3GPP TSG-RAN WG2 #103-bis R2-181xxxx

Chengdu, China, 8th - 12th October 2018

Agenda Item: x.x.x

Source: Ericsson (Rapporteur)

Title: TP for IAB bearer mapping, QoS and fairness assurance

Document for: Discussion, Decision

# Introduction

In RAN2 #103, we discussed on how to capture the IAB bearer mapping, QoS and fairness assurance aspects in the TR, but it was not possible to agree during the meeting time. To this effect, a short email discussion has been proposed.

From both the online offline discussion, the following main comments were captured, with the rapporteur’s response in italics

* Proposal to add another option that shows non QoS mapping (Nokia):
	+ *The TR is supposed to capture the aggregated mapping in a generic way so that it is not fixed to QoS class based mapping. Thus, proposed not to go that way.*
* Renaming of *“aggregated mapping” to “many to one” mapping* (Samsung):
	+ *TP to be changed to reflect that.*
* Removal of “hop count” in the many to one mapping description (Samsung):
	+ *The hop count is just an example parameter that can be used in addition to QoS profiles to perform many-to-one mapping. As such, proposed to keep it, but make it clear that it is just an example, rather than an agreed parameter.*
* Clarify what is meant by “shared by multiple IAB nodes” (Samsung):
	+ *OK*
* Why is IAB node ID needed? (LG/ZTE):
	+ *The adaptation layer needs some identities to determine where to forward the incoming packet to the right path (incoming packets can be destined to the IAB node, to a UE that is directly under the IAB node, or to be forwarded further to another IAB node). The UE ID, the DRB ID, and the IAB node ID are some of the identities that can be used (depending on architecture options).*

In addition to the above, there were several editorial and general comments, which are copied directly from the chairman notes:

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* Huawei think we can remove RB multiplexing and think Bearer mapping should be changed to Bearer mapping to BH RLC channel, in the table “none” should be changed into something more descriptive.
* Huawei suggest to remove last paragraph in the text above the table.
* Samsung thinks that we should be careful about information, whether it is examples or decided IEs etc.
* Nokia think that FFSes should either be resolved in WI phase or closed in the SI.
* Nokia think we should mention that all packets on a BH RLC channel gets the same QoS treatment.
* Address all the comments above

Since there were several comments regarding the table and since many of the rows were either redundant as noted (e.g. “RB multiplexing”, “Required mapping information”, “QoS guarantee”) or creating confusion (e.g. “In band identification”), it is proposed to remove the summary table.

The TP has been updated to reflect the above comments and is available in section 2.

# Text Proposal to TR 38.874

------------------------------------------Change 1-------------------------------------------

8.2.4 Scheduler and QoS impacts

8.2.4.1 Bearer mapping

An IAB node needs to multiplex the UE DRBs to the BH RLC-Channel. The following two options can be considered on bearer mapping in IAB node.



**Figure 8.2.4.1-1 example of one-to-one mapping between UE DRB and BH RLC-Channel**

**Option 1. One-to-one mapping**

In this option, each UE DRB is mapped onto a separate BH RLC-Channel. Further, the each BH RLC-Channel is mapped onto a separate BH RLC-Channel on the next hop. The number of established BH RLC-Channels is equal to the number of established UE DRBs.

Since the IAB node just relays a data block between UE DRBs and BH RLC-Channels, there is no need to multiplex UE DRBs, and no need to identify the data block.



**Figure 8.2.4.1-2 example of many-to-one mapping between UE DRB and BH RLC-Channel**

**Option 2. Many-to-one mapping**

For the many-to-one mapping, the IAB node establishes BH RLC-Channels based on specific parameters such as bearer QoS profile. Other information such as hop-count could also be considered. The mapping is dependent on network implementation/configuration and the exact information needed to be specified for the aggregation is FFS. The IAB node can multiplex DRBs or QoS flows based on the parameters used for many-to-one mapping (i.e. QoS profile and other parameters, if any) into a single BH RLC-Channel even in case they belong to different UEs. Further, the each BH RLC-channel may be mapped onto the different BH RLC-Channels on the next hop.

