**3GPP TSG-SA5 Meeting #157 *S5-246097***

**Hyderabad, India 14 - 18 October 2024**

**Source: Ericsson**

**Title: pCR 28.874-101 Update evaluations**

**Document for: Approval**

**Agenda Item: 6.19.15**

# 1 Decision/action requested

***Approve the pCR***

# 2 References

[1] 3GPP TR 28.874-101 Study on management aspects of NTN – Phase 2

[2] S5-245361 pCR 28.874-101 Complement potential solutions for Management of connections and associations

# 3 Rationale

The evaluations need to be updated to reflect contributions to this meeting, e.g. S5-245361.

The Editor’s notes are proposed to be removed as the format in the evaluation clauses all seem consistent.

# 4 Detailed proposal

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| **Beginning of changes** |

#### 5.1.1.4 Evaluation of potential solutions

There are 2 potential solutions support the REQ-NTN-REGCON-1. It is proposed to evaluate them based on the following principles.

**Principle 1**: When regenerative mode is considered, the potential solution supports gNB/eNB and ground nodes to know in advance when the connections will be lost and need to be reconnected, without dependence of a working management interface. So that the N2/S1 connection setup/resume and disconnect/suspend can be triggered.

Both of the potential Solution #<1> and the potential Solution #<2> can support **Principle 1.** Moreover, both of them can be configured based on the pre-obtained information about the connection between the satellite and the gateway. Therefore, neither of them has the risk of N2/S1 connection update failure due to the configuration delay.

**Principle 2**: Less configuration complexity.

Solution #<1> proposes to change the attribute of the existing EP\_RP IOC. It requires that the existing standard definition of the FarEndEntity attribute changes from a DN type attribute allowing only one value, to the FarEndEntityList attribute which is a list attribute and each list element of this attribute consists of a FarEndEntity and a timeWindow describing the valid time of the connection.

Because of this change, the associations represented by EP\_RP IOC may need to change from one-to-one association to one-to-many association. Considering that many IOCs inherit from the EP\_RP IOC, such change may lead to impact on other IOCs.

Solution #<2> adds a new attribute or IOC in the existing interface instances. The new attribute or IOC is a list describing the available time window for the instance.

Potential solution#<1>:

* Pros:
	+ Supports gNB/eNB and ground nodes to know in advance when the connections will be lost and need to be reconnected, without dependence of a working management interface. So that the N2/S1 connection setup/resume and disconnect/suspend can be triggered.
	+ Since the association between the local address and the remote address is changed, the complexity and overhead when configuring all association time windows is reduced, as only one instance per association needs to be updated.
	+ No changes to EP\_RP and not modifying any existing attributes, minimizing the impact on inheritance relationships and reducing unexpected backward compatibility issues.
	+ In case of large satellite constellation, the number of EP instances will be the same as in terrestrial network case.
* Cons:
	+ Each MOI can represent different logical entities in different time windows which can potentially increase the complexity.

Potential solution#<2>:

* Pros:
	+ Supports gNB/eNB and ground nodes to know in advance when the connections will be lost and need to be reconnected, without dependence of a working management interface. So that the N2/S1 connection setup/resume and disconnect/suspend can be triggered.
	+ No changes to EP\_RP, minimizing the impact on inheritance relationships and reducing unexpected backward compatibility issues.
* Cons:
	+ When the satellite constellation is large, many instances need to be created and updated, resulting in more overhead cost and potential misalignment needs to be handled.

Potential solution #<3.1>

* Pros:
	+ Minimizes the complexity and overhead when configuring all association time windows, as only one instance per association needs to be updated. Also minimizes feeder link load as well as satellite CPU load and memory usage.
	+ No backward compatibility issues as there are no modifications of any existing attributes.
* Cons:
	+ Each MOI can represent different logical entities in different time windows which can potentially increase the complexity..

Potential solution #<3.2>

* Pros:
	+ No backward compatibility issues.
* Cons:
	+ As in gNB in space are non-geo synchronized, each space gNB needs to serve all the quasi-earth fixed cells on the entire earth, and the association updates need to be made with a period of approximately every minute, this solution has the drawback of managing a huge number of instances for all the connections (hundreds or even thousands) with the high system load for creation and updates, and related risk of delays and inconsistency in the creation/updates due to loss of feeder link between the management system and satellites, or alternatively a huge overhead and memory cost if all instances should be created in advance. In the latter case there is also a risk for inconsistent configuration in case some of all the sub-operations cannot be successfully executed for various reasons, causing a "PARTIALLY\_FAILED" response.

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| **Next change** |

#### 5.1.2.4 Evaluation of potential solutions

Potential solution #<1>

* Pros:
	+ Minimizes the complexity and overhead when configuring all association time windows, as only one attribute per association needs to be updated. Also minimizes feeder link load as well as satellite CPU load and memory usage.
	+ No backward compatibility issues as there are no modifications of any existing attributes.
* Cons:

Each MOI can represent different logical entities in different time windows which can potentially increase the complexity.Potential solution #<2>

* Pros:
	+ No backward compatibility issues as there are no modifications of any existing attributes.
* Cons:
	+ As the association updates need to be made with a period of approximately every minute, this solution has the drawback of managing a huge number of instances for all the connections (hundreds or even thousands) with the high system load to create and update them frequently, and related risk of delays and inconsistency in the creation/updates due to loss of feeder link between the management system and satellites, or alternatively a huge overhead and memory cost if all instances should be created in advance. In the latter case there is also a risk for inconsistent configuration in case some of all the sub-operations cannot be successfully executed for various reasons, causing a "PARTIALLY\_FAILED" response.

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| **End of changes** |