3GPP TSG-SA WG2#161 S2-2403280

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**Source: Qualcomm Incorporated, IIT Bombay?, CATT?**

**Title: New solution proposal: Architecture enhancements for the support of MWAB**

**Document for: Approval**

**Agenda Item: 19.6**

**Work Item / Release: FS\_VMR\_Ph2 / Rel-19**

*Abstract of the contribution: This contribution proposed a solution on the 5GS architecture enhancement for the support of MWAB operation.*

# 1. Discussion

This contribution proposed a solution for architecture enhancements for supporting MWAB operation, i.e. addressing key issue 1 of TR 23.700-06.

# 2. Text proposal

It is proposed to agree the following changes vs. TS 23.700-06:

>>>>BEGINNING OF CHANGES<<<<

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 22.261: "Service requirements for the 5G system; Stage 1".

[4] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description".

[5] 3GPP TS 38.401: "NG-RAN Architecture description".

[6] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

[x] 3GPP TS 23.502: "Procedures for the 5G System (5GS); Stage 2"

[y] 3GPP TS 38.413: “NG-RAN; NG Application Protocol (NGAP)”.

[z] 3GPP TS 23.122: “Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode”.

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## 6.0 Mapping of solutions to key issues

Editor's note: This clause describes the mapping between solutions and key issues.

|  |  |
| --- | --- |
|  | Key Issues |
| Solutions | 1 | 2 | 3 | 4 | 5 | 6 |
| X | x | x | x |  | x | x |
|  |  |  |  |  |  |  |
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## 6.X Solution #X: Architecture enhancements to support MWAB operations

### 6.X.1 General

Figure 6.X.1-1 presents an example architecture for the MWAB operation when no roaming was involved for the MWAB-UE. In this case, there may be two PLMNs involved, i.e. the PLMN 1 that serves the MWAB-UE, and the PLMN 2 that serves the UE connected to the MWAB.

In this case, the MWAB-gNB logically belongs to PLMN 2, and establishes N2 and N3 connection with the UE AMF and UE UPF via the PDU session of the MWAB-UE established with PLMN 1. MWAB-gNB announces PLMN IDs of PLMN 2.

If the UE served by the MWAB is roaming, there is another PLMN (not shown in the figure), i.e. the HPLMN of the UE served by the MWAB, involved. The interactions of the HPLMN of the UE and PLMN 2 are the same as that described in TS 23.501 [2] clause 4.2.4 for the roaming case.

The MWAB UPF in PLMN 1 serves the MWAB-UE and provides the connection via a N6 interface towards PLMN 2, to carry the N2 and N3 traffic from MWAB-gNB. The MWAB-UPF also supports the access to the OAM system in PLMN 2 by the MWAB-gNB.

UE connected to the MWAB-gNB can access the 5GS services offered by PLMN 2 as normal. No enhancement to the UE is required.

In some cases, the PLMN 1 and PLMN 2 can be the same PLMN.



Figure 6.X.1-1 Architecture for MWAB operation support – non-roaming

Figure 6.X.1-2 presents an example architecture for the MWAB operation when MWAB-UE is roaming with a Local Breakout PDU session for its operation. In this case, there may be three PLMNs involved, i.e. the PLMN 1 that serves the MWAB-UE, and the PLMN 2 that serves the UE connected to the MWAB, and the HPLMN of the MWAB-UE. The use of the Local Breakout PDU session by the MWAB can be configured by the HPLMN, e.g. with some VPLMN specific URSP rules.

In this case, the PLMN-1 may access the MWAB's HPLMN UDM for the subscription information. The rest of the operation are similar to that shown in Figure 6.X.1-1.

If the UE served by the MWAB is roaming, there is another PLMN (not shown in the figure), i.e. the HPLMN of the UE served by the MWAB, involved. In that case, the interaction of the HPLMN of the UE and PLMN 2 is the same as that described in TS 23.501 [2] for the roaming case.



Figure 6.X.1-2 Architecture for MWAB operation support – roaming with Local Breakout

Figure 6.X.1-3 presents an example architecture for the MWAB operation when MWAB-UE is roaming with a Home Routed PDU session for its operation. In this case, PDU session of the MWAB-UE is routed by PLMN 1 to the HPLMN of the MWAB.

In this case, the PLMN-1 may access the MWAB's HPLMN UDM for the subscription information. The rest of the operation are similar to that shown in Figure 6.X.1-1.

If the UE served by the MWAB is roaming, there is another PLMN (not shown in the figure), i.e. the HPLMN of the UE served by the MWAB, involved. In that case, the interaction of the HPLMN of the UE and PLMN 2 is the same as that described in TS 23.501 [2] for the roaming case.



