3GPP TSG-RAN WG3 #125bis R3-24xxxxx

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Agenda Item: 12.2

Source: NTTDOCOMO (moderator)

Title: Summary of Offline Discussion on additional topological enhancement

Document for: Approval

# Introduction

This document provides a summary of the offline discussion on additional topological enhancements.

# Discussion

## WAB

### General

**Proposal 1.1: In compliance with the WID and TR 38.799, WAB to meet the following assumptions:**

**- The WAB-gNB is based on the gNB functionality specified in TS 38.300 [4] and TS 38.401 [3].**

**- The WAB-MT supports at least a subset of UE functionalities.**

**- The NR Uu is used for the radio link between WAB-gNB and the served UEs.**

**- The NR Uu radio link between the WAB-gNB and the served UEs does not use NTN.**

**- WAB does not support the scenario where the access and the backhaul are in-band while the backhaul uses NTN.**

**- A WAB-gNB should not serve WAB-MT(s).**

**- The WAB-gNB and the WAB-MT may connect to the same PLMN or to different PLMNs.**

**- The WAB-MT may connect to a public PLMN or an SNPN.**

**- The WAB-gNB may connect to a public PLMN or an SNPN.**

**Proposal 1.2: The above assumptions for WAB to be captured on stage-2 in TS 38.401.**

**Proposal 1: RAN3 to capture the following in the TS 38.300? or TS 38.401? based on TR 38.799:**

**- The terms, architecture and protocol stack for WAB.**

**- WAB-node integration procedure.**

**- Configuration of WAB-gNB**

### Multiple hop prevention

**Proposal 1-2: Downselect between the following two options of multihop prevention in WAB topologies:**

* **Option 1: Introduction of a “WAB-gNB cell” indication in the SIB broadcast by WAB-gNBs.**
* **Option 2: Introduction of a “WAB-MTs allowed to connect” indication in the SIB broadcast by “regular” gNBs.**
* **Proposal 1-1: Inform SA2 that RAN3 is working on a RAN-based solution for preventing a WAB-MT to connect to a WAB-gNB’s cell, and that a CN-based solution is not necessary.**

**Proposal 1-1: The following RAN-based solutions can avoid multi-hop WAB and address SA2’s issues:**

**Solution 1: The WAB-gNB uses dedicated frequencies and/or PCI partitions, which are avoided by the WAB-MT for cell-reselection and measurement reports.**

**Solution 2: WAB-gNB-cells broadcast a “WAB” indicator in SIB, and the WAB-MT avoids (re)selection or reporting of cells broadcasting this indicator.**

**Solution 3: WAB-MT includes a “WAB” indicator in UE capabilities, and a WAB-gNB rejects an access attempt or a handover request based on this indicator.**

**Proposal 7: For multi-hop avoidance, RAN3 to discuss the following options:**

* **Option 1: Broadcasting “WAB-barred” solution. WAB-node is barred to a cell if the SIB1 in this cell contains “WAB-barred” indication. A WAB-gNB should broadcast “WAB-barred” in SIB1.**
* **Option 2: Broadcasting “WAB-support” solution.** **WAB-node only access the cell which broadcasts “WAB-support” in SIB1. A WAB-gNB will not broadcast “WAB-support”.**

**Proposal 4-1: Multi-hop WAB topology can be avoided by BH-AMF not accepting WAB-MT’s access/ handover to a WAB-gNB. For performance optimization, an idle/inactive WAB-MT does not (re)select to WAB cells and connected WAB-MT does not report measurement results of WAB cells.**

### Additional ULI

**Proposal 2: Additional ULI for WAB consists of WAB-gNB cell’s TAC and Cell ID, which are determined by the WAB-gNB based on WAB-node’s geo-location.**

**Proposal 2: Reply to SA2 that from RAN3’s perspective, all three options to include the WAB-MT’s location information in the UE’s ULI are feasible, and that RAN3 prefers to leave the down-selection to SA2.**

Proposal 10: RAN3 to provide unified signalling design for additional ULI report in both intra-PLMN case and inter-PLMN case, then option 3 is recommended for the inter-PLMN case.

Observation 7: For additional ULI provision of inter-PLMN scenario of WAB:

* Option 1 requires additional functionality of OAM and this solution will be useless in the area without any coverage of WAB-gNB’s PLMN.
* Option 2 is technical feasible but the signalling design for location information is different from legacy and intra-PLMN case.
* Option 3 is same as the legacy design, then the intra-PLMN and inter-PLMN can have unified solution.