Since the BH RLC-Channel is multiplexing data from/to multiple bearers, UEs or IAB nodes, each data block transmitted in the BH RLC-Channel needs to contain an identifier of the UE, IAB node and/or DRB it belongs to. Which identifiers are needed and which of these identifier(s) is/are needed at the adaptation layer header depends on the architecture/protocol option, and the details are FFS.

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------------------------------------------Change 2-------------------------------------------

8.2.4.2 Enforcement of Fairness Schemes

An IAB network should attempt to schedule the wireless resources to meet each UE bearer’s requirement regardless of the number of hops a given UE is away from the Donor DU.

The scheduler on the wireless backhaul link can distinguish the QoS profiles associated with different RLC channels. It may also apply information regarding the number of hops a packet needs to traverse, in addition to the QoS profile of the bearers, in order to provide hop-agnostic performance.

When one-on-one mapping is used between UE bearer and RLC-channel on the backhaul, the IAB node has explicit information on each UE bearer and can therefore apply appropriate QoS differentiation among QoS profiles, as well as fairness among UE bearers with same QoS profile.

While QoS differentiation is still possible when UE bearers are aggregated to backhaul RLC-channels, enforcement of fairness across UE bearers become less granular.

**Figure 8.2.4.2-1 IAB network with 3 hops and 12 UEs**

Figure 8.2.4.2-1 shows an example scenario of an IAB network with 3 hops and 12 UEs attached. The UEs are assumed to have one bearer each with same QoS profile (e.g. default bearer). The UE-bearers are assumed to share the same RLC channel on BH links. Consequently, each backhaul link carries different number of UE-bearers (Table 8.2.4-y).

Below are the two options for applying fairness schemes across backhaul and access links (other options are not precluded):

* Option 1: The DU scheduler obtains information about the number of UE bearers carried on each backhaul link. This enables the scheduler to apply fairness schemes. For this, the scheduler has to be updated whenever the number of UE bearers change on one of its backhaul RLC-channels. Alternatively, the scheduler derives the number of UE bearers carried on the backhaul RLC-channel from packet inspection.
* Option 2: The DU scheduler obtains information about the number of descendant IAB-nodes supported by each backhaul link. This allows enforcing fairness schemes as long as the total traffic is balanced across IAB-nodes.

------------------------------------------Change 3-------------------------------------------

9.5 Satisfying the QoS requirements

IAB mode of operation may impose additional requirements on the RAN design, in order for the RAN to support the QoS profiles imposed by the Core network. These additional requirements may be due to e.g. the latency associated with multiple hops, congestion and failure of wireless backhaul links. However, in both IAB and non-IAB mode of operation, RAN may not always be able to meet the QoS profiles requested by the core network. To handle this scenario, the TS 23.502 [3] in Section 4.3.2. defines an N2 procedure which allows the RAN to reject the QoS profiles requested by the core network, in case the RAN cannot meet these QoS profiles. This N2 procedure is applicable to both IAB and non-IAB mode of operation.

With regards to the aforementioned N2 procedure, after receiving a flow QoS request from the core network, the IAB-donor CU may inform, via F1-AP, the corresponding access-IAB-node-DU and some or all intermediate IAB-node DUs about this flow and its QoS requirement. The inquired DUs shall accept/reject the request. In order to guarantee latency bounds, the CU should include in the QoS request to the DUs some assistance information including at least e.g. some hop-count-related information pertaining to the route to the access-IAB-node-DU. Further details of this information to be provided are FFS.

Since the IAB-specific constraints on QoS depend on the particular IAB architecture option, the study will capture the tradeoff among the various IAB architecture options with respect to their impact on QoS.

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