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### 6.1.4 Protocol stacks of IAB

Figure 6.1.4-1 shows the protocol stack for F1-U between IAB-DU and the IAB-donor-CU-UP, and Figure 6.1.4-2 shows the protocol stack for F1-C between IAB-DU and the IAB-donor-CU-CP. In these example figures, F1-U and F1-C traffic are carried over two backhaul hops.

NOTE: F1 needs to be security-protected as described in TS 33.501. The security layer is not shown in the Figures 6.1.4-1/2/3.



Figure 6.1.4-1: Protocol stack for F1-U of IAB



Figure. 6.1.4-2: Protocol stack for F1-C of IAB

Figure 6.1.4-3 shows the protocol stack for F1-C between IAB-DU and the IAB-donor-CU-CP, when the F1-C traffic is exchanged via the MeNB.

**IAB-node**

F1AP

SCTP

IP

F1AP

SCTP

IP

X2AP

SCTP

IP

L2

L1

X2AP

SCTP

IP

L2

L1

LTE RRC

LTE PDCP

LTE RLC

LTE MAC

LTE PHY

LTE RRC

LTE PDCP

LTE RLC

LTE MAC

LTE PHY

IAB-DU

IAB-MT

**MeNB**

**IAB-donor-CU-CP**

LTE-Uu

X2-C

Fig. 6.1.4-3: Protocol stack for IAB F1-C traffic delivered via the MeNB

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8.2.3 Intra-CU topology adaptation procedure

8.2.3.1 Intra-CU topology adaptation procedure in SA

During the intra-CU topology adaptation in SA, both the source and the target parent node are served by the same IAB-donor-CU. The target parent node may use a different IAB-donor-DU than the source parent node. The source path may have common nodes with the target path. Figure 8.2.3.1-1 shows an example of the topology adaptation procedure, where the target parent node uses a different IAB-donor-DU than the one used by the source parent node.

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**Figure 8.2.3.1-1: IAB intra-CU topology adaptation procedure**

1. The migrating IAB-MT sends a *MeasurementReport* message to the source parent node IAB-DU. This report is based on a Measurement Configuration the migrating IAB-MT received from the IAB-donor-CU before.

2. The source parent node IAB-DU sends an UL RRC MESSAGE TRANSFER message to the IAB-donor-CU to convey the received *MeasurementReport*.

3. The IAB-donor-CU sends a UE CONTEXT SETUP REQUEST message to the target parent node IAB-DU to create the UE context for the migrating IAB-MT and set up one or more bearers. These bearers can be used by the migrating IAB-MT for its own signalling, and, optionally, data traffic.

4. The target parent node IAB-DU responds to the IAB-donor-CU with a UE CONTEXT SETUP RESPONSE message.

5. The IAB-donor-CU sends a UE CONTEXT MODIFICATION REQUEST message to the source parent node IAB-DU, which includes a generated *RRCReconfiguration* message. The *RRCReconfiguration* message includes a default BH RLC channel and a default BAP Routing ID configuration for UL F1-C/non-F1 traffic mapping on the target path. It may include additional BH RLC channels. This step may also include allocation of TNL address(es) that is (are) routable via the target IAB-donor-DU. The new TNL address(es) may be included in the *RRCReconfiguration* message as a replacement for the TNL address(es) that is (are) routable via the source IAB-donor-DU. In case IPsec tunnel mode is used to protect the F1 and non-F1 traffic, the allocated TNL address is outer IP address. The TNL address replacement is not necessary if the source and target paths use the same IAB-donor-DU. The *Transmission Action Indicator* in the UE CONTEXT MODIFICATION REQUEST message indicates to stop the data transmission to the migrating IAB-node.

6. The source parent node IAB-DU forwards the received *RRCReconfiguration* message to the migrating IAB-MT.

7. The source parent node IAB-DU responds to the IAB-donor-CU with the UE CONTEXT MODIFICATION RESPONSE message.

8. A Random Access procedure is performed at the target parent node IAB-DU.

9. The migrating IAB-MT responds to the target parent node IAB-DU with an *RRCReconfigurationComplete* message.

10. The target parent node IAB-DU sends an UL RRC MESSAGE TRANSFER message to the IAB-donor-CU to convey the received *RRCReconfigurationComplete* message. Also, uplink packets can be sent from the migrating IAB-MT, which are forwarded to the IAB-donor-CU through the target parent node IAB-DU. These UL packets belong to the IAB-MT’s own signalling and, optionally, data traffic.

