TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3)
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Title: **Model of RLC**

Document for: Decision

Model of RLC

1 Introduction

The purpose of this document is to clarify some items that were unclear in the old RLC model 3GPP TSG RAN WG2, Tdoc RAN WG2 /99, “Description of the RLC protocol”, v 0.0.1.. A new more distinct model of the RLC sublayer is proposed. The proposed model is very similar to the model in 3GPP TSG RAN WG2, Tdoc RAN WG2 /99, “Description of the RLC protocol”, v 0.0.1.. The main differences are:

1. **One RLC entity for each mode.** The reason for this change is that we do not see the need for multiplexing on RLC level, since this would only be needed in the control plane. The radio access bearers in the user plane will use either unacknowledged mode or acknowledged mode.
2. **The possibility to send higher layer information during set up of acknowledged mode has been removed.** It has been removed since we do not see the need of explicit RLC signalling for establishment of acknowledged mode for the moment.

2 Model of RLC

Figure 1 gives an overview model of the RLC layer. The figure illustrates the different RLC peer entities. There is one transmitting and one receiving entity for the transparent mode service and the unacknowledged mode service and one combined transmitting and receiving entity for the acknowledged mode service. The dashed lines between the AM-Entities illustrate the possibility to send the RLC control data (e.g. resynchronisation PDUs and acknowledgements) and data PDUs on separate logical channels. More detailed descriptions of the different entities are given in subsections Transparent mode entities, Unacknowledged mode entities and Acknowledged mode entity.

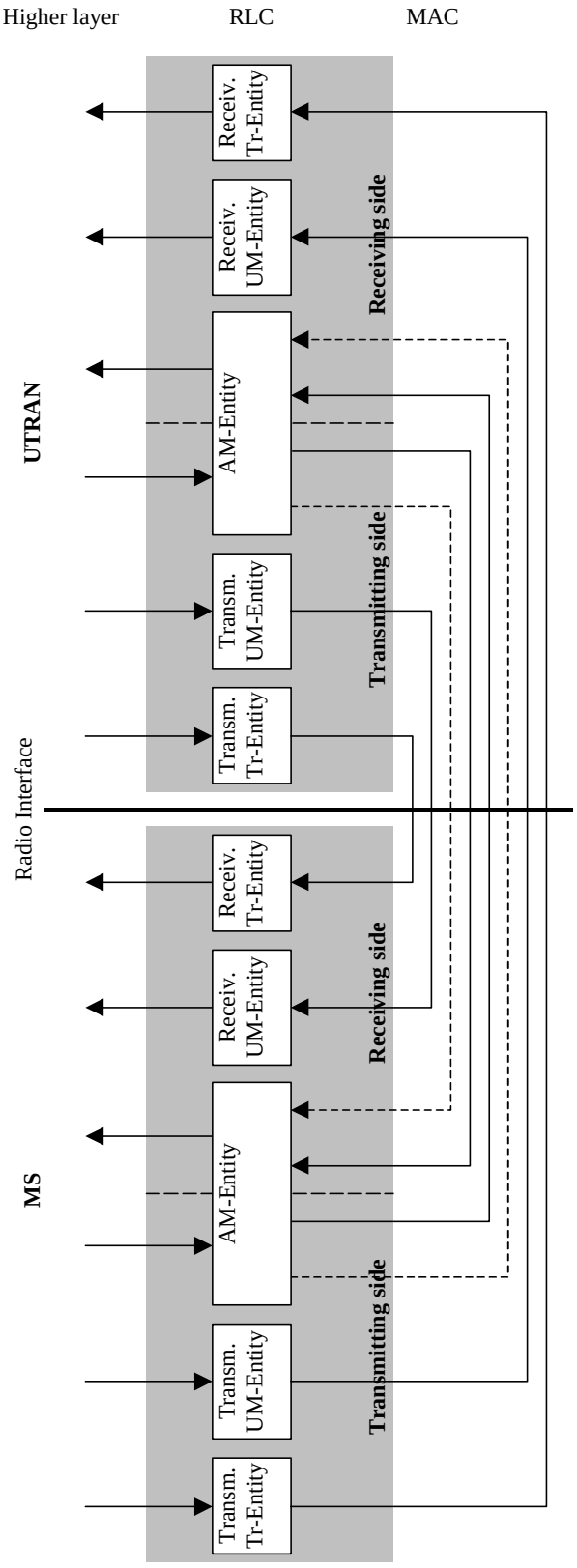

Figure 1. Overview model of RLC.

2.1 Transparent mode entities

Figure 2 below shows the model of two transparent mode peer entities.

