Switching via a UPF on-board

Editor's note: The above three figures are sourced from 3GPP TR 23.700-27 [4]

#### 3.2Potential charging requirements

The charging mechanism in terrestrial network operator should support conveying charging information on usage of satellite backhaul to the satellite network operator.

Terrestrial network operator could be charged by Satellite network operator based on usage of satellite backhaul per EAS related to EAS deployment (EAS deployment, EAS modification, EAS termination) and infrastructure resource (virtual CPU usage, virtual memory usage, virtual disk usage, data volumes).

The charging mechanism in terrestrial network operator should support conveying charging information on usage of satellite for 5G VN group related to the data volume to the satellite network operator.

#### 3.3 Existing interface for CHF to CHF

N107 Reference point has been introduced for CHF to CHF in TS32.255[2].

Figure 3.3-1 depicts the 5G data connectivity converged charging architecture for roaming local breakout with V-CHF to H-CHF in reference point representation:



Figure 3.3-1: 5G data connectivity converged charging architecture in Local Breakout V-CHF to H-CHF scenario reference point representation

The N40 reference point is defined for the interactions between V-SMF and V-CHF, the N107 reference point is defined for the interactions between V-CHF and H-CHF.

For scenarios with MVNO (owning a CHF referred to as A-CHF) non-roaming, the N40 reference point is defined for the interactions between SMF and CHF owned by MNO, the N107 reference point is used for the interactions between CHF owned by the MNO and A-CHF owned by the MVNO.

# 4 Detailed proposal

Propose to incorporate the following change into the TR 28.846.

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| **1st change** |

# 6 Charging scenarios and key issues

## 6.X Topic 1 Charging for satellite resource usage between SSP and MNO

### 6.X.1 Use cases

#### 6.X.1.1 Use Case #1.1: SSP charging MNO for satellite used for backhal

MNO has an agreement to use the satellite from SSP for backhaul, the charging party and charged party can be:

- Charged party: MNO who using the satellite which rented from the Satellite Service Provider.

- Charging party: SSP who provides the satellite to MNO.

This charging could be based on the total data volume transferred via the satellite.

#### 6.X.1.2 Use Case #1.2: SSP charging MNO for edge computing via UPF deployed on the satellite

SSP provides the satellite infrastructure resources to terrestrial network operator to enable the EAS to be running on the satellite. The charging party and charged party can be:

- Charged party: MNO who using the satellite which rent from the Satellite Service Provider.

- Charging party: SSP who provides the satellite to MNO.

This charging may be based on usage of satellite per EAS related to EAS deployment (EAS deployment, EAS modification, EAS termination) and infrastructure resource (virtual CPU usage, virtual memory usage, virtual disk usage, data volumes).

#### 6.X.1.3 Use Case #1.3: SSP charging MNO for local switch via UPF deployed on the satellite.

SSP can lease satellite to MNO for local switch via UPF deployed on the satellite.

The MNO has an agreement to use the satellite from SSP the charging party and charged party can be:

- Charged party: MNO who using the satellite which rented from the Satellite Service Provider.

- Charging party: SSP who provides the satellite to MNO.

Thischarging could be based on usage of satellite for local switch related to the data volume.

### 6.X.2 Potential charging requirements

**REQ-CH\_ SATBH\_SMNO-01**: The 5GS should support collecting and converging charging information related to satellite backhaul service, edge computing or local switch.

### 6.X.3 Key issues

Key Issue #1a: Aggregation of charging information in MNO.

Key Issue #1b: Conveying of charging information from MNO to SSP.

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| **End of changes** |