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**Title: Evaluation and conclusion on architecture**

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*Abstract of the contribution: Evaluation and conclusion on architecture.*

# 1 Discussion

Following table illustrates the comparison of solutions for KI#1 (excluding solutions #11, 12, 15 for service continuity), which shows the common and different aspects of solutions. This table can be used for architecture consideration for 5MBS. The comparison is based on description or obvious implication of solutions and does not consider obvious combination of solutions.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  Impacted CP NF SolutionsFunction | AMF | SMF\* | MB-SMF\* | MBSF | NEF | UDR | PCF |
| Initiation of MB session network operations (e.g. start, stop, delete, suspend, resume, configuration, etc.) | 2, 5, 13, 14 | 32 | 2, 3, 4, 5\*, 6\*, 9\*, 10\*, 13, 14, 32 | 4, 6, 10, 14 | 2\*, 3, 4, 5\*, 14 |  |  |
| Alt 1: AMF triggers RAN for session start notification (Sol#2, 4, 5, 13, 32); (RAN specific, revisited after getting response from RAN)Alt 2: No session start notification if session start time is known, and UE initiates session join after session start time (Sol#4) |
| MB-SMF selection for MB session network operations |  |  |  | 6, 9, 10 | 2\*, 3, 4, 5\*, 10 |  |  |
| Alt 1: NEF selects MB-SMF (Sol#2, 3, 4, 5); Alt 2: MBSF selects MB-SMF (Sol#6, 10) |
| Initiation of MB session user operations (e.g. join, leave, etc.) | 2, 4, 6, 14, 16 | 3, 4, 32 | 2, 3, 4, 6\*, 10\*, 14, 16\*, 32 | 10, 14 | 14 |  |  |
| Alt 1: Operation via CP without PDU session (de-)activation (Sol#2, 4, 14); Alt 2: Operation via CP with PDU session (de-)activation (Sol#3, 4, 6, 10, 16, 32);Alt 3: Operation via UP (Sol#2, 3, 4, 32) |
| MB-SMF selection for MB session user operations | 2, 4, 14, 16 | 3, 4, 32 |  |  |  |  |  |
| Alt 1: AMF interacts with NRF for MB-SMF selection (Sol#2, 16);Alt 2: AMF interacts with UDM/UDR for MB-SMF selection (Sol#4);Alt 3: AMF selects MB-SMF based on S-NSSAI and DNN (Sol#6, 10, 14);Alt 4: SMF selects MB-SMF (Sol#3, 4, 32);Alt 5: SMF notifies AMF to select MB-SMF for session join via UP (Sol#2, 16); |
| Delivery method selection | 2 | 3 | 4 |  |  |  |  |
| Alt 1: AMF determines the delivery method - AMF holds MB session context (Sol#2);Alt 2: SMF determines the delivery method - SMF holds MB session context (Sol#3)Alt 3: MB-SMF determines the delivery method - AMF and SMF do not hold MB session context (Sol#4) |
| Session context management | 2 | 3 | 2, 4, 6\*, 9\*, 10\*, 14 | 10, 14 | 2\* |  |  |
| Alt 1: AMF stores the session context (Sol#2);Alt 2: MB-SMF stores the session context (Sol#4, 6, 9, 10);Alt 3: SMF stores the session context (Sol#3); |
| MB session/group ID allocation |  |  | 2 | 4 | 2\* |  |  |
| Alt 1: 5GS internally assigned ID (Sol#2, 4); Alt 2: Source specific multicast address (Sol#3) |
| Shared N3 tunnel operation | 2, 3, 4, 13 |  | 2, 3, 4, 6\*, 9\*, 10, 13 |  |  |  |  |
| Alt 1: RAN indicates MB-SMF ID to AMF for signalling forwarding from RAN to MB-SMF (Sol#3, 4);Alt 2: AMF manages MB session context for signalling forwarding from RAN to MB-SMF (Sol#2) |
| N9 tunnel operation for individual delivery |  | 2, 3, 4, 13 | 2, 3, 4, 10\*, 13, 14 | 10, 14 |  |  |  |
| Control of UPF joining into multicast tree for individual delivery | 2 | 2 | 2 |  |  |  |  |
| Alt 1: AMF gets MC address from MB-SMF and informs SMF of MC address (Sol#2);Alt 2: SMF uses LL MC address for N9 tunnel (Sol#2)Alt 3: SMF uses HL MC address for N6 (Sol#2) |
| Control of MB-UPF joining into multicast tree |  |  | 2, 3, 4, 6\*, 9\*, 13 |  |  |  |  |
| Service parameters provisioning |  |  | 2 | 6, 9 | 2\*, 3, 4 | 3, 4 |  |
| Alt 1: UDR is the storage place (Sol#3, 4);Alt 2: MBSF is the storage place (Sol#6)Alt 3: MB-SMF is the storage place (Sol#2) |
| Policy provision and control |  |  |  | 6, 14 | 2, 3, 4, 5, 14 |  | 2, 3, 4, 5, 6, 8, 14, 16 |
| N6 tunnel operation |  |  | 2, 3 |  | 2\*, 3 |  |  |
| \* Solution #2 and 5 proposes MBSF collocated with NEF, so any impact on MBSF for solution #2 and 5 is marked as impact on NEF\* Solution #5, 6, 9, 10, and 16 proposes MB-SMF is same as SMF, so any impact on SMF/MB-SMF for solution #5 and 6 is marked as impact on MB-SMF\* Some solutions use different name for SMF and MB-SMF, e.g. solution #4 uses MB-SMF as SMF and Anchor MB-SMF as MB-SMF, solution #13 uses SMF1 as SMF and SMF2 as MB-SMF. |