**Proposal 5-1: For issue-2, RAN3 to reply to SA2 that Option 2 or Option 3 defined in clause 8.5 of TR 23.700-06 is preferred.**

### Access control during HO

**Option 1: via explicit indication.**

**Option 2: via UE capability. (RAN2 impact)**

**Proposal 9: In case of handover for a WAB-node, the WAB-node indication is included in the HO request, then the target BH-RAN node can perform access control for this WAB-node. RAN3 to discuss whether to introduce a new explicit indicator or use a special S-NSSAI value as the indicator.**

**Proposal 5-3: Target WAB-gNB of a handover sees slices deployed for WAB-MTs in the WAB-MT’s handover request, and rejects the handover to avoid multi-hop in Xn/NG handovers.**

### NG interface

**Proposal 1-1: The NG connection(s) of a WAB-gNB can be removed upon WAB-node mobility, or when the authorization status of the WAB-gNB becomes “not authorized”.**

**Proposal 1-2: The NG connection(s) of a WAB-gNB can be suspended.**

**Proposal 1-3: Introduce a “WAB-gNB” indication in the NG SETUP REQUEST message.**

**Proposal 1-4: Introduce a cause value indicating the reason for NG connection removal.**

**Proposal 8-1: Whether to introduce NG suspension procedure can wait for NTN's conclusion.**

**Proposal 6: If the backhaul is NTN link, the UE’s CN should know the BH link type is NTN.**

### WAB authorization

**Proposal 3.1: RAN3 to wait for SA2 on the definition for the WAB-node authorization procedure.**

**Proposal 2: When the authorization status of a WAB-gNB changes from “authorized” to “not authorized”:**

* **The WAB-gNB node attempts to hand over and/or release the UEs.**
* **The NG and Xn connections of the WAB-gNB are removed or suspended.**
* **Optionally, some or all PDU sessions of the WAB-MT may be released, and the WAB-MT may be de-registered from the network.**

**Proposal 3.3: In case the WAB-gNB authorization status changes from “not authorized” to “authorized”, the WAB-gNB to reinstate NG and the operation of the WAB-gNB’s air interface.**

**Proposal 3.4: The above agreements to be captured on stage 2.**

### Mobility

**Proposal 3: Support only the two-logical-gNB solution for UE’s AMF change.**

1. RAN3 send LS to SA2 to confirm the feasibility of the option B1, i.e., Single WAB-gNB with a single cell using mobility registration update due to TAC change.

**Proposal 7: Capture the two logical gNB solution and Option 2 for single gNB solution in stage-2 spec.**

Option 1: Single WAB-gNB with a single cell using mobility registration update due to TAC change.

Option 2: Single WAB-gNB with two cells with different TACs, using NG-based HO.

Option 3: Single WAB-gNB single cell without TAC change.

### Xn interface

**Proposal 4-1: The WAB-gNB includes an ID of the co-located WAB-MT in the XN SETUP REQUEST or in the NG-RAN CONFIGURATION UPDATE message sent to the BH-gNB.**

**Proposal 4-2: The WAB-gNB should be aware of whether the BH link for the WAB-MT is TN or NTN.**

**Proposal 4-3: Xn connection between WAB-gNBs can be established.**

**Proposal 4-4: Specify a cause value to be used in the XN SETUP FAILURE message, for the case when the sending node does not allow setting up Xn with other WAB-gNBs.**

**Proposal 4-5: The WAB-gNB should be notified about the target BH-gNB for the WAB-MT HO.**

**Proposal 4-6: Introduce a cause value indicating the reason for Xn removal.**

**Proposal 4-7: Specify a cause value indicating that the cause of Xn removal failure is WAB-MT HO failure or HO cancellation.**

**Proposal 2: The BH-gNB can provides the TNL information of neighbour gNBs to the WAB node.**

**Proposal 5-3: WAB-gNB can also use the neighboring cell information received from the BH-gNB to update its NCRT or initiate the Xn-C TNL address discovery procedure towards the neighboring gNB for further TNL/Xn Setup with the neighboring gNB, without waiting for the measurement report from UE (or WAB-MT).**

**Proposal 5.1: For avoiding Xn establishment between WAB-gNBs, the following two options to be considered:**

**Option 1: The WAB-gNB rejects Xn Setup Requests based on WAB-specific frequency or PCI range in the served cell information.**

**Option 2: The WAB-gNB rejects Xn Setup Request based on a “WAB” indicator in the served cell information.**

**Proposal 5.2: In case RAN3 agrees to PCI partitioning as the solution to PCI collision avoidance, the same solution to be used for avoidance of Xn establishment between WAB-gNBs.**

### PCI configuration and collision avoidance

**Proposal 4: PCI configuration and PCI collision avoidance to follow the same procedure as defined for mobile IAB in TS 38.401, clause 7.8.**

### Resource coordination

**Proposal 5-1: For in-band backhauling in non-roaming scenarios, introduce a new XnAP procedure for the WAB-gNB and the BH-gNB to coordinate the resources of a WAB-gNB and its co-located WAB-MT.**

**Proposal 5-2: RAN3 assumes out-of-band backhauling when the WAB-gNB and the WAB-MT are served by different PLMNs.**

**Proposal 5-3: For in-band backhauling, discuss which parts of XnAP IEs defined in clauses 9.2.2.94-97 of TS 38.423 should be used in the procedure for WAB resource coordination.**

### Handling of WAB-gNB’s traffic during WAB-node mobility

During the mobility of WAB node, there is no impact on the the WAB-gNB’s traffic during WAB-node mobility if a tunnel carried via BH PDU session is used to protect the WAB-gNB’s traffic.

