**3GPP TSG-WG SA2 Meeting #152E e-meeting *S2-220XXXX***

**August 17 – 26, 2022, Elbonia**

**Source: Thales**

**Title: KI#1 and KI#2: proposed methodology for global evaluation**

**Document for: Approval**

**Agenda Item: 9.24**

**Work Item / Release: FS\_5GSAT\_Ph2 / Rel-18**

*Abstract: Propose methodology based on KI verification and evaluation criteria to select solutions solving KI#1 and KI#2.*

# 1. Introduction

As study objective is to determine best solutions for KI#1 (mobility management enhancement with discontinuous satellite coverage) and KI#2 (power saving enhancement for UE in discontinuous coverage), it is proposed to define methodology and evaluation criteria in priority in relation with particular aspects that have been highlighted for investigation in the definition of Key Issues.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-28.

\* \* \* \* First change (all new) \* \* \* \*

# 7 Overall Evaluation

## 7.x Methodology

Considering that the elaborated Key Issues are mentioning some aspects that need to be covered in priority by final selected solution(s) (each may be single self-contained solution or an aggregation of interesting part of proposed solutions), and that it might be possible to rank solutions according preferable underlying system assumptions, for each Key Issue, proposed methodology is the following:

* 1- Refine the mapping between solution and Key Issues, by identifying for each aspect of the Key Issue, if the given solution addresses the aspect or not.
* 2- If yes, indicate as simply as possible, underlying system assumptions among the following

System assumption list:

*Editor’s note: Following list is a proposal and need to be discussed during meeting.*

* + Which entity (UE, NW) determines satellite coverage
	+ Is the movement of UE taken into account or not, if yes, which entity determines it
	+ Which entity (UE, NW) takes decision in related procedure
	+ Are important part of the solution is considered implementation dependant and let out of 3GPP scope
	+ for IoT-NTN, NR-NTN, both
	+ …
* 3 - Once solutions are grouped as described above, considerations on preferable system assumptions, in relation with Key Issue aspects may help in determining the final solutions or assembly of parts of solutions.

## 7.y KI#1 aspects coverage by solutions and system assumptions matrix

Aspects to be considered for Key Issue#1 are, as mentioned in Key Issue definition chapter:

- [KI#1-1] how UE determines that it has to remain with no service or it has to attempt to register on available different RAT's/ PLMNs to receive the normal service during discontinuous coverage in current NTN RAT.

- [KI#1-2] how to reduce the impact to target RAT or system due to large number of UEs triggering signalling load on the target RAT or system to receive normal service

Following table defines if solution covers KI#1 aspects, with corresponding system assumptions. If no system assumption, means the aspect is not covered.

*Editor’s note:*

* *For each solution, indicates if KI particular aspect is covered, with relative system assumptions picked up among the System assumption list. Empty cell means the aspect is not covered.*
* *The solution list is populated according table 6.0-1: Mapping of solutions to key issues*

Table 7.y‑1 Candidate Solutions with system assumptions

|  |  |  |
| --- | --- | --- |
| Solutions | KI#1-1(remain with no service or attempt to register on available different RAT's/ PLMNs) | KI#1-2(reduce signalling on target RAT) |
| 4: Mobility Management enhancement based on coverage information and UE location |   |  |
| 6: Discontinuous coverage architecture |   |  |
| 7: Utilizing discontinuous coverage wait timer for satellite discontinuous coverage scenario |   |   |
| 8: Leaving Coverage Notification |   |  |
| 10: UE Reachability Events with Expected in Coverage Time |   |   |
| 11: Combined UE Management Architecture |   |   |
| 12: Minimize discontinuous coverage by inter-RAT handover processing |   |  |
| 13: Applicability of no service in discontinuous coverage |   |  |
| 14: Wait timer for discontinuous coverage |   |  |
| 15: Solution to support Provision of Coverage Data to a UE |   |   |
| 16: Solution to support a UE Triggered Generalized Unavailability Period |   |   |

## 7.z KI#2 aspects coverage by solutions and system assumptions matrix

Aspects to be considered for Key Issue#2, based on the coverage information of the UE and enhancement of power saving mechanisms, e.g. PSM, MICO mode and eDRX, are, as mentioned in Key Issue definition chapter:

- [KI#2-1] UE does not attempt PLMN access when there is no network coverage

- [KI#2-2] when there is network coverage (of any RAT supported by UE) the UE attempts PLMN access as needed e.g. to transfer signalling, transfer data or receive paging, etc

Following table defines if solution covers KI#2 aspects, with corresponding system assumptions.

*Editor’s note:*

* *For each solution, indicates if KI particular aspect is covered, with relative system assumptions picked up among the System assumption list. Empty cell means the aspect is not covered.*
* *The solution list is populated according table 6.0-1: Mapping of solutions to key issues*

Table 7.z‑1 Candidate Solutions with system assumptions

|  |  |  |
| --- | --- | --- |
| Solutions | KI#2-1(no PLMN attempt if no coverage) | KI#2-2(PLMN attempt if any RAT coverage) |
| 1: Power Saving based on AMF awareness of coverage information |   |  |
| 2: Predictive Power Saving Mode | * NW determines satellite coverage
* UE movement determined by UE
* NW takes decision
* No implementation dependence
* IoT-NTN only
 |  |
| 3: Power Saving based on UE awareness of coverage information |   |   |
| 5: Power Saving based on updating parameters before releasing signalling connection |   |  |
| 7: Utilizing discontinuous coverage wait timer for satellite discontinuous coverage scenario |   |   |
| 9: Modification of Timers when in or out of Coverage |   |   |
| 10: UE Reachability Events with Expected in Coverage Time |   |  |
| 11: Combined UE Management Architecture |   |  |
| 15: Solution to support Provision of Coverage Data to a UE |   |   |
| 16: Solution to support a UE Triggered Generalized Unavailability Period |   |   |

## 7.zz Considerations on system assumptions.

Each solution is based on few system assumptions, for example: which entity (UE, NW) determines satellite coverage, which entity (UE, NW) takes decision in related procedure …

Determination of preferable system assumptions would make easier the selection of final solutions or aggregation of solution parts.

Following preferable system assumptions (psa), with corresponding justification, are proposed as guidance for final choice:

*Editor’s note: Following list is a proposal and need to be discussed during meeting.*

* + [psa-1] Satellite service coverage shall be determined preferably by NW rather than by the UE
		- Justification:
			* More complete information on satellite constellation due to connection with Satellite Network Center
			* No UE resources required to determine satellite coverage
	+ [psa-2] For non-static UE, it is preferable to take the UE trajectory into account. The entity (UE, NWDAF, and external AS via NEF) providing this trajectory may depend on the use case.
		- Justification:
			* If movement is predictable, the parameter adaptation will better correspond to reality
	+ [psa-3] Decision on system behaviour shall be made preferably by NW rather than by the UE
		- Justification:
			* Global system behaviour is more coherent and centralized.
	+ [psa-4] Solution should preferably apply to both IoT-NTN and NR-NTN
		- Justification:
			* Reuse concepts and avoid procedure divergence.
	+ …

\* \* \* \* End of changes \* \* \* \*