**Observation 1: There’re proposals that MBSF selects MB-SMF or NEF selects MB-SMF for MB session network operations.**

**Observation 2: There’re proposals that MBSF manages MB session context or MB-SMF manages.**

**Observation 3: There’re proposals that MBSF allocates MB session ID, or MB-SMF allocates, or 5GS does not allocate MB session ID.**

**Observation 4: There’re proposals that AF interacts with MBSF (via NEF or not) or UDR (via NEF) for service parameters provisioning.**

**Observation 5: There’re proposals that MBSF or UDR interacts with PCF for MB session QoS provisioning.**

# 2 Proposal

From the above observations, except MBSU control, functionalities of MBSF can be deployed on other existing NFs.

**It is proposed that MBSF is an optional NF.**

Following is based on S2-2005409r15 that removes EN in A.X.2.1 to make it clear that MBSF/MBSU are optional, and makes some modification.

\* \* \* \* First change \* \* \* \* (All Text New)

Annex A:
Architecture alternatives

A.X Baseline architecture X: 5G MBS system architecture

A.X.1 General

Based on the two baseline architectures for 5G MBS as depicted in Annex A.1 and A.2, a consolidated 5GS architecture supporting MBS is proposed.

NOTE: Please note that architectures are typically frameworks with little or no functionality in themselves. Therefore, architectures cannot successfully be evaluated or compared without any solutions. Functionalities need to be added to an architecture e.g. by studying certain use cases and providing solutions that realize these use cases. The description in A.X.2 below therefore contains baseline architecture together with a set of basic solutions.

Editor´s note: The functionality described will need to be refined depending on the selected solutions or combination of selected aspects in solutions. It is not meant as evaluation criteria that all solution need to fulfil during the evaluation phase.
It is not necessary to update the terminology of all solutions to comply with the present baseline architecture. It is anticipated that this will be done for the solution during the normative phase.

A.X.2 Reference Architecture

A.X.2.1 General

Figure A.X.2.1-1 illustrates the 5GS architecture supporting MBS.

UPF

N4

UE

NG-RAN

MB-UPF

AMF

MB-SMF

NEF

MBSF

MBSU

**Data Network**

PCF

N6

gMB-U

(xMB-U/

MB2-U)

Nmb

N4

N3

Uu

N2

Namf

Nmbsmf

Npcf

Nnef

Naf

Nmbsf

SMF

Nsmf

UDR

Nudr

AF

gMB-C (xMB-C/

MB2-C)

N6

N1

N9

**Figure A.X.2.1-1: 5GS Architecture supporting MBS**

In Figure A.X.2.1-1, the SMF and UPF which have the roles to support MBS Sessions are named "MB-SMF" and "MB-UPF" respectively.

