**3GPP SA WG2 Meeting #164 *S2-240xxxx***

**Maastricht, NL, 19-23 August 2024 *(was S2-240xxxx)***

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **23.501** | **CR** | **#** | **rev** | **-** | **Current version:** | **19.0.0** |  |
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| *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 | **x** | ME | **x** | Radio Access Network | **x** | Core Network | **x** |

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| ***Title:***  | Adding support of Mobile Wireless Access Backhaul in 5GS  |
|  |  |
| ***Source to WG:*** | Qualcomm Incorporated, Sony?, Huawei?, Ericsson?, Nokia?, LGE?, ZTE? |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | VMR\_Ph2 |  | ***Date:*** | 2024-08-19 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-19 |
|  | *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 canbe 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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | The approved VMR\_Ph2 work item (SP-240632) is set to specify the architecture enhancements, functionalities and procedures to support MWAB based on conclusions of TR 23.700-06 (clause 8).This contribution added the general description of the MWAB feature and corresponding architecture enhancements in TS 23.501.  |
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| ***Summary of change:*** | Add general description of the system architecture for MWAB support in new clause 5.x.  |
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| ***Consequences if not approved:*** | No support of VMR\_Ph2 feature in Rel-19.  |
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| ***Clauses affected:*** | (new) 5.x |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*FIRST CHANGE*

5.x Support for Mobile gNB with Wireless Access Backhauling (MWAB)

### 5.x.1 General

#### 5.x.1.1 Principles and functional entities

Mobile gNB with Wireless Access Backhauling (MWAB) allows a mobile device to provide an NR access link to UEs in proximity and connects wirelessly to the 5GC through an IP connectivity provided by a backhaul PDU session(s), as illustrated in figure 5.x.1.1-1. The MWAB consists of a gNB component (MWAB-gNB) and a UE component (MWAB-UE). The MWAB-gNB is based on the gNB functionality specified in TS 38.300 [27] and TS 38.401 [42]. The UE(s) served by the MWAB-gNB may or may not move together with the MWAB, e.g. the UEs may located inside or outside the vehicle mounted with the relay.



Figure 5.x.1.1-1: Non-Roaming MWAB architecture for 5GS

NOTE 1: In this release, the CU/DU split of the MWAB-gNB is not supported.

NOTE 2: The interface between MWAB-UE and MWAB-gNB is not in scope of this specification.

MWAB operation support both PLMN and SNPN cases. The specific architecture for supporting PLMN is provided in clause 5.x.1.2, and the architecture for supporting SNPN is provided in clause 5.x.1.3.

MWAB-UE has a single NR Uu hop to the BH NG-RAN, using either TN or NTN access technology. NR access is used for the radio link between a MWAB-gNB and the served UEs. The NR Uu access link between the MWAB-gNB and the served UE(s) does not use NTN access technology. 5G MOCN is supported by the MWAB-gNB.

The MWAB-UE can be authorized by the BH 5GC to operate as MWAB, and establishes the necessary BH PDU session(s). The detailed procedures for the authorization of MWAB is described in clause 5.x.3.

The IP based BH PDU session(s) of the MWAB-UE to the BH 5GC is used for the MWAB-gNB's connection to the OAM server in the 5GC serving the UE(s), and the N2, N3, and Xn interfaces. The BH 5GC and the 5GC serving the UE can be different. Same or different PDU Sessions of the MWAB-UE can be used for carrying the above traffic.

NOTE 3: The use of multiple PDU Sessions for N2, N3, Xn, OAM access, follows the existing URSP logic as defined in TS 23.503 [45].

The MWAB is configured with the address(es) of the OAM server of the 5GC and obtains the corresponding configurations for the MWAB-gNB from the OAM server. The details of the MWAB configuration/provisioning process are described in clause 5.x.2.

Service continuity for the UE(s) served by the MWAB-gNB is supported, when the MWAB moves and the UE(s) move or not move together with the MWAB. The detailed procedures for the support of mobilty are described in clause 5.x.5.

The MWAB shall be able to serve legacy UE(s) to connect to the 5GC. For certain operations, the MWAB may be configured to provide access to only certain UEs. Existing access control mechanisms, e.g. CAG control, can be used to manage the UE(s)'s access to the MWAB-gNB. The details of the access control of the UEs served by MWAB are described in clause 5.x.6.

The LCS framework as defined in TS 23.273 [87] is used for providing the location service to the UE(s) served by MWAB. Details on supporting the LCS over MWAB are described in clause 5.x.7.

Regulatory services (e.g. emergency services, priroity services) can be supported by the MWAB, and the details are provided in clasue 5.x.8.

MWAB operation can also support roaming scenarios, include when the MWAB-UE is roaming, and when the UE(s) served by the MWAB-gNB is roaming.

#### 5.x.1.2 Architecture to support MWAB in PLMN case

Figure 5.x.1.2-1 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 PLMN 1 is the Backhaul PLMN (BH PLMN). In some cases, the PLMN 1 and PLMN 2 can be the same PLMN.

