**3GPP TSG-WG SA2 Meeting #164 *S2-240xxxx***

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

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | 3800 | **rev** | 5 | **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 | | | | | | | | | |
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| ***Source to WG:*** | Samsung, Novamint, Sateliot, NEC, Intel, CATT, China Telecom | | | | | | | | | |
| ***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.  If the UE context has not been synchronized between multiple satellites in time due to e.g. UE mobility, the MT data cannot be successfully transferred to the UE. | | | | | | | | |
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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.  MME-onboard can send back the unsuccessfully delivered MT data to the MME-ground when the feeder link becomes available. The MT data can be stored in MME-ground and then sent again to a chosen MME-onboard after the UE context(e.g. location) is synchronized. | | | | | | | | |
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| ***Consequences if not approved:*** | | S&F features is not completely described.  The MT data may be lost when the UE context does not been synchronized between multiple satellites in time due to e.g. UE mobility in S&F mode. | | | | | | | | |
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| ***Clauses affected:*** | | Annex Y(new), Y.0(new), Y.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 Y (informative):   
Example Models of Store and Forward Satellite operation

## Y.0 Introduction

TODO

## Y.1 Model A: 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 associated with one or multiple MME-onboard instances (see Figure Y.1).



Figure Y.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 together with the set of MME-onboard instances deployed in the set of satellites behaves jointly as a single MME entity and the UE context is synchronized between them. Each MME-onboard instance is associated with a different Satellite ID identifier.

3) When UE initiates a MO procedure that needs an interaction with a core network node on the ground, the MME-onboard stores the MO procedure transaction if the feeder link is not available and synchronizes with the MME-ground when the feeder link becomes available. The MME-ground executes the procedure with the ground network nodes and syncs back the UE context with the MME-onboard when the feeder link becomes available.

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 when the feeder link is unavailable and transferred to the MME-onboard when the feeder link becomes available. The MME determine the satellite which will serve the UE next and the MT data is sent to the respective MME-onboard and stored in the MME-onboard of the satellite(s) when the feeder link is available (and service link is unavailable), and transferred to the UE when service link becomes available. If the MT data cannot be successfully transferred to the UE (e.g. because the UE context has not been synchronized between multiple satellites in time due to e.g. UE mobility), the MME-onboard can send back the unsuccessfully delivered data to the MME-ground when the feeder link becomes available. The MME-ground can store the the unsuccessfully delivered MT data for a time duration, and then send it later to the MME-onboard which is chosen to serve the UE after the UE context(e.g. location) is updated within the MME-ground.

5) For MO SMS, if the feeder link is not available upon reception of the MO SMS the MME-onboard can store the MO-SMS and can 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 as an additional deployment model, partial or full SMS-IWSMS functionality is expected to be collocated with MME-onboard the satellite.

Editor's note: How to update the figure above in relation to SMS-IWSMS function onboard of the satellite is FFS.

6) To support UE location verification on satellite, the E-SMLC in additional deployment model is also deployed on satellite to perform the verification of UE location functionality.

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

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