**3GPP TSG-RAN WG3 Meeting #114bis-eR3-220292**

**Electronic Meeting, January 17 – 26, 2022**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.300** | **CR** | **-** | **rev** | **-** | **Current version:** | **16.7.0** |  |
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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 |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | draftCR TS 38.300 on RAN3-related topics of Rel-17 | | | | | | | | | |
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| ***Source to WG:*** | Qualcomm | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_IAB\_enh-Core | | | | |  | | ***Date:*** | | 2022-01-06 |
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| ***Category:*** | **C** |  | | | | | | ***Release:*** | | Rel-17 |
|  | *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 can be 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)*  *Rel-17 (Release 17)* | |
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| ***Reason for change:*** | | RAN3 introduced additional functionality in Rel-17 IAB such as inter-donor partial migration, inter-donor RLF recovery, inter-donor redundancy and CP-UP separation. | | | | | | | | |
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| ***Summary of change:*** | | Addition of St2 description related to inter-donor partial migration, inter-donor RLF recovery, inter-donor redundancy and CP-UP separation. Some corrections of Rel-16 text. | | | | | | | | |
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| ***Consequences if not approved:*** | | Rel-17 IAB features of inter-donor partial migration, inter-donor RLF recovery, inter-donor redundancy and CP-UP separation cannot be supported. | | | | | | | | |
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| ***Clauses affected:*** | | 3.2, 4.7.1, 4.7.3, 4.7.3.1, 4.7.4.2, 4.7.4.3, 4.7.4.4 | | | | | | | | |
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|  | | **Y** | **N** |  | | |  | | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | TS/TR ... CR ... | | | |
| ***affected:*** | |  | **x** | Test specifications | | | TS/TR ... CR ... | | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | TS/TR ... CR ... | | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

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| ***This CR's revision history:*** |  |

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| **Begin of Changes** |

## 3.2 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1], in TS 36.300 [2] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1] and TS 36.300 [2].

**BH RLC channel**: an RLC channel between two nodes, which is used to transport backhaul packets**.**

**Boundary IAB-node:** an IAB-node with one RRC interface terminating at a different IAB-donor-CU than the F1 interface. This definition applies to partial migration and inter donor redundancy and inter donor RLF recovery.

**CAG Cell**:a PLMN cell broadcasting at least one Closed Access Group identity.

**CAG Member Cell**:for a UE, a CAG cell broadcasting the identity of the selected PLMN, registered PLMN or equivalent PLMN, and for that PLMN, a CAG identifier belonging to the Allowed CAG list of the UE for that PLMN.

**CAG-only cell**: a CAG cell that is only available for normal service for CAG UEs.

**Cell-Defining SSB**: an SSB with an RMSI associated.

**Child node**: IAB-DU's and IAB-donor-DU's next hop neighbour node; the child node is also an IAB-node.

**Conditional Handover (CHO**): a handover procedure that is executed only when execution condition(s) are met.

**CORESET#0**: the control resource set for at least SIB1 scheduling, can be configured either via MIB or via dedicated RRC signalling.

**DAPS Handover**: a handover procedure that maintains the source gNB connection after reception of RRC message for handover and until releasing the source cell after successful random access to the target gNB.

**Downstream**: Direction toward child node or UE in IAB-topology.

**Early Data Forwarding**: data forwarding that is initiated before the UE executes the handover.

**gNB**: node providing NR user plane and control plane protocol terminations towards the UE, and connected via the NG interface to the 5GC.

**IAB-donor**:gNB that provides network access to UEs via a network of backhaul and access links.

**IAB-donor-CU**: as defined in TS 38.401 [4].

**IAB-donor-DU**:as defined in TS 38.401 [4].

**IAB-DU**: gNB-DU functionality supported by the IAB-node to terminate the NR access interface to UEs and next-hop IAB-nodes, and to terminate the F1 protocol to the gNB-CU functionality, as defined in TS 38.401 [4], on the IAB-donor.

**IAB-MT**: IAB-node function that terminates the Uu interface to the parent node using the procedures and behaviours specified for UEs unless stated otherwise. IAB-MT function used in 38-series of 3GPP Specifications corresponds to IAB-UE function defined in TS 23.501 [3].

**IAB-node**: RAN node that supports NR access links to UEs and NR backhaul links to parent nodes and child nodes. The IAB-node does not support backhauling via LTE.

**Intra-system Handover**:Handover that does not involve a CN change (EPC or 5GC).

**Inter-system Handover**:Handover that involves a CN change (EPC or 5GC).

**Inter-donor partial migration:** Migration of an IAB-MT to a parent node underneath a different IAB-donor-CU while the collocated IAB-DU and descendant IAB-nod(s), if any, are terminated at the initial IAB-donor-CU. The procedure renders the said IAB-node as a boundary IAB-node.

**Late Data Forwarding**: data forwarding that is initiated after the source NG-RAN node knows that the UE has successfully accessed a target NG-RAN node.

