**SA WG2 Meeting #16x *S2-240xxxx***

**xxx**

**Source: Thales, XXX**

**Title: Solutions grouping**

**Document for: Approval**

**Agenda Item: 19.1**

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

*Abstract of the contribution: Analyse and group solutions according to their intrinsic characteristics (services, architecture), completeness and self-contained level.*

1. Introduction

The TR 23.700-29 proposes several solutions to address the listed 3 Key Issues as per listed in chap.6:

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 |  |
| 34 | X |  |  |  |
| 35 | X |  |  |  |
| 36 | X |  |  |  |
| 37 |  | X |  |  |
| 38 |  | X |  |  |
| 39 |  | X |  |  |
| 40 |  |  | X |  |
| 41 |  |  | X |  |
| 42 | X |  | X |  |

2. Text Proposal

The following text is proposed to be applied to TR 23.700-29.

\*\*\* First Change \*\*\*

# 7 Overall Evaluation

## 7.1 Solution grouping

This chapter intends to analyse and group solutions according to their intrinsic characteristics (services, architecture), completeness and self-contained level.

### 7.1.1 Solution grouping for regenerative payload

The problems addressed by the different solutions to KI#1 are categorized into:

A. Satellite leaving ("setting") the coverage area of a CN and later returning ("raising") to the coverage area of that CN after having circulated the earth. The gNB/eNB is typically away for a significant time (multiple hours).

B. Satellite is switching from one feeder link to another feeder link while it is still serving the same geographic area and still connected to the same CN. This issue is equivalent to a "cable" between terrestrial RAN and CN being re-connected, potentially resulting in that the gNB/eNB gets a new TNL IP address. Both "soft" and "hard" feeder link switches are considered.

C. Handling of earth-fixed TAIs when the gNB/eNBs are moving and need to change the TAIs it servers over time. This thus results in that a specific earth-fixed TAI (and corresponding geo area) is served by different gNB/eNBs over time.

Handling of mapped Cell IDs when different gNB/eNBs serving a specific geo area over time. This topic is related to how Cell IDs are used over the RAN-CN interface and by the AMF/MME, e.g. in paging, WUS, and PWS procedures.

D. Other aspects, e.g. AMF selection, QoS aspects.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Solutions | KI#1 sub-problem targeted | EPC and/or 5GC | New NF(s)? | # of ENs / FFS (for update) | RAN dependency (primarily RAN3)  | Other comments |
| A. Setting gNB/eNB | B. Feederlink switch | C. TAI and/or CellID | D. Other (QoS, AMF discovery)  |
| 1 | X |  |  |  | EPC/5GC |  | 3 | X |  |
| 2 | X |  | X |  | EPC/5GC |  | 1 | X |  |
| 3 | X |  |  |  | EPC/5GC |  | 3 | X |  |
| 4 | X |  | X |  | 5GC |  | 3 | X |  |
| 5 |  | X |  |  | EPC |  | 3 | X |  |
| 6 |  | X |  |  | EPC/5GC |  | 3 | X |  |
| 7 |  | X |  |  | 5GC |  | 3 | X | Focus on user-plane aspects. Dependency on how N2/S1 is handled. |
| 8 |  |  |  | X | 5GC |  | 1 | X | QoS (PDB) handling |
| 9 | X | X | X |  | EPC/5GC | Yes | 0 | X | New NFs: RAN agent, RAN Proxy Node, Link Layer Proxy) |
| 10 | X | X | X |  | EPC/5GC | Yes | 2 | X | FFS whether this will be a vendor-specific solution or standardized by RAN WGs.New NF: IWF |
| 34 |  |  |  | X | 5GC | Yes | 1 | X | Focus on AMF selection.New NF: AMF agent |
| 35 |  | X |  |  | EPC/5GC |  | 2 | X |  |
| 36 |  | X |  |  | 5GC |  | 2 | X | Focus on user-plane aspects. Dependency on how N2/S1 is handled. |