11. The IAB-donor-CU configures BH RLC channels and BAP-sublayer routing entries on the target path between the target parent IAB-node and target IAB-donor-DU as well as DL mappings on the target IAB-donor-DU for the migrating IAB-node’s target path. These configurations may be performed at an earlier stage, e.g. immediately after step 3, or before step 3. The IAB-donor-CU may establish additional BH RLC channels to the migrating IAB-MT via RRC message.

12. The F1-C connections are switched to use the migrating IAB-node’s new TNL address(es), IAB-donor-CU updates the UL BH information associated to each GTP-tunnel to migrating IAB-node. This step may also update UL FTEID and DL FTEID associated to each GTP-tunnel. All F1-U tunnels are switched to use the migrating IAB-node’s new TNL address(es). This step may use non-UE associated signaling in E1 and/or F1 interface to provide updated UP configuration for F1-U tunnels of multiple connected UEs or child IAB-MTs. The IAB-donor-CU may also update the UL BH information associated with non-UP traffic. Implementation must ensure the avoidance of potential race conditions, i.e. no conflicting configurations are concurrently performed using UE-associated and non-UE-associated procedures.

In case IPsec tunnel mode is used for TNL protection, the IAB-node may use MOBIKE (IETF RFC 4555 [29]) to migrate the IPsec tunnel to the new IP outer addresses. After the completion of the MOBIKE procedure, the IAB-DU initiates an F1AP gNB-DU Configuration Update procedure from which the IAB-donor-CU can conclude whether the existing inner IP address(es) (e.g. for SCTP association) and the DL F-TEID can be reused.

13. The IAB-donor-CU sends a UE CONTEXT RELEASE COMMAND message to the source parent node IAB-DU.

14. The source parent node IAB-DU releases the migrating IAB-MT’s context and responds to the IAB-donor-CU with a UE CONTEXT RELEASE COMPLETE message.

15. The IAB-donor-CU releases BH RLC channels and BAP-sublayer routing entries on the source path between source parent IAB-node and source IAB-donor-DU.

NOTE: In case that the source path and target path have common nodes, the BH RLC channels and BAP-sublayer routing entries of those nodes may not need to be released in Step 15.

Steps 11, 12 and 15 should also be performed for the migrating IAB-node’s descendant nodes, as follows:

The IAB-donor-CU may allocate new TNL address(es) that is (are) routable via the target IAB-donor-DU to the descendent nodes via *RRCReconfiguration* message.

If needed, the IAB-donor-CU may also provide a new default UL mapping which includes a default BH RLC channel and a default BAP Routing ID for UL F1-C/non-F1 traffic on the target path, to the descendant nodes via *RRCReconfiguration* message.

If needed, the IAB-donor-CU configures BH RLC channels, BAP-sublayer routing entries on the target path for the descendant nodes and the BH RLC channel mappings on the descendant nodes in the same manner as described for the migrating IAB-node in step 11.

The descendant nodes switch their F1-C connections and F1-U tunnels to new TNL addresses that are anchored at the new IAB-donor-DU, in the same manner as described for the migrating IAB-node in step 12.

Based on implementation, these steps can be performed after or in parallel with the handover of the migrating IAB-node. To enable performing these steps in parallel, the IAB-donor-CU sends the RRCReconfiguration message with the new TNL address(es) and the new default BAP configuration to the descendent node while the migrating IAB-MT is still connected with source parent node, for example, before Step 5. In this case, the UE CONTEXT MODIFICATION REQUEST message carrying this RRCReconfiguration message includes a conditional delivery indication for the descendent node’s parent IAB-DU. Based on this indication, the parent IAB-DU retains the RRCReconfiguration message until the conditions for delivery are met, as specified in TS 38.473 [4].

NOTE: In upstream direction, in-flight packets between the source parent node and the IAB-donor-CU can be delivered even after the target path is established.

NOTE: In-flight downlink data in the source path may be discarded, up to implementation via the NR user plane protocol (TS 38.425 [24]).

NOTE: The IAB-donor-CU can determine the unsuccessfully transmitted downlink data over the backhaul link by implementation.

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8.12 IAB-node Integration Procedure

8.12.1 Standalone IAB integration

A high-level flow chart for SA-based IAB integration is shown in the Figure 8.12.1-1:

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**Figure 8.12.1-1: The integration procedure for IAB-node in SA**

Phase 1: IAB-MT setup. In this phase, the IAB-MT of the new IAB-node (e.g. IAB-node 2 in Figure 8.12.1-1) connects to the network in the same way as a UE, by performing RRC connection setup procedure with IAB-donor-CU, authentication with the core network, IAB-node 2-related context management, IAB-node 2’s access traffic-related radio bearer configuration at the RAN side (SRBs and optionally DRBs), and, optionally, OAM connectivity establishment by using the IAB-MT’s PDU session. The IAB-node can select the parent node for access based on an over-the-air indication from potential parent node IAB-DU (transmitted in SIB1). To indicate its IAB capability, the IAB-MT includes the IAB-node indication in *RRCSetupComplete* message, to assist the IAB-donor to select an AMF supporting IAB.