**MSG1**: preamble transmission of the random access procedure for 4-step random access (RA) type.

**MSG3**: first scheduled transmission of the random access procedure.

**MSGA**:preamble and payload transmissions of the random access procedure for 2-step RA type.

**MSGB**:response to MSGA in the 2-step random access procedure. MSGB may consist of response(s) for contention resolution, fallback indication(s), and backoff indication.

**Multi-hop backhauling**: Using a chain of NR backhaul links between an IAB-node and an IAB-donor.

**ng-eNB**: node providing E-UTRA user plane and control plane protocol terminations towards the UE, and connected via the NG interface to the 5GC.

**NG-C**: control plane interface between NG-RAN and 5GC.

**NG-U**: user plane interface between NG-RAN and 5GC.

**NG-RAN node**: either a gNB or an ng-eNB.

**Non-CAG Cell**: a PLMN cell which does not broadcast any Closed Access Group identity.

**NR backhaul link**: NR link used for backhauling between an IAB-node and an IAB-donor, and between IAB-nodes in case of a multi-hop backhauling.

**NR sidelink communication**: AS functionality enabling at least V2X communication as defined in TS 23.287 [40], between two or more nearby UEs, using NR technology but not traversing any network node.

**Numerology**: corresponds to one subcarrier spacing in the frequency domain. By scaling a reference subcarrier spacing by an integer *N*, different numerologies can be defined.

**Parent node**: IAB-MT's next hop neighbour node; the parent node can be IAB-node or IAB-donor-DU

**PLMN Cell**: a cell of the PLMN.

**SNPN Access Mode**: mode of operation whereby a UE only accesses SNPNs.

**SNPN-only cell**: a cell that is only available for normal service for SNPN subscribers.

**SNPN Identity:** the identity of Stand-alone NPN defined by the pair (PLMN ID, NID).

**Topology:** The unison of all IAB-nodes and IAB-donor-DUs that are controlled by a single IAB-donor-CU.

**Transmit/Receive Point:** Part of the gNB transmitting and receiving radio signals to/from UE according to physical layer properties and parameters inherent to that element.

**Upstream**: Direction toward parent node in IAB-topology.

**V2X sidelink communication**: AS functionality enabling V2X communication as defined in TS 23.285 [41], between nearby UEs, using E-UTRA technology but not traversing any network node.

**Xn**: network interface between NG-RAN nodes.

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## 4.7 Integrated Access and Backhaul

### 4.7.1 Architecture

Integrated access and backhaul (IAB) enables wireless relaying in NG-RAN. The relaying node, referred to as *IAB-node*, supports access and backhauling via NR. The terminating node of NR backhauling on network side is referred to as the *IAB-donor*, which represents a gNB with additional functionality to support IAB. Backhauling can occur via a single or via multiple hops. The IAB architecture is shown in Figure 4.7.1-1.

The IAB-node supports the gNB-DU functionality, as defined in TS 38.401 [4], to terminate the NR access interface to UEs and next-hop IAB-nodes, and to terminate the F1 protocol to the gNB-CU functionality, as defined in TS 38.401 [4], on the IAB-donor. The gNB-DU functionality on the IAB-node is also referred to as *IAB-DU*.

In addition to the gNB-DU functionality, the IAB-node also supports a subset of the UE functionality referred to as *IAB-MT*, which includes, e.g., physical layer, layer-2, RRC and NAS functionality to connect to the gNB-DU of another IAB-node or the IAB-donor, to connect to the gNB-CU on the IAB-donor, and to the core network.

The IAB-node can access the network using either SA mode or EN-DC. In EN-DC, the IAB-node connects via E-UTRA to a MeNB, and the IAB-donor terminates X2-C as SgNB (TS 37.340 [21]).



Figure 4.7.1-1: IAB architecture; a) IAB-node using SA mode with NGC; b) IAB-node using EN-DC

All IAB-nodes that are connected to an IAB-donor via one or multiple backhaul hops and controlled by this IAB-donor form a directed acyclic graph (DAG) topology with the IAB-donor as its root (Fig. 4.7.1-2). In this DAG topology, the neighbour node of the IAB-DU or the IAB-donor-DU is referred to as the *child* node and the neighbour node of the IAB-MT is referred to as the *parent* node. The direction toward the child node is referred to as *downstream* while the direction toward the parent node is referred to as *upstream*. The IAB-donor performs centralized resource, topology and route management for its IAB topology.



Figure 4.7.1-2: Parent- and child-node relationship for IAB-node

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### 4.7.3 User-plane Aspects

#### 4.7.3.1 Backhaul transport

The IAB-DU's IP traffic is routed over the wireless backhaul via the BAP sublayer. The BAP sublayer is specified in TS 38.340 [31]. In downstream direction, upper layer packets are encapsulated by the BAP sublayer at the IAB-donor-DU and de-encapsulated at the destination IAB-node. In upstream direction, upper layer packets are encapsulated at the IAB-node and de-encapsulated at the IAB-donor-DU. IAB-specific transport between IAB-donor-CU and IAB-donor-DU is specified in TS 38.401 [4].