If the WAB-gNB’s traffic reuse the WAB-MT’s IP address, the WAB-gNB’s traffic should be redirected to the new IP address using legacy procedures when the WAB-MT’s IP address is updated during mobility.

### Others

**Proposal 3-1: BH-gNB can indicate to the WAB-gNB that specific BH resources cannot be maintained.**

**Proposal 3-2: BH-gNB is aware which slices/PDU sessions are associated with specific resources at the WAB-gNB and may use this information to determine whether a target BH-gNB is able to maintain BH resources for the WAB-gNB.**

**Proposal 1: it is concluded that WAB-MT need to support all RRC States and all SRBs.**

**Proposal 2: the behaviour of WAB-gNB in Idle and inactive state of WAB-MT need to be discussed in RAN2.**

## 5G Femto

### General

**Proposal 1**: align the protocol and functional aspects of NR Femto GW with the equivalent protocol and functional aspects of HeNB GW.

**Proposal 2**: agree the stage 2 CR in R3-245324 for the architecture and protocol aspects.

**Proposal 3**: agree the stage 2 CR in R3-245325 for the functional aspects including NOTEs for the security aspects which are still pending SA3.

**Proposal 4:** agree the stage 3 CR for TS 38.413 in [4].

**Proposal 5**: send the LS in R3-245327 to SA3 to check whether the verification aspects which applied to HeNB GW architecture apply to NR Femto GW architecture.

### Others

**Decide whether an NR Femto may have more than one cell**

1. RAN3 to investigate how to design the ID for NR femto node, i.e., whether to introduce dedicated NR Femto Node ID, or reuse the Global gNB ID.

**Proposal 1: 5G-S-TMSI IE sent from the Femto node in NGAP messages can be used to select AMF for UE.**

**Proposal 2: The new IE AMF UE NGAP ID 2 is introduced to the INITIAL CONTEXT SETUP REQUEST message, HANDOVER REQUEST message and PATH SWITCH REQUEST ACKNOWLEDGE message to indicate the AMF UE NGAP ID assigned by the AMF.**

**Proposal 3: The NR Femto GW supports NG-Flex configuration and can simultaneously connect to multiple AMFs.**

**Proposal 4: The NR Femto GW shall host the NNSF function instead of the NR Femto nodes.**

**Proposal 5: The assistance information for NNSF if present should be transferred over NG interface from NR Femto node to NR Femto GW.**

**Proposal 2: A NR Femto GW should have the ability to verify the validity of the indicated cell access mode and CAG ID for a closed HeNB during the PATH SWITCH procedure.**

# Conclusion, Recommendations

# BLCR assignments

* WAB
  + 38.413 Huawei
  + 38.423 Nokia
  + 38.401 E///
  + 38.300 ZTE
  + 38.410 Samsung
  + 38.420 CATT