NOTE: The signalling flow for UE initial access procedure as shown in Figure 8.1-1/Figure 8.9.1-1 is used for the setup of the IAB-MT.

Phase 2-1: BH RLC channel establishment. During the bootstrapping procedure, one default BH RLC channel for non-UP traffic e.g. carrying F1-C traffic/non-F1 traffic to and from the IAB-node 2 in the integration phase, is established. This may require the setup of a new BH RLC channel or modification of an existing BH RLC channel between IAB-node 1 and IAB-donor-DU. The IAB-donor-CU may establish additional (non-default) BH RLC channels. This phase also includes configuring the BAP Address of the IAB-node 2 and default BAP Routing ID for the upstream direction.

NOTE: If the OAM connectivity is supported via backhaul IP layer by implementation, one or more BH RLC channels used for OAM traffic can also be established.

Phase 2-2: Routing update. In this phase, the BAP sublayer is updated to support routing between the new IAB-node 2 and the IAB-donor-DU. For the downstream direction, the IAB-donor-CU initiates F1AP procedure to configure the IAB-donor-DU with the mapping from IP header field(s) to the BAP Routing ID related to IAB-node 2. The routing tables are updated on all ancestor IAB-nodes (e.g. IAB-node 1 in Figure 8.12.1-1) and on the IAB-donor-DU, with routing entries for the new BAP Routing ID(s). This phase may also include the IP address allocation procedure for IAB-node 2. IAB-node 2 may request one or more IP addresses from the IAB-donor-CU via RRC. The IAB-donor-CU may send the IP address(es) to the IAB-node 2 via RRC. The IAB-donor-CU may obtain the IP address(es) from the IAB-donor-DU via F1-AP or by other means (e.g. OAM, DHCP). IP address allocation procedure may occur at any time after RRC connection has been established.

Phase 3: IAB-DU part setup. In this phase, the IAB-DU of IAB-node 2 is configured via OAM. The IAB-DU of IAB-node 2 initiates the TNL establishment, and F1 setup (as defined in clause 8.5) with the IAB-donor-CU using the allocated IP address(es). The IAB-donor-CU discovers collocation of IAB-MT and IAB-DU from the IAB-node’s BAP Address included in the F1 SETUP REQUEST message. After the F1 is set up, the IAB-node 2 can start serving the UEs.

NOTE: The IAB-DU can discover the IAB-donor-CU’s IP address in the same manner as a non-IAB gNB-DU.

NOTE: If the IAB-node establishes NR-DC before the establishment of F1-C connection, the IAB-node can implicitly derive whether the MN or the SN is the F1-terminating donor, e.g., based on the entity which provides the default BAP configuration.

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8.17 IAB Inter-CU Topology Management

8.17.1 IAB Inter-donor-DU Re-routing

When an IAB-donor-DU is configured to support inter-donor-DU re-routing, the IAB-donor-DU forwards UL IP packets, whose source IP addresses are anchored at a peer IAB-donor-DU, to this peer IAB-donor-DU via a GTP-U tunnel. The inter-donor-DU tunnel may be a GTP-U tunnel. The configuration of the tunnel is up to implementation. At the IAB-donor-DU forwarding the UL IP packets, inter-donor-DU tunnelling may be restricted to only a subset of the IP addresses anchored at the peer IAB-donor-DU. For this purpose, the IAB-donor-CU configures the IAB-donor-DU for forwarding the UL IP packets with a list of TNL addresses and/or prefixes for which tunnelling should be permitted.

NOTE: Tunnel types other than GTP-U may be used for the inter-donor-DU tunnel, by implementation.

8.17.2 IAB Inter-CU Topology Redundancy

8.17.2.1 IAB Inter-CU topological redundancy procedure

The inter-CU topological redundancy procedure enables the establishment, modification and release of redundant paths in IAB-topologies underneath different IAB-donor-CUs. Since topological redundancy uses NR-DC for the IAB-MT, it is only supported for IAB-nodes operating in the SA mode.

Figure 8.17.2.1-1 shows an example of the inter-CU topological redundancy procedure, where a second backhaul path is established forte a dual-connecting IAB-node via a separate IAB-topology that is not controlled by the F1-terminating IAB-donor-CU. Through this procedure, the dual-connecting IAB-node retains its F1 connection with the initial IAB-donor-CU. The dual-connecting IAB-node therefore becomes a boundary node since it is controlled by the F1-terminating IAB-donor via F1AP and RRC as well as by the non-F1-terminating IAB-donor via RRC.