On the BAP sublayer, packets are routed based on the BAP routing ID, which is carried in the BAP header. The BAP header is added to the packet when it arrives from upper layers, and the BAP header is stripped off when the packet has reached its destination node. The selection of the packet's BAP routing ID is configured by the IAB-donor-CU. The BAP routing ID consists of BAP address and BAP path ID, where the BAP address indicates the destination node of the packet on the BAP sublayer, and the BAP path ID indicates the routing path the packet should follow to this destination. For the purpose of routing, each IAB-node and IAB-donor-DU is further configured with a designated BAP address.

On each hop of the packet's path, the IAB-node inspects the packet's BAP address in the BAP routing ID carried in the BAP header to determine if the packet has reached its destination, i.e., matches the IAB-node's BAP address. In case the packet has *not* reached the destination, the IAB-node determines the next hop backhaul link, referred to as *egress* link, based on the BAP routing ID carried in the BAP header and a routing configuration it received from the IAB-donor-CU.

For each packet, the IAB-node further determines the egress BH RLC channel on the designated egress link. For packets arriving from upper layers, the designated egress BH RLC channel is configured by the IAB-donor-CU, and it is based on upper layer traffic specifiers. Since each BH RLC channel is configured with QoS information or priority level, BH-RLC-channel selection facilitates traffic-specific prioritization and QoS enforcement on the BH. For F1-U traffic, it is possible to map each GTP-U tunnel to a dedicated BH RLC channel or to aggregate multiple GTP-U tunnels into one common BH RLC channel. For traffic other than F1-U traffic, it is possible to map UE-associated F1AP messages, non-UE-associated F1AP messages and non-F1 traffic onto the same or separate BH RLC channels.

When packets are routed from one BH link to another, the egress BH RLC channel on the egress BH link is determined based on the mapping configuration between ingress BH RLC channels and egress BH RLC channels provided by the IAB-donor-CU.

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### 4.7.4 Signalling procedures

#### 4.7.4.1 IAB-node Integration

The IAB-node integration procedure is captured in TS 38.401 [4].

#### 4.7.4.2 IAB-node Migration

The IAB-node can migrate to a different parent node underneath the same IAB-donor-CU. The IAB-node continues providing access and backhaul service when migrating to a different parent node.

The IAB-MT can also migrate to a different parent node underneath another IAB-donor-CU. In this case, the collocated IAB-DU retains its F1 connectivity with the initial IAB-donor-CU. This migration is referred to as *inter-donor partial migration*. The IAB-node is referred to as a *boundary node* since its IAB-MT and IAB-DU connect to separate topologies controlled by different IAB-donors. For inter-donor partial migration, the F1 traffic of the IAB-DU and its descendent nodes is routed via the BAP layer of the topology to which the IAB-MT has migrated.

Inter-donor partial migration is only supported for SA mode.

The intra-donor IAB-node migration and inter-donor partial migration procedures are captured in TS 38.401 [4].

#### 4.7.4.3 Topological Redundancy

The IAB-node may have redundant routes to the IAB-donor-CU.

For IAB-nodes operating in SA-mode, NR DC can be used to enable route redundancy in the BH by allowing the IAB-MT to have concurrent BH links with two parent nodes. The parent nodes may be connected to the same or to different IAB-donor-CUs, which control the establishment and release of redundant routes via these two parent nodes. The parent nodes' gNB-DU functionality together with the respective IAB-donor-CU obtain the role of the IAB-MT's master node and/or secondary node. The NR DC framework (e.g. MCG/SCG-related procedures) is used to configure the dual radio links with the parent nodes (TS 37.340 [21]).

The procedures for establishment of topological redundancy for IAB-nodes operating in SA-mode are captured in TS 38.401 [4].

IAB-nodes operating in NR-DC may also use one of the legs for BH connectivity with an IAB-donor and the other leg for access-only connectivity with a separate gNB that does not assume IAB-donor role. The IAB-donor can have MN or SN role. The IAB-node may exchange F1-C traffic with the IAB-donor via the backhaul link with the IAB-donor and/or via the access link with the gNB. In the latter case, the F1-C messages are carried over NR RRC between IAB-node and gNB and via XnAP between gNB and IAB-donor. For F1-C traffic, SRB2 is used in case the gNB has MN role, and split-SRB2 is used in case the gNB has SN role.

IAB-nodes operating in EN-DC can exchange F1-C traffic with the IAB-donor via the MeNB. The F1-C message is carried over LTE RRC using SRB2 between IAB-node and MeNB and via X2AP between MeNB and IAB-donor.

The procedures for establishment of redundant transport of F1-C for IAB-nodes using NR-DC and EN-DC are captured in TS 37.340 [21] and TS 38.401 [4].

#### 4.7.4.4 Backhaul RLF Recovery

When the IAB-node using SA-mode declares RLF on the backhaul link, it can migrate to another parent node underneath the same IAB-donor-CU. Alternatively, the IAB-MT can perform RLF recovery at a different IAB-donor-CU. In this case, the collocated IAB-DU retains its F1 connectivity with the initial IAB-donor-CU in the same manner as for *inter-donor partial migration*.

The BH RLF recovery procedures are captured in TS 38.401 [4]. BH RLF declaration for IAB is handled in clause 9.2.7 of the present document.

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| **End of changes** |