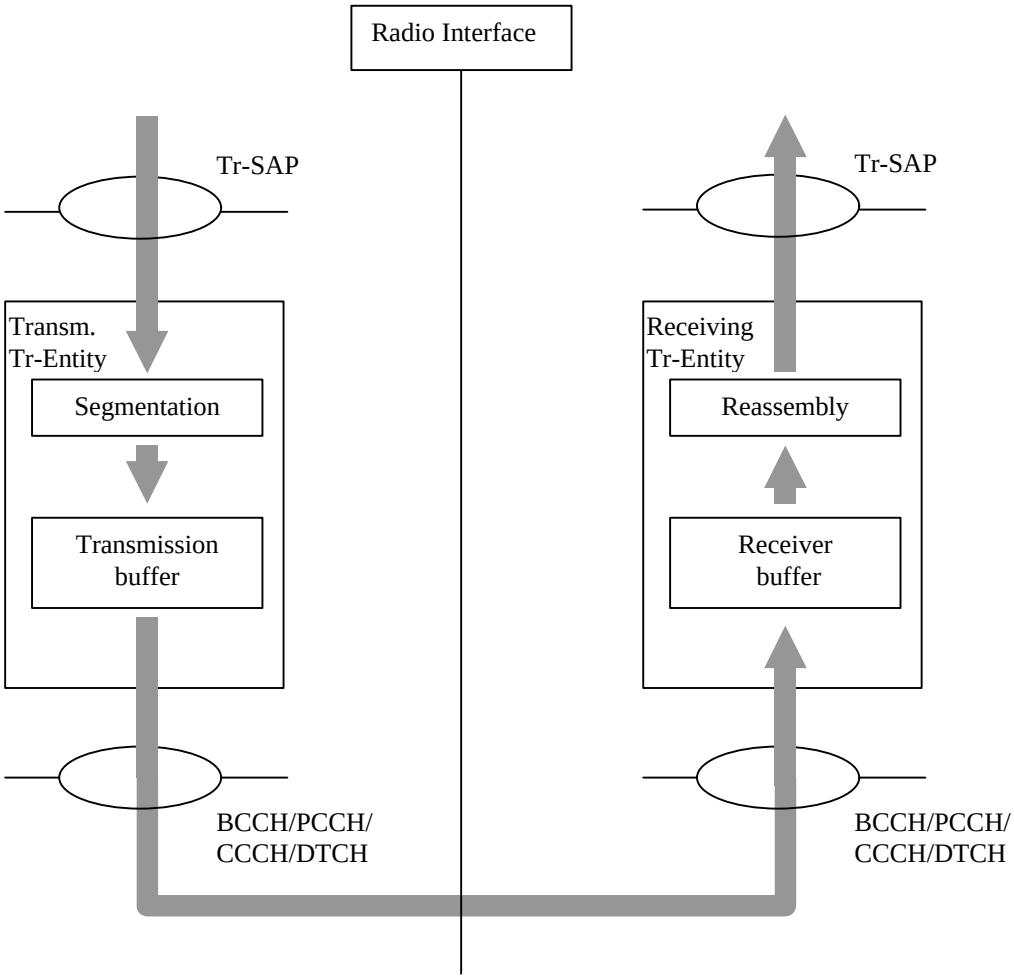

Figure 2. Model of two transparent mode peer entities.

The transmitting Tr-entity receives SDUs from the higher layers through the Tr-SAP. RLC might segment the SDUs into appropriate RLC PDUs without adding any overhead. How to perform the segmentation is decided upon when the service is established. RLC delivers the RLC PDUs to MAC through either a BCCH, PCCH or a DTCH. The delivery of RLC PDUs to MAC through CCCH is FFS. Which type of logical channel depends on if the higher layer is located in the control plane (BCCH, PCCH, CCCH) or user plane (DTCH).

The Tr-entity receives PDUs through from one of the logical channels from the MAC sublayer. RLC reassembles (if segmentation has been performed) the PDUs into RLC SDUs. How to perform the reassembling is decided upon when the service is established. RLC delivers the RLC SDUs to the higher layer through the Tr-SAP.

2.2 Unacknowledged mode entities

Figure 3 below shows the model of two unacknowledged mode peer entities.