**Group 1:** Solutions supporting both EPC and 5GC and that address control plane aspects

**Group 2:** Solutions addressing other aspects e.g. related to user plane, QoS, AMF selection

### 7.1.2 Solution grouping for Store and Forward

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution | SMS only  | CP C IoT Optimisation (IP packet, SMS, NIDD)  | UP C IoT Optimisation  | IP over PDU session | e/gNB on board | (proxy) UPF on bard  | (proxy) MME/AMF in SAT | (proxy) S-GW/P-GW in SAT | (proxy) all NF and IMS servers: all services, simplex or half duplex | (proxy) UE emulation on ground | SCEF in SAT | Support different SATs  | Security studied  | Security NF on board | S&F mode activation | Roaming supported  | Level of details  | Self contained  | Nb of ENs (for update) |  |
| 11 |  | X |  |  | X |  | X |  |  |  |  | X | X |  |  |  | H | X | 7 | Full solution, link to sol25 |
| 12 |  |  |  | X | X |  | X | X |  |  |  | X | X |  | X |  | M | X | 4 | Full solution |
| 13 |  |  |  | X | X |  | X | X |  |  |  |  | X |  | X |  | M | X | 4 | “simple” version of solution 12 for always same SAT |
| 14 |  |  |  |  | X |  | X |  |  |  |  |  | X |  |  |  | L |  | 3 | Not full solution, covers attach procedure with 1SAT  |
| 15 |  | X |  |  | X |  | X | X |  |  |  | X | X |  | X | X | H | X | 2 | Full solution  |
| 16 |  | X | X |  | X |  | X | X |  |  |  |  | X |  | X |  | M | X | 5 | Full solution with full C-SGN on board, limited to 1 SAT |
| 17 |  | X |  |  | X |  | X | X() |  |  | X |  | X | X | X |  | H | X | 2 | Full solution limited to 1 SAT; () not P-GW |
| 18 |  |  |  |  | X |  | X |  |  |  |  |  |  | X | X |  | L |  | 2 | Not full solution, covers attach procedure with 1SAT  |
| 19 |  | X | X | X | X |  | X | X | X | X |  | X |   | X | X |  | H | X | 4 | Full solution, all services simplex/half duplex + packaging transactions.  |
| 20 |  |  | X |  | X |  |  |  |  |  |  |  |  |  |  |  | M |  | 8 | Not full solution, only MT part, assumes fix terminal |
| 21 |  | X |  |  | X |  |  |  |  |  |  |   |  |  |  |  | M |  | 2 | Not full solution, Attachment in S&F mode not addressed |
| 22 | X |  |  |  | X |  | X |  |  |  |  |  |  |  |  |  | M |  | 1 | Not full solution, Attachment in S&F mode not addressed, SMS only |
| 23 | X |  |  |  | X |  | X |  |  |  |  |  |  |  |  |  | M |  | 3 | Not full solution, Attachment in S&F mode not addressed, SMS only |
| 24 |  |  |  |  | X | O1 | O2 | O2 |  |  |  |  | X | O2 |  |  | L |  | 8 | Not full solution, 2 sub-solutions dedicated to 5G, covers (partially- ENs) REGISTRATION only.  |
| 25 |  |  |  |  |  |  | X |  |  |  |  |  |  |  |  |  | H |  | 2 | Not Full solution, possible enabler for other solutions with MME proxy in SAT  |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M |  | 1 | Not full solution, 5G NEF S&F provisioning, possible enabler for other solutions |
| 27 |  |  |  | X |  | X |  |  |  |  |  |  |  |  | X |  | H |  | 1 | Not full solution. Algorithm smoothing traffic I-UPF in SAT to PSA-UPF. Possible enabler of other 5G solution with proxy UPF on board.  |
| 37 |  | X |  |  | X |  | X |  |  |  |  | X | X |  |  |  | H | X | 7 | Full solution, 5G version of solution 11. (NAS PDU rather than CIoT but same principles) |
| 38 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | H |  | 1 | Not full solution, SCEF/NEF S&F events exposure. possible enabler for other solutions |
| 39 |  | X |  |  | X |  | X | X |  |  |  |  |  |  |  |  | M |  | 1 | Not full solution, MME/SGW storage size control. Possible enabler for other solutions in same architecture group.  |

For the Store and Forward feature, solutions can be categorized in following groups:

**- Group1**: proposals are full solution, self-contained, not limited to the same SAT for a given UE. In this group we have solutions 11, 12, 15, 19, 37

**- Group2**: proposals are full solution, self-contained, limited to the same SAT for a given UE. In this group we have solutions 13, 16, 17

**- Group3:** proposals are part of solution, not self-contained. In this group we have solutions 14, 18, 20, 21, 22, 23, 24

 - 14 & 18 addresses ATTACH procedure with one SAT restriction.

 - 22 & 23 are very similar addressing SMS

**- Group4:** proposals are enablers or utilities for other solutions with correspondent architecture. In this group we have solutions 25, 26, 27, 38, 39

### 7.1., 3 Solution grouping for UE-Sat-UE communications,

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solutions | gNB+UPF on board  | gNB+UPF+IMS AGW on board  | Eligibility verification  | Roaming  | Dedicated SMF  | No media transcoding restriction  | Different SATs (ISL)  | HO between SATs | New entity or NF  | Level of details | Self contained  | Nb of ENs (for update) |  |
| 28 | X |  | X |  X  | X |  | X | X |  | H | X | 1 | Full solution. SAT features (gNB, UPF) defined through groups in SMF configuration. IMS LI is not supported, media transcoding restrictions. |
| 29 | X |  |  |   | X |   |  | ? |  | M | X | 5 | Not full solution given importance of ENs. Same architecture hyp.and building blocks as Sol28.  |
| 30 | X |  | X |   |  |  | X |  |  | M |   | 3 | Not Full solution, possible enabler for eligibility verification for other solutions (e.g.: sol40) |
| 31 | X |  | X |  X | X |  | X |  |  | M | X | 5 | Not full solution given importance of ENs. Same architecture hyp.and building blocks as Sol28. |
| 32 |  | X | X | X  |  | X | X |   |  | H |  X | 1 | Full solution. AGW removes limitation (LI, codecs). Missing SAT change management.  |
| 33 |  | X | X |   |  | X |   | X |  | M | X | 2 | Full solution. AGW removes limitation (LI, codecs). Limitation to same cell in same SAT  |
| 40 | X |  | X |   |  |  | X | X |  | H | X | 3 | Full solution. IMS LI is not supported, media transcoding restrictions. |
| 41 |  | X |  |   |  | X | X | X |  | H | X | 4 | Full solution. AGW removes limitation (LI, codecs). IP pool use. Missing eligibility (sol30?). HO and UL CL insertion to complete.  |
| 42 |   | X |  |   |  | X | X |   | X | M | X | 3 | Full solution for KI1 and 3. Ground based relay select SAT based on ephemeris. |

For the UE-SAT-UE feature, solutions can be categorized in following groups:

**- Group1**: proposals are full solution, self-contained, not limited to the same SAT for a given UE. In this group we have solutions 28, 32, 40, 41, 42.

**- Group2**: proposals are full solution, self-contained, limited to the same SAT. In this group we have solution 33.

**- Group3:** proposals are part of solution, not self-contained, given importance of ENs. In this group we have solutions 29, 31.

**- Group4:** proposals are enablers or utilities for other solutions with correspondent architecture. In this group we have solution 30.

\*\*\* End of Changes \*\*\*