3GPP TSG-RAN WG3 Meeting #121bis R3-235776

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**Agenda item:** 13.2

**Source:** Huawei, Qualcomm

**Title:** (TP for NR\_mobile\_IAB BL CR for TS 38.401) Support of mobility for mobile IAB

**Document Type:** Other

# 1 Introduction

**CB: # IAB\_13-2**

* **Agree to R3-235776**
* **Agree to R3-235775**
* **Agree to R3-235781**

(moderator - QC)

# Annex 1: Text Proposal for TS 38.401

-------------------------------------------Start 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 38.300: "NR; Overall description; Stage-2".

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

[4] 3GPP TS 38.473: "NG-RAN; F1 application protocol (F1AP)".

[5] 3GPP TS 38.414: "NG-RAN; NG data transport".

[6] 3GPP TS 38.424: "NG-RAN; Xn data transport".

[7] 3GPP TS 38.474: "NG-RAN; F1 data transport".

[8] ITU-T Recommendation G.823 (2000-03): "The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy".

[9] ITU-T Recommendation G.824 (2000-03): "The control of jitter and wander within digital networks which are based on the 1544 kbit/s hierarchy".

[10] ITU-T Recommendation G.825 (2001-08): "The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)".

[11] ITU-T Recommendation G.8261/Y.1361 (2008-04): "Timing and Synchronization aspects in Packet networks".

[12] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

[13] 3GPP TS 33.501: "Security Architecture and Procedures for 5G System".

[14] 3GPP TS 38.410: "NG-RAN; NG general aspect and principles".

[15] 3GPP TS 38.420: "NG-RAN; Xn general aspects and principles"

[16] 3GPP TS 38.470: "NG-RAN; F1 general aspects and principles".

[17] 3GPP TS 38.460: "NG-RAN; E1 general aspects and principles".

[18] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP Network Layer Security".

[19] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA), Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[20] 3GPP TS 32.422: "Trace control and configuration management".

[21] 3GPP TS 37.470: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and NG-RAN; W1 general aspects and principles; Stage-2".

[22] 3GPP TS 38.340: "NR; Backhaul Adaptation Protocol (BAP) specification".

[23] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[24] 3GPP TS 38.425: "NG-RAN; NR user plane Protocol".

[25] 3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".

[26] 3GPP TS 38.472: "NG-RAN; F1 signalling transport".

[27] 3GPP TS 23.247: " Architectural enhancements for 5G multicast-broadcast services; Stage 2".

[28] 3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture Description".

[29] IETF RFC 4555 (2006-06): "RFC IKEv2 Mobility and Multihoming Protocol (MOBIKE)".

[30] 3GPP TS 38.321 “NR; Medium Access Control (MAC) protocol specification”.

[31] 3GPP TS 37.320: "Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".

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

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### 8.9.X Mobile IAB node authorization

During mobile IAB-node integration procedure, the RRC-terminating IAB-donor-CU receives the authorization status of the mobile IAB-node from the 5GC. If the authorization status is “not authorized”, the RRC-terminating IAB-donor-CU will not establish any backhaul resources (including BAP address, TNL address and default BAP configuration) for this mobile IAB-node. If the authorization status for the mobile IAB-node changes, the 5GC sends an updated authorization status to the RRC-terminating IAB-donor.

In case the mobile IAB-MT and its co-located mIAB-DU connect to different IAB-donor-CUs, i.e. the RRC-terminating IAB-donor is different from the F1-terminating IAB-donor, the RRC-terminating IAB-donor will inform the F1-terminating IAB-donor about the authorization status of the mobile IAB-node via XnAP signalling once the authorization status has been updated.

NOTE: In absence of Xn between RRC-terminating IAB-donor-CU and F1-terminating IAB-donor-CU, the passing of the authorization status is left up to implementation.

If the updated authorization status for the mobile IAB node is “not authorized”, the F1-terminating donor may hand over the UEs served by the mobile IAB-node, and should releases the F1 interface towards the mobile IAB-DU. After that, the F1-terminating IAB-donor requests from the RRC-terminating donor the release of all the offloaded traffics, and then the RRC-terminating donor releases all backhaul resources (including BAP address, TNL address and default BAP reconfiguration) for this mobile IAB node.

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8.12.X Mobile IAB node integration

During the integration, the mobile IAB-MT and mobile IAB-DU can connect to the same IAB-donor or to different IAB-donors. The procedure for the latter case is shown in Figure 8.12.X-1.

Figure 8.12.X-1: Decoupled mobile IAB node integration procedure

Phase 1: Equivalent procedure to Phase 1 of the IAB-node integration in SA mode in section 8.12.1, where the mobile IAB-node and the RRC-terminating IAB-donor correspond to IAB-node 2 and the IAB-donor, respectively. The mobile IAB-node selects the parent node based on a mobile-IAB-specific over-the-air indication (transmitted in SIB1). The mobile IAB-MT includes a mobile-IAB-node-specific indication in the *RRCSetupComplete* message to assist the RRC-terminating IAB-donor to select an AMF supporting mobile IAB.

