**3GPP TSG-WG SA2 Meeting #164 *S2-2408800***

**Maastricht, NL, 19th Aug – 23rd Aug, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | 3800 | **rev** | 1 | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:*** | Introduction to Split MME architecture | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung, Novamint, Sateliot, NEC, Intel, CATT | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5GSAT\_Ph3\_ARCH | | | | |  | ***Date:*** | | | 2024-08-19 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | Based on conclusions agreed in the TR 23.700-29 for KI#2 this CR proposes to introduce S&F features. This CR proposes the Annex to describe the S&F architectures using split MME option. | | | | | | | | |
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| ***Summary of change:*** | | S&F feature is implemented based on the conclusions reached for KI#2 in TR 23.700-29. | | | | | | | | |
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| ***Consequences if not approved:*** | | S&F features is not completely described. | | | | | | | | |
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| ***Clauses affected:*** | | Annex X(new), X.1(new), X.1.1(new) | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of Changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Annex X (informative):   
Store and Forward Satellite operation

## X.1 Example S&F Satellite operation Architectures

### X.1.1 Split MME architecture

In this architecture option:

1) eNB is onboard the satellite

1) MME is split into two functions:

a) MME-onboard: the MME part which is onboard the satellite. MME-onboard is in charge of (1) handling the S1 interface with the onboard eNB and (2) terminating the NAS protocol signalling from/to UEs via the onboard eNB.

b) MME-ground: the MME part which is on the ground network. MME-ground is in charge of handling the rest of interfaces towards other CN functions (e.g. S6a towards HSS, SGd towards SMS-GMSC/IWMSC /SMS Router, T6a towards SCEF, T6ai towards IWF-SCEF, S11 towards SGW). One MME-ground instance can be connected to one or multiple MME-onboard instances (see Figure X.2.1).

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Figure X.2.1-1: “Split-MME” architecture for supporting S&F satellite operation for SMS and CP CIoT services

The split-MME architecture has below principles:

1) How MME-onboard interacts with MME-ground is outside the scope of 3GPP in this release of specification.

2) The MME-ground is an anchor node situated in ground network. MME-ground is responsible to synchronize the UE context with all the MME-onboard(s). The MME-ground together with the set of MME-onboard instances deployed in the set of satellites behaves jointly as a single MME entity. Each MME-onboard instance is associated with a different Satellite ID identifier. The Satellite IDs are based on the SIB information broadcasted by eNB. The list of Satellite IDs are valid in the registration area (i.e. TAI list), if available.

3) Whenever a procedure needs an interaction with a core network node in the ground then MME-onboard (stores it as feeder link is not available) and synchronizes with the MME-ground when feeder link is available, the MME-ground executes the procedure with the ground network nodes and syncs back the UE context with the MME-onboard.

4) The MO data is stored in the MME-onboard when the service link is available and the feeder link is unavailable, and transferred to the ground when the feeder link becomes available. The MT data is stored in the MME-ground or in S-GW when the feeder link is unavailable and transferred to the MME-onboard when the feeder link becomes available. The MME may determine the satellite which will serve the UE in shortest time. It may be one of the satellites included in the list of satellite IDs provided to the UE. The MT data is stored in the MME-onboard when the feeder link is available and service link is unavailable, and transferred to the UE when service link becomes available.

Features described for High latency communication in clause 4.3.17.7 may be used to handle mobile terminated (MT) communication with UEs operating in store and forward mode, and the time until the feeder link with the satellite to be available to forward the data may be used when determining the Downlink Buffering Duration time.

5) For MO SMS, upon reception of the MO SMS the MME-onboard stores the MO-SMS and immediately send the delivery report(i.e. RP-ACK) to the UE i.e. as if the MO-SMS has already been successfully delivered to the Service Centre (SC). For this, some or full SMS-GMSC/IWMSC/SMS Router is expected to be collocated with MME-onboard the satellite.

6) The mobile reachable timer value has to be sufficiently large at network so that it takes into account delay in receiving information from the MME-onboard to MME-ground, after UE enters connected mode with MME-onboard( including case of PTAU procedure). How this is achieved is upto network implementation.

Editor's note: How to document the S-GW/P-GW(i.e. user plane) aspects as agreed in conclusions is FFS.