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**Figure 8.17.2.1-1 IAB inter-CU topology redundancy procedure**

1. The NR-DC establishment procedure is performed for the IAB-MT of the dual-connecting IAB-node as described in TS 37.340 [12], clause 10.2. This procedure can be conducted before or after establishment of the backhaul towards the IAB-node.

2. The F1-terminating IAB-donor-CU sends an IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message to the non-F1-terminating IAB-donor-CU to provide the context of the traffic to be offloaded. This message may include a request for new TNL address(es).

3. The non-F1-terminating IAB-donor-CU sends a DL RRC MESSAGE TRANSFER message to the second parent IAB-DU, which includes an *RRCReconfiguration* message for the dual-connecting IAB-MT. The RRC configuration includes a BAP address for the boundary node, pertaining to the non-F1-terminating IAB-donor-CU’s IAB topology. The RRC configuration may include new TNL address(es) for the dual-connecting IAB-node, anchored at the second-path, i.e., at the IAB-donor-DU under the non-F1-terminating IAB-donor-CU. In case IPsec tunnel mode is used to protect the F1 and non-F1 traffic, the new TNL address refers to the outer IP address.

4. The second parent IAB-DU forwards the received *RRCReconfiguration* message to the dual-connecting IAB-MT.

5. The dual-connecting IAB-MT responds to the second parent IAB-DU with an *RRCReconfigurationComplete* message.

6. The second parent IAB-DU sends an UL RRC MESSAGE TRANSFER message to the non-F1-terminating IAB-donor-CU, to convey the received *RRCReconfigurationComplete* message.

7. The non-F1-terminating IAB-donor-CU may configure or modify BH RLC channels and BAP-sublayer routing entries on the second path between the dual-connecting IAB-node and the second-path IAB-donor-DU, as well as DL mappings on the second-path IAB-donor-DU for the dual-connecting IAB-node’s second path. The DL mappings may be based on the TNL address(es) allocated to the dual-connecting IAB-node in step 3. These configurations may support the transport of UP and non-UP traffic on the second path.

8. The non-F1-terminating IAB-donor-CU responds with an IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE message to the F1-terminating IAB-donor-CU, to provide the mapping information for the traffic to be offloaded as indicated in step 2. The message includes the L2 info necessary to configure the dual-connecting IAB-node with the UL mappings for this traffic. The message includes the DSCP/IPv6 Flow Label values to be used for the DL traffic to be offloaded.

NOTE: The non-F1-terminating IAB-donor-CU should select the same IAB-donor-DU in its topology for all to-be-offloaded traffic, whose UL BH mappings received from the F1-terminating IAB-donor-CU in step 2 share the same BAP address.

9. The F1-terminating IAB-donor-CU updates the boundary node with the UL BH information received from the non-F1-terminating IAB-donor-CU in Step 8 for the traffic to be offloaded. This step may also update UL FTEID and DL FTEID associated with individual GTP-tunnel(s). The affected GTP tunnel(s) will be switched to use the dual-connecting IAB-node’s new TNL address(es). This step may use non-UE associated signaling in E1 and/or F1 interface to provide updated UP configuration for F1-U tunnels of multiple connected UEs or child IAB-MTs. Implementation must ensure the avoidance of potential race conditions, i.e., that no conflicting configurations are concurrently performed using UE-associated and non-UE-associated procedures.

The F1-terminating IAB-donor-CU may also provide UL BH information associated with non-UP traffic. New TNL addresses for F1-C traffic configured in step 3, if any, can be added to the dual-connecting IAB-DU’s F1-C association(s) with the F1-terminating IAB-donor-CU.

10. The F1-terminating IAB-donor-CU sends an IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message to the non-F1-terminating IAB-donor-CU, to modify the context of the dual-connecting IAB-node’s offloaded traffic. The message may include the DL TNL address information used for the offloaded traffic and reported by the boundary node in step 9. The non-F1-terminating IAB-donor-CU may use this information to configure DL mappings on the second-path IAB-donor-DU.

11. The non-F1-terminating IAB-donor-CU responds with an IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE message to the F1-terminating IAB-donor-CU.

12. The steps above may be repeated, except step 1, if needed, for the F1-terminating IAB-donor-CU to request addition, modification, or release of the offloaded traffic. The non-F1-terminating IAB-donor-CU can fully or partially reject the addition or modification requested by the F1-terminating IAB-donor-CU.