Phase 2-1: Same as Phase 2-1 of procedure in section 8.12.1.

Phase 2-2: Same as Phase 2-2 of procedure in section 8.12.1.

Phase 3: Mobile IAB-DU part setup. In this phase, the mobile IAB-DU is configured via OAM. This configuration includes the information for the establishment of F1-C to the F1-terminating IAB-donor-CU. The mobile IAB-DU initiates the TNL establishment, and F1 setup (as defined in clause 8.5) with the F1-terminating IAB-donor-CU using the default BAP routing ID and default BH RLC channel configured by the RRC terminating IAB-donor-CU in Phase 2-1 for upstream traffic. During the F1 setup, the mobile IAB-DU includes the gNB ID of the RRC-terminating IAB-donor-CU and its BAP address in the F1 SETUP REQUEST message. The mobile IAB-node obtains this gNB ID from the over-the-air broadcast by the RRC-terminating IAB-donor (SIB1).

After the F1 is set up, the mobile IAB-node can start serving UEs. The F1-terminating IAB-donor-CU can initiate the IAB Transport Migration Management procedure towards the RRC-terminating IAB-donor-CU as defined in section 8.17.3.1.

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## 8.YY Mobile IAB migration procedures

### 8.YY.1 Migration of mobile IAB-MT via Xn handover

The mIAB-MT of a mobile IAB-node can be migrated from a source RRC-terminating IAB-donor-CU to a target RRC-terminating IAB-donor-CU using the Xn handover procedure. During this migration, the mIAB-DU co-located with the mIAB-MT is connected to an F1-terminating IAB-donor-CU, which may be the same as the source RRC-terminating IAB-donor-CU or the target RRC-terminating IAB-donor-CU, or it can be different from both the source and the target RRC-terminating IAB-donor-CU.

Figure 8.YY.1.1-1 shows an example of mIAB-MT migration via Xn handover. In this example, the mIAB-MT is connected to the source RRC-terminating IAB-donor-CU via a source path of an IAB topology before the migration, and it is connected to the target RRC-terminating IAB-donor-CU via a target path of a different IAB topology after the migration.



Figure 8.YY.1.1-1: Procedure for Xn-based migration of mobile IAB-MT

1. Steps 1-14 of the topology adaptation procedure of Section 8.17.3.1 are performed to conduct Xn handover of the mIAB-MT from the source parent IAB-node connected to the source RRC-terminating IAB-donor-CU to the target parent IAB-node connected to the target RRC-terminating IAB-donor-CU. In these steps, the mIAB-node corresponds to the migrating IAB-node of Section 8.17.3.1, and the mIAB-MT’s source and target RRC-terminating IAB-donor-CUs correspond to the respective source and target IAB-donor-CUs of Section 8.17.3.1.

2. Same as step 15 of the topology adaptation procedure of Section 8.17.3.1, where the F1-C connection between the co-located mIAB-DU and its F1-terminating IAB-donor-CU is switched to the target path using the new TNL address information of the IAB-MT. In this step, the mIAB-node corresponds to the migrating IAB-node, and the F1-terminating IAB-donor-CU corresponds to the source IAB-donor-CU.

3. The mIAB-DU passes the gNB ID of the target RRC-terminating IAB-donor-CU and the mIAB-node’s BAP address allocated by the target RRC-terminating IAB-donor-CU to the F1-terminating IAB-donor-CU via F1AP.

4. Steps 16-20 of the topology adaptation procedure of Section 8.17.3.1, where the F1-terminating IAB-donor-CU initiates the IAB Transport Migration Management procedure towards the target RRC-terminating IAB-donor-CU to provide the context of the traffic offloaded. The target RRC-terminating IAB-donor-CU reconfigures the BAP sublayer and/or BH RLC channels on the target path accordingly, and provides the UL BH information for UL BH reconfigurations to be conducted by the F1-terminating IAB-donor-CU on the mIAB-node. Then, the F1-U connections of the mIAB-node are migrated to the target path.

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### 8.YY.2 Migration of mobile IAB-MT via NG handover

The mIAB-MT of a mobile IAB-node can be migrated from a source RRC-terminating IAB-donor-CU to a target RRC-terminating IAB-donor-CU using the NG handover procedure. During this migration, the mIAB-DU co-located with the mIAB-MT is connected to an F1-terminating IAB-donor-CU, which may be the same as the source RRC-terminating IAB-donor-CU or the target RRC-terminating IAB-donor-CU, or it can be different from both the source and the target RRC-terminating IAB-donor-CU.