* 5G Femto
  + 38.300 E///
  + 38.413 Nokia
  + 38.410 ZTE

# References

|  |  |  |
| --- | --- | --- |
| [R3-245402](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245402.zip) | Functional Aspects of WAB-Nodes (Ericsson) | discussion |
| [R3-245391](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245391.zip) | (TPs for TS 38.300/38.413) Architecture and Access control for WAB (Huawei) | other |
| [R3-245247](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245247.zip) | (draft Reply LS to SA2) Discussion on SA2 questions on multi-hop WAB and UE ULI (Qualcomm Inc.) | other |
| [R3-245175](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245175.zip) | (TP for TS 38.401) Discussion on high level aspects for WAB (Nokia, Nokia Shanghai Bell) | other |
| [R3-245176](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245176.zip) | (TP for TS 38.423) Discussion on WAB mobility (Nokia, Nokia Shanghai Bell) | other |
| [R3-245248](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245248.zip) | Discussion on assumptions and architecture for WAB (Qualcomm Inc.) | other |
| [R3-245252](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245252.zip) | Discussion on stage-2 aspects for WAB (CATT) | discussion |
| [R3-245253](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245253.zip) | Other issues for WAB (CATT) | discussion |
| [R3-245286](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245286.zip) | (TP to BL CR of 38.423 on WAB) Discussion on the reliability and mobility for WAB (NEC) | other |
| [R3-245381](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245381.zip) | Discussion on Wireless Access Backhaul (NTTDOCOMO, INC.) | discussion |
| [R3-245383](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245383.zip) | Discussion on enhancements for WAB (CANON Research Centre France) | discussion |
| [R3-245392](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245392.zip) | (TP for TS 38.300) Discussion on WAB related procedures (Huawei) | other |
| [R3-245155](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245155.zip) | Discussion on WAB mobility (Samsung) | discussion |
| [R3-245156](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245156.zip) | Discussion on other aspects for the support of WAB (Samsung) | discussion |
| [R3-245403](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245403.zip) | Reply to SA2 Regarding WAB-MT Access Control and Additional ULI for WAB-Nodes (Ericsson) | discussion |
| [R3-245446](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245446.zip) | Architecture and configuration for WAB-node (Lenovo) | discussion |
| [R3-245447](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245447.zip) | Integration and migration for WAB node (Lenovo) | discussion |
| [R3-245637](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245637.zip) | Access control and location information in WAB (LG Electronics) | discussion |
| [R3-245640](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245640.zip) | Discussion on RAN2 impact of WAB (China Telecom) | discussion |
| [R3-245641](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245641.zip) | On Xn and NG interface management (China Telecom) | discussion |
| [R3-245655](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245655.zip) | (TP to 38.300) Discussion on supporting WAB and the reply LS to SA2 (ZTE Corporation) | other |
| [R3-245656](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245656.zip) | (TP to 38.305 38.455) Support of location service involving WAB (ZTE Corporation) | other |

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| [R3-245018](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245018.zip) | LS on Clarification regarding definition of 5G NR femto ownership (SA3(Nokia)) | LS in |
| **Architecture, Functional Aspects** | | |
| [R3-245151](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245151.zip) | On NR Femto Architecture and functional split (China Telecom) | discussion |
| [R3-245157](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245157.zip) | Discussion on NR Femto architecture (Samsung) | discussion |
| [R3-245254](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245254.zip) | Discussion on 5G Femto in stage 2 (CATT) | discussion |
| [R3-245255](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245255.zip) | Impact to NG interface for 5G Femto (CATT) | discussion |
| [R3-245298](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245298.zip) | (TP to TS38.300) NR Femto (NEC) | other |
| [R3-245305](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245305.zip) | Discussion on NR Femto Architecture and Functionality (Baicells) | discussion |
| [R3-245306](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245306.zip) | TP to 38.300 for NR Femto (Baicells) | discussion |
| [R3-245323](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245323.zip) | Completion of Protocol and Functional aspects of NR Femto Architecture (Nokia ) | discussion |
| [R3-245324](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245324.zip) | Introduction of NR Femto Architecture and protocol aspects (Nokia, TMO US, AT&T, Verizon Wireless, BT, Charter) | draftCR |
| [R3-245325](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245325.zip) | Introduction of Functional aspects of NR Femto architecture (Nokia, TMO US, AT&T, Verizon Wireless, BT, Charter) | draftCR |
| [R3-245327](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245327.zip) | LS on Security Verifications related to NR Femtos (Nokia) | LS out To: SA3 CC: |
| [R3-245639](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245639.zip) | Discussion on 5G femto (NTTDOCOMO, INC.) | discussion |
| [R3-245393](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245393.zip) | (TP for TS 38.300) Discussion on the architecture for NR Femto (Huawei) | other |
| [R3-245486](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245486.zip) | NR Femto - Stage 2 Aspects (Ericsson) | discussion |
| [R3-245487](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245487.zip) | NR Femto - Stage 2 TP (Ericsson) | other |
| [R3-245448](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245448.zip) | Architecture and access control for NR Femto (Lenovo) | discussion |
| [R3-245449](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245449.zip) | (TP to 38.300) On NR Femto (Lenovo) | other |
| [R3-245535](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245535.zip) | Discussion on architecture and access control for NR Femto (ZTE corporation) | discussion |
| [R3-245536](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245536.zip) | (TP for BLCR 38.300&38.410)NR Femto (ZTE corporation) | discussion |
| [R3-245636](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245636.zip) | (TP for TS 38.300) Support of 5G Femto (LG Electronics) | other |
| **Access Control** | | |
| [R3-245152](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245152.zip) | On access control for NR Femtos (China Telecom) | discussion |
| [R3-245158](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245158.zip) | Discussion on access control for NR Femto (Samsung) | discussion |
| [R3-245394](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245394.zip) | (TP for TS 38.300) Access control for NR Femto (Huawei) | other |
| **NGAP Impacts** | | |
| [R3-245326](file:///D:\会议硬盘\TSGR3_125-bis\Docs\R3-245326.zip) | Introduction of NR Femto architecture with optional NR Femto Gateway (Nokia, TMO US, AT&T, Verizon Wireless, BT, Charter) | CR1194r, TS 38.413 v18.3.0, Rel-19, Cat. B |