The non-F1-terminating IAB-donor-CU may request the modification of the L2 transport for the offloaded traffic in the non-F1-terminating IAB-donor-CU’s IAB topology using the IAB TRANSPORT MIGRATION MODIFICATION REQUEST message. The F1-terminating IAB-donor-CU reconfigures UL BH mappings accordingly and acknowledges the modification via the IAB TRANSPORT MIGRATION MODIFICATION RESPONSE message. The non-F1-terminating IAB-donor-CU may further reconfigure the TNL addresses of the dual-connecting IAB-node via RRC.

The traffic offload for descendant nodes follows the same procedure as defined for the partial migration in clause 8.17.3.2.

The F1-terminating IAB-donor-CU may request full or partial release of the offloaded traffic from the non-F1-terminating IAB-donor-CU by initiating the IAB Transport Migration Management procedure towards the non-F1-terminating IAB-donor-CU (e.g., for the purpose of revoking, or in case UE bearers are released).

The traffic offload for the dual-connecting IAB-node and the descendent nodes can be partially or fully revoked, resulting in the return of the offloaded traffic back to the F1-terminating IAB-donor-CU’s IAB topology. Full or partial traffic revoking can be initiated by the F1-terminating IAB-donor-CU by initiating the IAB Transport Migration Management procedure towards the non-F1-terminating IAB-donor-CU. The non-F1-terminating IAB-donor-CU can request partial or full revoking of traffic offload from the F1-terminating IAB-donor-CU by initiating the IAB Transport Migration Modification procedure towards the F1-terminating IAB-donor-CU.

8.17.3 IAB Inter-CU Topology Adaptation

8.17.3.1 IAB inter-CU topology adaptation procedure

During the inter-CU topology adaptation for a single-connected IAB-node, the IAB-MT migrates from an old parent node to a new parent node, where the old and the new parent nodes are served by different IAB-donor-CUs. Without loss of generality, the old parent node is referred to as source parent node, and the new parent node is referred to as target parent node.

Figure 8.17.3.1-1 shows an example of the topology adaptation procedure, where the IAB-MT is migrated from a source IAB-donor-CU to a target IAB-donor-CU. In this procedure, the migrating IAB-node becomes a boundary node since itsIAB-DU retains F1AP with the source IAB-donor-CU while its IAB-MT obtains RRC connectivity with the target IAB-donor-CU,.

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**Figure 8.17.3.1-1: IAB inter-CU topology adaptation procedure**

1. The source IAB-donor-CU sends an Xn HANDOVER REQUESTmessage to the target IAB-donor-CU. Thismessage may include the migrating IAB-node’s TNL address information in the RRC container.

2. The target IAB-donor-CU sends a UE CONTEXT SETUP REQUESTmessage to the target parent node IAB-DU, to create the UE context for the migrating IAB-MT and to set up the bearers, which the migrating IAB-MT uses for its signaling, and, optionally, data traffic.

3. The target parent node IAB-DU responds to the target IAB-donor-CU with a UE CONTEXT SETUP RESPONSE message.

4. The target IAB-donor-CU performs admission control and provides the new RRC configuration as part of the HANDOVER REQUEST ACKNOWLEDGE message. The RRC configuration includes a BAP address for the boundary node in the target IAB-donor-CU’s IAB topology, a default BH RLC channel and a default BAP routing ID configuration for UL F1-C/non-F1 traffic mapping on the target path. The RRC configuration may include the new TNL address(es) anchored at the target IAB-donor-DU for the migrating node.

5. The source IAB-donor-CU sends a UE CONTEXT MODIFICATION REQUESTmessage to the source parent node IAB-DU, which includes the received *RRCReconfiguration* message from the target IAB-donor-CU.

6. The source parent node IAB-DU forwards the received *RRCReconfiguration* message to the migrating IAB-MT.

7. The source parent node IAB-DU responds to the source IAB-donor-CU with the UE CONTEXT MODIFICATION RESPONSE message.

8. The migrating IAB-MT performs a random access procedure at the target parent node IAB-DU.

9. The migrating IAB-MT responds to the target parent node IAB-DU with an *RRCReconfigurationComplete* message.

10. The target parent node IAB-DU sends an UL RRC MESSAGE TRANSFER message to the target IAB-donor-CU, to convey the received *RRCReconfigurationComplete* message.

11. The target IAB-donor-CU triggers the path switch procedure for the migrating IAB-MT, if needed.

12. The target IAB-donor-CU sends UE CONTEXT RELEASE message to the source IAB-donor-CU.

NOTE: The XnAP UE IDs of the migrating node are retained at target and source IAB-donor-CU as long as the target path is used for transport of traffic between the migrating node and the source IAB-donor-CU.