Figure 8.YY.2.1-1 shows an example of mIAB-MT migration via NG handover. In this example, the mIAB-MT is connected to the source RRC-terminating IAB-donor-CU via a source path of an IAB topology before the migration, and it is connected to the target RRC-terminating IAB-donor-CU via a target path of a different IAB topology after the migration.

**Figure 8.YY.2.1-1: Procedure for NG-based migration of mobile IAB-MT**

1. Similar to Step 1-14 in Section 8.17.3.1, where the NG-based handover procedure is used instead as defined in Section 4.9.1.3.2 and 4.9.1.3.3 in TS 23.502[xx].

2. Same as step 2 to step 4 of Section 8.YY.1.

NOTE: How to exchange the IAB Transport Migration Management/Modification messages between the F1-terminating IAB-donor-CU and the target RRC-terminating IAB-donor-CU without Xn interface is up to implementation.

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### 8.YY.3 Mobile IAB-DU migration procedure

The RAN may perform the mobile IAB-DU migration procedure. During this procedure, the mobile IAB-node concurrently supports two logical mobile IAB-DUs, which have F1AP associations with the source F1-terminating IAB-donor-CU and target F1-terminating IAB-donor-CU, respectively. The mobile IAB-MT’s IAB-donor-CU may be the same as either the source F1-termainting IAB-donor CU or the target F1-terminating IAB-donor-CU, or it may be different from both source and target F1-terminating IAB-donor-CUs.

UEs connected to the mobile IAB-node are handed over from the cell(s) of the source logical mobile IAB-DU associated with the source F1-terminating IAB-donor-CU to the cell(s) of the target logical mobile IAB-DU associated with the target F1-terminating IAB-donor-CU. After the UEs are handed over, the source logical mobile IAB-DU’s F1AP association with the source F1-terminating IAB-donor-CU may be released.

Figure 8.YY.3.1-1 shows an example of the mobile-IAB-DU migration procedure. In this example, the source and target F1-terminating IAB-donor-CUs are different from the RRC-terminating IAB-donor-CU.



Figure 8.YY.3.1-1: Mobile IAB-DU inter-CU migration procedure

1. The source F1-terminating IAB-donor-CU sends an MIAB F1 SETUP TRIGGERING to the source logical mIAB-DU to initialize the F1 Setup procedure towards the target F1-terminating IAB-donor-CU. The MIAB F1 SETUP TRIGGERING message includes the gNB ID of the target F1-terminating IAB-donor-CU and the information needed to establish the TNL connection with the target F1-terminating IAB-donor-CU for F1-C.

NOTE: The mIAB-DU migration can also be triggered by the OAM. In this case, OAM provides the mIAB-node with all information to initiate the F1 Setup procedure toward the target F1-terminating IAB-donor-CU, and step 1 is omitted.

1. The target logical mIAB-DU initiates TNL establishment and F1 setup (as defined in clause 8.5) with the target F1-terminating IAB-donor-CU. During the F1 Setup procedure, the target logical mobile IAB-DU includes the gNB ID of the RRC-terminating IAB-donor-CU, and the BAP address of the mIAB-node in the F1 SETUP REQUEST message.
2. The target F1-terminating IAB-donor-CU responds to the target logical mIAB-DU with an F1 SETUP RESPONSE message. After F1 setup with the target F1-terminating IAB-donor-CU, the target logical mobile IAB-DU can serve UEs via the target mobile IAB-DU’s activated cell(s).
3. By sending the MIAB F1 SETUP OUTCOME NOTIFICATION, the source logical mIAB-DU informs the source F1-terminating IAB-donor-CU about the outcome of the F1 interface setup between the co-located target logical mIAB-DU and the target F1-terminating IAB-donor-CU. The source logical mIAB-DU may provide the source F1-terminating IAB-donor-CU a mapping between activated cells of the source logical mIAB-DU and those of the target logical mIAB-DU.
4. The source F1-terminating IAB-donor-CU hands over the UE from a source cell served by the source logical mobile IAB-DU to a target cell served by the target logical mobile IAB-DU. The target F1-termianting IAB-donor-CU initiates IAB Transport Migration management procedure towards the RRC-terminating IAB-donor-CU during this step.

Editor’s NOTE: The sequence of procedures of UE HO and IAB TMM procedures is FFS.

NOTE: How to exchange the IAB Transport Migration Management/Modification messages between the target F1-terminating IAB-donor-CU and the RRC-terminating IAB-donor-CU without Xn interface is up to implementation.

1. After all the UEs are handed over, the source F1-terminating IAB-donor-CU may initiate the removal of the F1 interface towards the source logical mIAB-DU.

-------------------------------------------End of changes-------------------------------------------