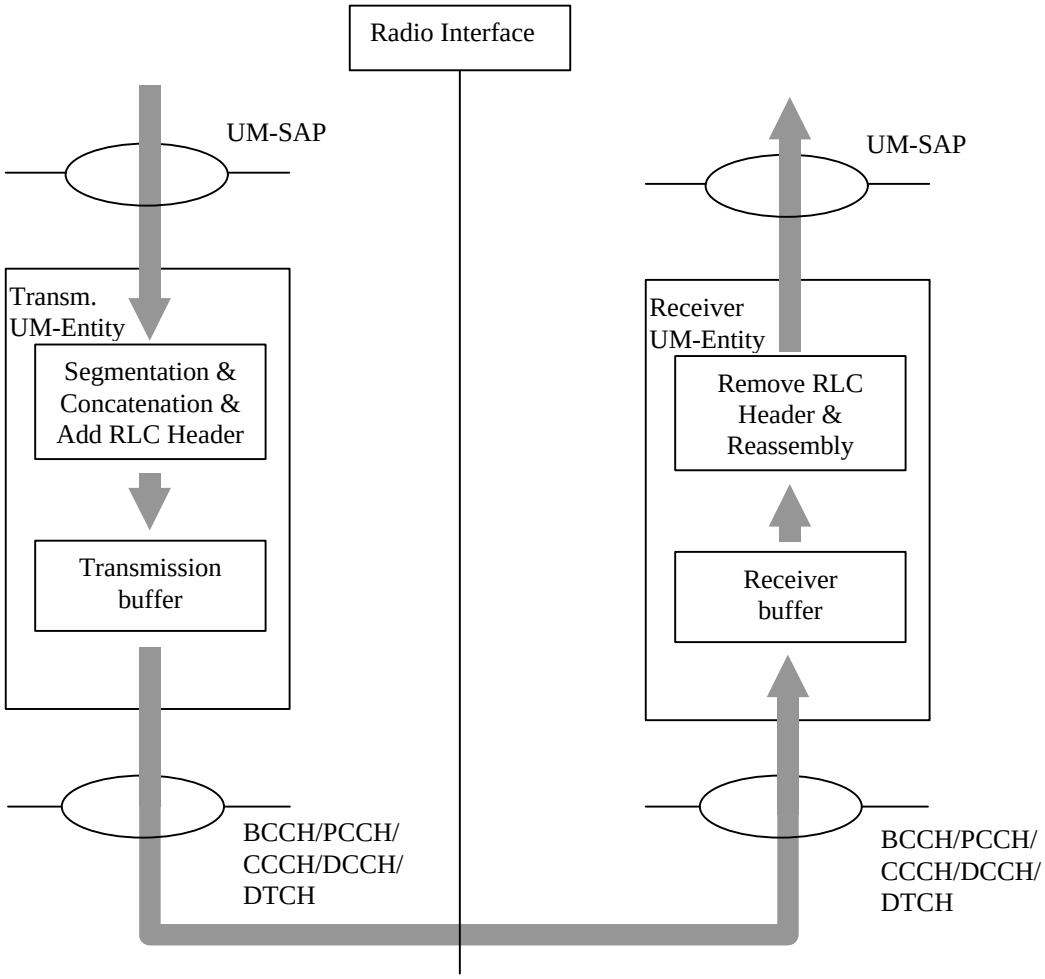

Figure 3. Model of two unacknowledged mode peer entities.

The transmitting UM-entity receives SDUs from the higher layers. If the SDU is very large it is segmented into RLC PDUs of appropriate size. The SDU might also be concatenated with other SDUs. RLC adds a header and the PDU is placed in the transmission buffer. RLC delivers the RLC PDUs to MAC through either a DCCH or a DTCH. Which type of logical channel depends on if the higher layer is located in the control plane (BCCH, PCCH, CCCH, DCCH) or user plane (DTCH).

The receiving UM-entity receives PDUs through one of the logical channels from the MAC sublayer. RLC removes header from the PDUs and reassembles the PDUs (if segmentation has been performed) into RLC SDUs. After that the SDUs are delivered to the higher layer.

2.3 Acknowledged mode entity

Figure 4 below shows the model of an acknowledged mode entity.