NOTE 1: If 5GC individual delivery method is used, a UPF may be placed between MB-UPF and NG-RAN.

NOTE 2: MBSF and MBSU may be required depending on deployment.

NOTE 3: The MB-SMF is an SMF extended with MBS functionality. An MB-SMF may be dedicated to MBS services. The MB-UPF is an UPF extended with MBS functionality. A MB-UPF may be dedicated to MBS services.

NOTE 4: The architecture using the reference point representation may be specified based on the selected solutions.

NOTE 5: gMB-C and gMB-U provide similar functionalities as defined for xMB-C/MB2-C and xMB-U/MB2-U interfaces, respectively.

The 5G MBS System Architecture contains the following new service-based interfaces:

**Nmbsmf:** Service-based interface provided by MB-SMF, could be part of Nsmf.

**Nmbsf:** Service-based interface provided by MBSF, could be part of Nnef.

A.X.2.2 Functional entities

NOTE: The enhancements of network functions covers commonalities of architecture alternative 1 and 2, and can be refined based on the selected solution.

A.X.2.2.1 PCF

The PCF is used to provide policy rules for MBS services, and receive MBS service information from AF, directly or indirectly. The PCF performs the following functions to support MBS:

- Support QoS handling for MBS Session, including QoS parameters like 5QI, MFBR, GFBR

- Provide policy information regarding the MBS session for authorizing the related QoS profiles.

- Receive MBS QoS requirement.

A.X.2.2.2 MB-SMF

The MB-SMF is used for MBS session management (including QoS control), and control of MBS transport, including configuring the MB-UPF and RAN (via AMF) for MBS flows transport based on the policy rules for MBS services from PCF or local policy.

A.X.2.2.3 MB-UPF

The MB-UPF is used for delivery of MBS flows to RAN (or PSA-UPF) and QoS enforcement for MBS services. The UPF performs the following functions to support MBS:

- Packet filtering for MBS flows.

- Distribution of MBS data packets to different RAN nodes (or PSA-UPF nodes).

- QoS enforcement (MFBR) and counting/reporting based on existing means.

A.X.2.2.4 AMF

The AMF performs the following functions to support MBS:

- Selection of MB-SMFs that have MBS capabilities.

- Signalling with NG-RAN and MB-SMF for MBS Session management.

A.X.2.2.5 NG-RAN

The NG-RAN is used to receive MBS flows via shared N3 tunnel and deliver MBS flows to the UEs using PTP or PTM delivery method. The NG-RAN performs the following functions:

- Management of MBS flows via N2

- Reception of MBS data via shared N3 tunnel.

- Configuration of UE for MBS flow reception at AS layer.

- Delivery of MBS data using PTM or PTP.

- Control switching between PTM and PTP delivery per UE.

A.X.2.2.6 UE

The UE needs to support the MBS operations and receive MBS flows from NG-RAN. The UE performs the following functions:

- Reception of multicast data using PTM /PTP.

- Management of MBS flows.

- Signalling for MBS session operations.

- MBS support at AS layer.

A.X.2.2.7 AF

The AF requests MBS service from the 5GC. The AF does so by

- providing MBS service information.

- negotiating with NEF for MBS related service exposure.

- instructing MBS session operation towards 5GC if needed.

A.X.2.2.8 NEF

The NEF supports 5MBS service exposure by providing an interface to AFs for 5MBS procedures including service provisioning and MBS session and QoS management.

A.X.2.2.9 MBSF

The MBSF performs the following functions:

- Interacting with AF and MB-SMF for MBS session operations and transport.

- Controling MBSU if the MBSU is used.

A.X.2.2.10 MBSU

The MBSU performs the following functions:

- Modification of encoding of MBS data.

- Media anchor for MBS data traffic if needed.

NOTE: The MBSF and the MBSU may be collocated or deployed separately.

A.X.2.2.11 UDR

The UDR performs the following functions:

- Receive, store, and provide MBS service information.

\* \* \* \* Second change \* \* \* \*

8 Conclusions

INTERIM CONCLUSION: Architectural option X "5G MBS system architecture" as described in Annex A.X is chosen as the baseline architecture for 5G MBS.

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