13. The source IAB-donor-CU may release BH RLC channels and BAP-sublayer routing entries on the source path between source parent IAB-node of the migrating IAB-node and the source IAB-donor-DU.

14. The target IAB-donor-CU configures BH RLC channels and BAP-sublayer routing entries on the target path between the migrating IAB-node and target IAB-donor-DU, as well as DL mappings on the target IAB-donor-DU for the migrating IAB-node’s target path. These configurations support the transport of F1-C traffic on the target path.

15. The F1-C connection between the migrating IAB-node and the source IAB-donor-CU are switched to the target path using the new TNL address information of the migrating IAB-node. The migrating IAB-node may report the new TNL address information it wants to use for each F1-U tunnel and non-UP traffic type to the source IAB-donor-CU, via the gNB-DU CONFIGURATION UPDATE message.

16. The source IAB-donor-CU sends an IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message to the target IAB-donor-CU, to provide the context of the traffic to be offloaded. The message may include the new DL TNL address information necessary for the target IAB-donor-CU to configure or modify DL mappings on the target IAB-donor-DU.

17. The target IAB-donor-CU may configure or modify BH RLC channels and BAP-sublayer routing entries on the target path between the migrating IAB-node and target IAB-donor-DU, as well as DL mappings on the target IAB-donor-DU for the migrating IAB-node’s target path. These configurations may support the transport of UP and non-UP traffic on the target path.

18. The target IAB-donor-CU responds to the source IAB-donor-CU with an IAB Transport Migration Management Response message, to provide the mapping information for the traffic to be offloaded. The message includes the L2 info that is used in the target IAB-donor-CU’s IAB topology and necessary to configure the migrating IAB-node with the UL mappings of traffic indicated in step 16. The message includes the DSCP/IPv6 Flow Label values used to configure the DL mappings of traffic indicated in step 16.

NOTE: The target IAB-donor-CU should select the same IAB-donor-DU in its topology for all to-be-offloaded traffic, whose UL BH mappings received from the source IAB-donor-CU in step 16 share the same BAP address.

19. The F1-U connections of the migrating IAB-node with the source IAB-donor-CU are switched to use the migrating IAB-node’s new TNL address(es). The source IAB-donor-CU provides to the IAB-DU of the migrating IAB-node the updated UL BH information for the traffic indicated in step 16, based on the UL BH information received from the target IAB-donor-CU in step 18. The source IAB-donor-CU may also update the UL BH information associated with non-UP traffic. This step may use UE associated signaling or non-UE associated signaling in E1 and/or F1 interface. Implementation must ensure the avoidance of potential race conditions, i.e., that no conflicting configurations are concurrently performed using UE-associated and non-UE-associated procedures.

20. The steps 16 to 19 may be repeated, if needed, where the source IAB-donor-CU can request addition, modification or release of QoS information for non-UP and UP traffic. The target IAB-donor-CU can fully or partially reject addition or modification requests by the source IAB-donor-CU.

The target IAB-donor-CU may request the modification of the L2 transport for the offloaded traffic in the target IAB-donor-CU’s IAB topology using the IAB TRANSPORT MIGRATION MODIFICATION REQUEST message. The source IAB-donor-CU reconfigures the UL BH mappings accordingly, and acknowledges the modification via the IAB TRANSPORT MIGRATION MODIFICATION RESPONSE message. The target IAB-donor-CU may further reconfigure the TNL addresses of the migrating IAB-node via RRC.

The traffic offload through the inter-CU topology adaptation procedure for the migrating IAB-node can be fully revoked. In this case, the migrating IAB-MT is handed over in reverse direction, i.e., from the non-F1-terminating IAB-donor-CU to the F1-terminating IAB-donor-CU, and the traffic of the migrating IAB-node’s IAB-DU is routed again along the former source path.

The non-F1-terminating IAB-donor-CU can initiate the full revoking of traffic offload by executing the XnAP Handover Preparation procedure for the migrating IAB-MT towards the F1-terminating IAB-donor-CU. The F1-terminating IAB-donor-CU can initiate the full revoking of traffic offload by requesting the release of all offloaded traffic from the non-F1-terminating IAB-donor-CU through the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST from the non-F1-terminating IAB-donor-CU.

The F1-terminating IAB-donor-CU may request full or partial release of the offloaded traffic from the non-F1-terminating IAB-donor-CU via the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message.

8.17.3.2 IAB inter-CU topology adaptation procedure with descendant IAB-node

Figure 8.17.3.2-1 shows an example of the topology adaptation procedure where the migrating IAB-MT is migrated from a source IAB-donor-CU to a target IAB-donor-CU, and where the migrating IAB-node has a descendant IAB-node.