Figure 6.X.1-3 Architecture for MWAB operation support – roaming with Home Routed

### 6.X.2 Functional descriptions

The MWAB operates as follows to provide service to a UE:

1. To operate as a MWAB, the MWAB-UE needs to first register to a serving network that is allowed by its subscription, and that is PLMN 1 in the architecture shown in clause 6.x.1. The serving PLMN authorizes the MWAB based on its subscription and provides the authorization result indication to the MWAB-UE.
2. MWAB-UE provides the authorization result indication to the MWAB-gNB, which may trigger the MWAB-gNB to attempt the connection with the PLMN it serves, i.e. PLMN 2 in the architectures shown in clause 6.x.1.
3. The attempt from the MWAB-gNB triggers the MWAB-UE to establishes a PDU session(s) for the MWAB operation, based on the configuration of the MWAB-UE, e.g. with the proper DNN, S-NSSAI, and the SSC Mode. Only IP based of PDU sessions are used for the MWAB operations support. The configuration of the MWAB-UE can be Local Configuration, or URSP rules.
4. The serving PLMN of MWAB-UE selects the proper MWAB UPF according to the DNN and S-NSSAI for the PDU session and ensures that the selected MWAB UPF provides the connection to the PLMN 2's AMF and UPF.
5. The MWAB-gNB establishes the connection to the OAM system of the PLMN 2 and obtains the corresponding configurations to operate as a gNB for PLMN 2. This includes for example the configuration on the AS layer operation, and also the information to be sent in the SIB, e.g. PLMN ID(s). Details of the configuration information are out of scope of SA2.
6. The MWAB starts to operate based on the OAM control as a gNB for PLMN 2, and serves the UE in proximity for PLMN 2. The MWAB-gNB may also instructed by the OAM system to establish N2 interface using the NG setup procedure defined in TS 38.413 [y] with some AMFs in PLMN 2 over the PDU session provided by MWAB-UE.

NOTE: In case of MOCN RAN sharing, gNB repeats steps 6 and 7 with any of the RAN partner PLMNs.

1. When a UE camps on the MWAB-gNB starts requests a connection, e.g. initiates a registration or service request procedure, the MWAB-gNB performs usual operation as specified in TS 23.501 [2] and route the message to a suitable UE AMF in PLMN 2. The AMF may be aware of that the UE is served by a MWAB based on the ULI information.
2. When the UE establishes a PDU session, the UE SMF selects a proper UE UPF. The MWAG-gNB may establish the N3 interface with the UPF over the PDU session of the MWAB-UE, if it is not yet established.

The efficient mobility and service continuity support for UE when the serving MWAB moves (KI#4) will be addressed in a separate solution compatible with this solution.

### 6.X.3 Procedures

#### 6.x.3.1 MWAB-UE registration and authorization

The MWAB-UE performs PLMN selection based on existing procedures in TS 23.122 [z].

MWAB-UE also follows existing procedures in TS 23.501 [2], for network slice configuration. The serving PLMN access the HPLMN of the MWAB-UE for the subscription data.

The MWAB-UE may be triggered by the MWAB-gNB to establish the PDU session(s) for MWAB operation. This can be based on an interface out of scope of SA2.

The MWAB-UE uses Local Configuration or the URSP to identify the PDU session parameters to use, e.g. the S-NSSAI, DNN, and SSC modes derived from the Route Selection Descriptor.

There may be VPLMN specific URSP rules configured on the MWAB-UE, and in that case the PDU session parameters may be different in different VPLMNs.

The requested S-NSSAI and DNN will be authorized based on the subscription of the MWAB based on existing procedures in TS 23.501 [2] and TS 23.502 [x].

No procedure enhancement to those defined in TS 23.501[2] and TS 23.502 [x] is necessary.

#### 6.x.3.2 Control of UE's access to MWAB

Legacy UE can access the MWAB-gNB as a normal gNB.

For CAG capable UEs, the enhancement as described in TS 23.501 [2] clause 5.35A.7 can be reused for control the access to the MWAB, if the MWAB is configured by OAM of PLMN 2 to broadcast CAGs.

Editor's Note: It is FFS whether enhancements is needed to prevent the MWAB-UE from selecting the MWAB-gNB cell.

#### 6.x.3.3 Support of Location Service for UEs when MWAB(s) is involved

The UE's AMF can be aware of the existence of MWAB, based on the ULI (i.e. cell ID) of the UE. Therefore, the UE's AMF may indicate that to the LMF. The LMF can thus trigger the enhancement as defined in TS 23.501 [2] clause 5.35A.5 to support the LCS operation with MWAB location considered.

Additionally, when LMF determines to involve a MWAB cell for the positioning of a UE not served by the MWAB-gNB, the procedures defined in TS 23.273 [6] can be utilized to allow the LMF obtaining the MWAB-gNB location through the NRPPa procedure.

Editor's Note: It is FFS if further enhancements is needed to use the NRPPa procedures with MWAB in the roaming cases.

#### 6.x.3.4 UE mobility to and from a MWAB cell

Existing UE mobility procedure can be reused. No enhancement is required, based on the same considerations as described in TS 23.501 [2] clause 5.35A.3.1 and 5.35A.3.2.

### 6.X.4 Impacts on services, entities, and interfaces

None.

Related procedures can be eventually documented in informative annex in TS 23.501[2].

>>>>END OF CHANGES<<<<