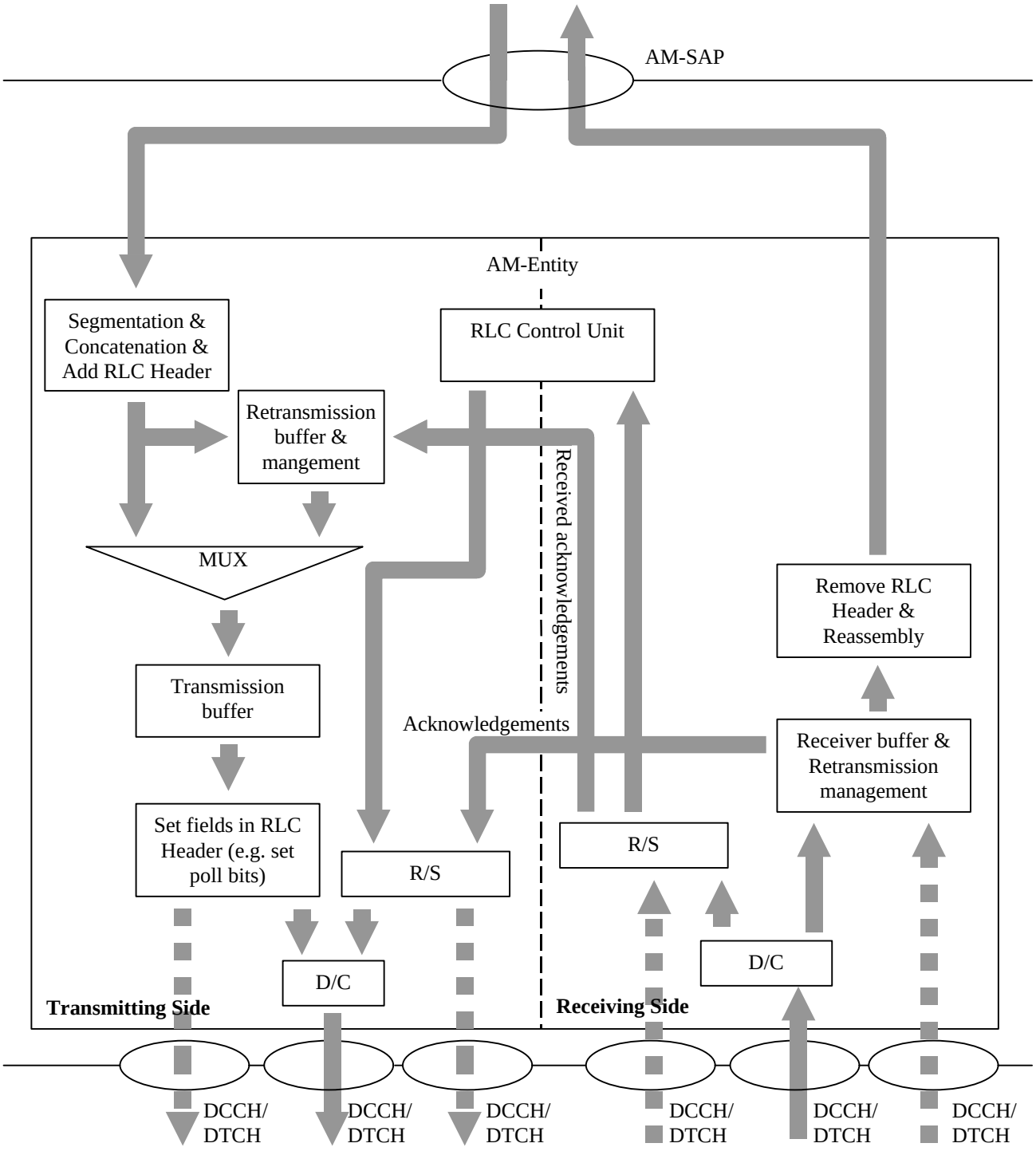

Figure 4. Model of a acknowledged mode entity.

The transmitting side of the AM-entity receives SDUs from the higher layers through the AM-SAP. The SDUs are segmented and/or concatenated to PDUs of fixed length. The length of the PDUs is decided upon when the service is established. After that RLC adds a header and the PDU is placed in the retransmission buffer and the transmission buffer. Before a PDU is delivered to MAC some fields in the header is set, e.g. the poll bit in case of AMD PDU and R/S bit in case of control PDUs, and if AMD PDUs and control PDUs are transmitted on the same logical channel the D/C bit is set. The dashed lines illustrate the case where AMD PDUs and control PDUs are transmitted on separate logical channels.
The retransmission buffer also receives acknowledgements from the receiving side, which are used to indicate retransmissions of PDUs and when to delete a PDU from the retransmission buffer.

The receiving side of the AM-entity receives PDUs through one of the logical channels from the MAC sublayer. The PDUs are placed in the receiver buffer until a complete SDU has been received. The receiver buffer requests retransmissions of PDUs by

sending negative acknowledgements to the peer entity. After that the headers are removed from the PDUs and the PDUs are reassembled into a SDU. Finally the SDU is delivered to the higher layer.
The receiving side also receives acknowledgements from the peer entity. The acknowledgements are passed to the retransmission buffer on the transmitting side.

3 Proposal

It is proposed that the above presented section 2 replaces the current text in section 4.2 “Overview on sublayer architecture” in S2.22 3GPP TSG RAN WG2, Tdoc RAN WG2 /99, “Description of the RLC protocol”, v 0.0.1..

4 References

[1] 3GPP TSG RAN WG2, Tdoc RAN WG2 /99, “Description of the RLC protocol”, v 0.0.1.