**Figure 8.17.3.2-1: IAB inter-CU topology adaptation procedure with descendant IAB-node**

0. The topology adaptation procedure of clause 8.17.3.1 is performed for the migrating IAB-node.

1. The source IAB-donor-CU sends an IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message to the target IAB-donor-CU to provide the context of the descendant IAB-node’s traffic to be offloaded. The message may include a request for new TNL address(es) for the descendant IAB-node(s), anchored at a target IAB-donor-DU. The source IAB-donor-CU includes an identifier of the migrating IAB-node in the request message.

2. The target IAB-donor-CU determines the target IAB-donor-DU, based on the identifier of the migrating IAB-node. The target IAB-donor-CU may configure or modify BH RLC channels and BAP-sublayer routing entries on the target path between the boundary IAB-node and target IAB-donor-DU, as well as DL mappings on the target IAB-donor-DU for the migrating IAB-node’s target path. These configurations may support the transport of UP and non-UP traffic on the target path.

3. The target IAB-donor-CU may obtain new TNL address(es) from the target IAB-donor-DU, based on the request for TNL address(es) received in step 1.

4. The target IAB-donor-CU responds with an IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE message to the source IAB-donor-CU, to provide the mapping information for the traffic to be offloaded. The message includes the L2 info from the target IAB-donor-CU IAB topology that is necessary to configure the migrating IAB-node with the BAP-sublayer routing, header-rewriting and BH RLC CH mapping entries of traffic indicated in step 1. The message includes the DSCP/IPv6 Flow Label values to be used for the DL traffic to be offloaded as indicated in step 1. The message may include the new TNL address(es) obtained in step 3, if any.

NOTE: The target IAB-donor-CU should select the same IAB-donor-DU in its IAB topology for all to-be-offloaded traffic, whose UL BH mappings received from the source IAB-donor-CU in step 1 share the same BAP address.

5. The source IAB-donor-CU configures the migrating IAB-node’s IAB-DU with the BAP-sublayer routing, header-rewriting and BH RLC CH mapping entries of the migrating IAB-node.

6. The source IAB-donor-CU sends a DL RRC MESSAGE TRANSFER message to the descendant IAB-node’s parent IAB-DU, which includes an RRCReconfiguration message for the descendant IAB-MT. The RRC configuration may include the new TNL addresses received in step 4.

7. The descendant IAB-node’s parent IAB-DU forwards the received *RRCReconfiguration* message to the descendant IAB-MT.

8. The descendant IAB-MT responds to the migrating IAB-DU with an *RRCReconfigurationComplete* message.

9. The migrating IAB-DU sends an UL RRC MESSAGE TRANSFER message to the source IAB-donor-CU, to convey the received *RRCReconfigurationComplete* message.

10. The F1-C connections and F1-U tunnels are switched to use the descendant IAB-node’s new TNL address(es), if any, as described in Steps 15 and 19 of the inter-CU topology adaptation procedure in section 8.17.3.1.

11. The source IAB-donor-CU sends an IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message to the target IAB-donor-CU, to modify the context of the descendant IAB-node’s offloaded traffic. The message may include the DL TNL address information received in step 10 that is necessary for the target IAB-donor-CU to configure or modify DL mappings on the target IAB-donor-DU.

12. The target IAB-donor-CU responds with an IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE message to the source IAB-donor-CU.

13. The steps above may be repeated, if needed, for the source IAB-donor-CU to request addition, modification or release of the offloaded traffic pertaining to the descendant IAB-node. The target IAB-donor-CU can fully or partially reject addition or modification requests by the source IAB-donor-CU.

The target IAB-donor-CU may trigger the modification of the L2 transport of the offloaded traffic in the target IAB-donor-CU’s IAB topology. The target IAB-donor-CU may further provide updated TNL address information for the descendant IAB-node to the source IAB-donor-CU.

The full or partial release (e.g. for revoking) of traffic offload pertaining to the descendant IAB-nodes and their served UEs follows the same procedure as defined for the partial migration in clause 8.17.3.1.

8.17.4 IAB Inter-CU Backhaul RLF recovery for single connected IAB-node

The inter-CU backhaul RLF recovery procedure for IAB-nodes in SA mode enables recovery of an IAB-node to another parent node underneath a different IAB-donor-CU, when the IAB-MT of the IAB-node detects backhaul RLF.

Figure 8.17.4-1 shows an example of the backhaul RLF recovery procedure for an IAB-node in SA mode. In this example, the IAB-node changes from its initial parent node to a new parent node, where the new parent node is served by a different IAB-donor-CU than that serving its initial parent node. In this procedure, the recovering IAB-node becomes a boundary node since the IAB-DU retains F1AP with the initial IAB-donor-CU while its IAB-MT obtains RRC connectivity with the new IAB-donor-CU.