The MWAB-gNB logically belongs to PLMN 2 and announces the PLMN IDs of PLMN 2. The MWAB-gNB establishes N2 and N3 connection with the UE AMF and UE UPF in PLMN 2 via the PDU session of the MWAB-UE established with PLMN 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, involved. The interactions of the HPLMN of the UE and PLMN 2 are the same as that described in clause 4.2.4 for the roaming case.

The BH 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 BH UPF also supports the access to the OAM system in PLMN 2 by the MWAB-gNB.

NOTE: Depending on deployment requirement, a security gateway may be required between the BH UPF and the PLMN 2 core network. In that case, the MWAB-gNB need to connect to the security gateway based on pre-configured security credentials. The traffic between MWAB-gNB and the PLMN 2 goes inside the security tunnel established via the security gateway.

UE connected to the MWAB-gNB can access the 5GS services offered by PLMN 2. No enhancement to the UE is required. The UE connected to the MWAB-gNB is not aware of PLMN 1, and thus does not need any roaming agreement between its HPLMN and the PLMN 1.



Figure 5.x.1.2-1: Architecture for MWAB operation support - non-roaming

Figure 5.x.1.2-2 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-UE can be configured by its HPLMN, e.g. with some VPLMN specific URSP rules. In some cases, the PLMN 1 and PLMN 2 can be the same PLMN. The PLMN 1 is also named Backhaul PLMN (BH PLMN).

The PLMN-1 can access the MWAB-UE's HPLMN UDM for the subscription information. The rest of the operation are similar to that shown in figure 5.x.1.2-1.

If the UE served by the MWAB is roaming, there can be another PLMN (not shown in the figure), i.e. the HPLMN of the UE served by the MWAB, involved. The interaction of the HPLMN of the UE and PLMN 2 follows that described in clause 4.2.4 for the roaming case. The UE served by the MWAB-gNB is not aware of PLMN 1, and thus does not need any roaming agreement between its HPLMN and the PLMN 1.



Figure 5.x.1.2-2: Architecture for MWAB operation support - roaming with Local Breakout

Figure 5.x.1.2-3 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. The rest of the operation are similar to that shown in figure 5.x.1.2-2. In some cases, the PLMN 1 and PLMN 2 can be the same PLMN. The PLMN 1 is also named Backhaul PLMN (BH PLMN).

If the UE served by the MWAB is roaming, there can be 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 follows that described in clause 4.2.4 for the roaming case. The UE served by the MWAB-gNB is not aware of PLMN 1, and thus does not need any roaming agreement between its HPLMN and the PLMN 1.

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**Figure 5.x.1.2-3: Architecture for MWAB operation support - roaming with Home Routed**

#### 5.x.1.3 Architecture to support MWAB in SNPN case

The MWAB operation also supports SNPN, and the corresponding architectures are presented in figure 5.x.1.3-1 and 5.x.1.3-2. The MWAB operation also supports mixed PLMN and SNPN operation, i.e. in the architecture presented in 5.x.1.3-1 and 5.x.1.3-2, the SNPN 1 can be replaced by a PLMN and SNPN 2 remains a SNPN.

Figure 5.x.1.3-1 presents an example architecture for the MWAB operation when the serving SNPN of the MWAB-UE is the same as subscribed SNPN of MWAB-UE. In this case, there may be two SNPNs involved, i.e. the SNPN 1 that serves the MWAB-UE, and the SNPN 2 that serves the UE connected to the MWAB-gNB. The MWAB-gNB logically belongs to SNPN 2 and establishes N2 and N3 connection with the UE AMF and UE UPF via the PDU session of the MWAB-UE established with SNPN 1. MWAB-gNB announces SNPN ID of SNPN 2. The SNPN1 is also named the Backhauling (BH) SNPN.

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**Figure 5.x.1.3-1: Architecture for MWAB operation support for SNPN – with MWAB-UE served by the subscribed SNPN (SNPN 1)**

Figure 5.x.1.3-2 presents an example architecture for the MWAB operation when the serving SNPN of the MWAB-UE is different from the subscribed SNPN of MWAB-UE. In this case, there may be two SNPNs involved, i.e. the SNPN 1 that serves the MWAB-UE, and the SNPN 2 that serves the UE connected to the MWAB-gNB. The MWAB-gNB logically belongs to SNPN 2 and establishes N2 and N3 connection with the UE AMF and UE UPF via the PDU session of the MWAB-UE established with SNPN 1. MWAB-gNB announces SNPN ID of SNPN 2. The SNPN1 is also named the Backhauling (BH) SNPN.

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**Figure 5.x.1.3-2: Architecture for MWAB operation support for SNPN – with MWAB-UE served by a SNPN (SNPN 1) other than the subscribed SNPN**

#### 5.x.1.4 Support of QoS for MWAB operations

If QoS optimization of the N3 connection is required, the MWAB-gNB can be configured (e.g. by OAM) with the mapping of the 5QIs to the DSCP values for TNL used by the PLMN/SNPN serving the UE via the MWAB-gNB. The DSCP values can then used in the QoS Flow binding of the BH PDU session used for N3 connection(s) based on existing procedures.

*End of CHANGEs*