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**Figure 8.17.4-1: IAB inter-CU backhaul RLF recovery procedure for an IAB-node in SA mode**

1. The IAB-MT of the IAB-node detects backhaul RLF.

2. The IAB-MT attempts RLF recovery by performing Random Access towards a new parent IAB-DU.

3. The IAB-MT undergoing RLF recovery sends an *RRCReestablishmentRequest* message to the new parent IAB-DU.

4. The new parent IAB-DU sends an INITIAL UL RRC MESSAGE to the new IAB-donor-CU, to convey the received *RRCReestablishmentRequest* message.

5. The new IAB-donor-CU retrieves the UE Context for the IAB-MT undergoing recovery, through the XnAP Retrieve UE Context procedure. The initial IAB-donor-CU may include the TNL address information of the IAB-node undergoing recovery in the RRC container of the RETRIEVE UE CONTEXT RESPONSE message.

6. The new IAB-donor-CU sends a DL RRC MESSAGE TRANSFER message to the new parent IAB-DU, to convey the generated *RRCReestablishment* message.

7. The new parent IAB-DU sends an *RRCReestablishment* message to the IAB-MT undergoing recovery.

8. The IAB-MT undergoing recovery sends an *RRCReestablishmentComplete* message to the new parent IAB-DU.

9. The new parent IAB-DU sends an UL RRC MESSAGE TRANSFER message to the new IAB-donor-CU, to convey the received *RRCReestablishmentComplete* message.

10. The new IAB-donor-CU triggers the UE Context Setup procedure toward the new parent IAB-DU, to create the UE context for the IAB-MT undergoing recovery and to set up one or more bearers. These bearers can be used by the IAB-MT undergoing recovery for its own signalling, and, optionally, data traffic.

11. The new IAB-donor-CU triggers the path switch procedure for the IAB-MT undergoing recovery, if needed.

12. The new IAB-donor-CU sends UE CONTEXT RELEASE message to the initial IAB-donor-CU.

NOTE: The XnAP UE IDs of the recovery IAB-MT are retained at initial IAB-donor-CU and new IAB-donor-CU as long as the recovery path is used for transport of traffic between the IAB-node undergoing recovery and the initial IAB-donor-CU.

13. The initial IAB-donor-CU may release the BH RLC channels and BAP-sublayer routing entries on the initial path between the initial parent IAB-node and the initial IAB-donor-DU.

14. The new IAB-donor-CU sends a DL RRC MESSAGE TRANSFERmessage to the new parent IAB-DU, which includes an *RRCReconfiguration* message for the IAB-MT undergoing recovery. The RRC configuration may include new TNL addresses anchored at the new IAB-donor-DU, a new BAP address, default BH RLC channel configuration, and a default UL BAP routing ID pertaining to the new path.

15. The new parent IAB-DU forwards the received *RRCReconfiguration* message to the IAB-MT undergoing recovery.

16. The IAB-MT undergoing recovery responds to the new parent IAB-DU with an *RRCReconfigurationComplete* message.

17. The new parent IAB-DU sends an UL RRC MESSAGE TRANSFER message to the new IAB-donor-CU, to convey the received *RRCReconfigurationComplete* message.

18. The remaining part of the procedure follows the steps 14-20 of the inter-CU topology adaptation procedure defined in clause 8.17.3.1.

Traffic offload for descendant nodes follows the same procedure as that of clause 8.17.3.2.

The new IAB-donor-CU may request the modification of the L2 transport of the offloaded traffic in the new IAB-donor-CU’s IAB topology. The new IAB-donor-CU may further reconfigure the TNL addresses of the boundary IAB-node via RRC.

The traffic offload due to inter-CU RLF recovery procedure for the recovering IAB-node and its descendant IAB-nodes can be fully revoked. In this case, the recovering IAB-MT is handed over in reverse direction, i.e., from the new IAB-donor-CU to the initial IAB-donor-CU, and the traffic of the its co-located IAB-DU and the descendant IAB-DUs is routed again along the initial path used prior to BH RLF recovery.

The new IAB-donor-CU can initiate the full revoking of traffic offload by executing the XnAP Handover Preparation procedure for the recovering IAB-MT towards the former initial IAB-donor-CU.

The initial IAB-donor-CU can initiate the full revoking of traffic offload in the same manner as described in section 8.17.3.1.

The initial IAB-donor-CU may request full or partial release of the offloaded traffic from the new IAB-donor-CU via the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message.

-------------------------------------------End of Change ---------------------------------------------------