

Agenda Item: 10.2.2.2
Source: Ericsson
Title: SRBs needed for direct RRC from SN
Document for: Discussion, Decision

1 Introduction

In RAN2#97, the following agreements were made regarding RRC signalling between the UE and the SN:

Agreements

- 1: For the SN/MN RRC reconfiguration requiring also MN/SN RRC reconfiguration, a MN RRC message is delivered with an embedded SN RRC message.
- 2 **UE can be configured with an SCG SRB to allow SN RRC messages to be sent directly between UE and SN.**
- 3: For SN RRC reconfigurations not requiring any coordination with MN then SN RRC messages can be transported directly to the UE (or eNB implementation can be deliver it embedded within a MN RRC message)
- 4 Measurement reporting for mobility within the SN can be transported in SN RRC messages directly from UE to SN, if SCG SRB is configured. Detail rules for UE to select transmission path for UL message to be defined in WI.
- 5 These agreements do not imply that the UE has to do any reordering of RRC messages.

In this paper, we will discuss which of the different SRBs (SRB0, SRB1, SRB1bis and SRB2) that are currently defined in LTE specifications are required for the communication needs of this agreed upon direct RRC connection between the UE and SN. In this contribution the focus is on LTE-NR tight interworking scenarios where LTE is the MN and NR is the SN.

2 Discussion

Since LTE-release 8, three SRBs (SRB0, SRB1 and SRB2) have been available for the transport of RRC and NAS messages between the UE and eNB. A new SRB, known as SRB1bis, was introduced in rel-13 for supporting DoNAS (Data Over NAS) in NB-IoT [1].

SRB0 is for RRC messages using the CCCH logical channel, and it is used for handling RRC connection setup, RRC connection resume and RRC connection re-establishment. In LTE-NR tight interworking, if the UE experiences RLF on the SCG, the same mechanism as in LTE DC can be employed where an *SCGFailureInformation* message is transmitted to the MN and the MN can decide to release or/and change the SN based on that. Thus, RRC connection re-establishment is not needed on the SCG. Also, when it comes to SN addition/change procedures, there is no need for “RRC connection setup request” or “RRC connection setup” message exchanges, as that is handled with the MN as a proxy (random access

procedures may be required for synchronization/timing advance alignment, but they are handled at MAC level). As such, SRB0 is not needed for direct RRC messaging between UE and SN.

Observation 1 SRB0 is not needed for the direct RRC message transport between the UE and SN.

Once the UE is connected to the eNB (i.e. RRC connection setup or RRC connection reestablishment succeed), SRB1 is used for handling RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the establishment of SRB2, all using DCCH logical channel. One of the main reasons behind the agreements in RAN2#97 for enabling direct RRC message transfer between the UE and SN is that there may be SCG reconfiguration scenarios where SN can configure the UE directly without the need for coordination with the MN. This is for cases such as intra-SN mobility, measurement configurations/reporting related to the intra-SN cells, etc. Thus, it is very clear that SRB1 is needed for transporting such messages between the UE and SN. Please refer to [2], where we discuss in detail the RRC messaging/functionalities that can be realized via the direct SRB.

Observation 2 SRB1 is needed for the direct handling of RRC messages between the UE and SN.

SRB2 is for RRC messages which include logged measurement information as well as for NAS messages, all using DCCH logical channel. SRB2 has a lower priority than SRB1, because logged measurement information and NAS messages can be lengthy and could cause the blocking of more urgent and smaller SRB1 messages. SRB2 is always configured by E-UTRAN after security activation. Since the S1-MME termination will still be via the MN for the case of LTE-NR interworking where LTE is the master, all NAS messaging end up arriving at the MN and thus SRB2 from the MN is the right transport for such messages. In case the NAS messages or the logged measurements to be sent via MCG SRB2 are very big, split MCG SRB can be used (which was also agreed in RAN2#97) and some part of the data can be sent over the faster secondary (NR) link.

Observation 3 SRB2 is not needed for the direct RRC message transport between the UE and SN.

For NB-IoT, SRB1bis was introduced for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the activation of security, all using DCCH logical channel. We can assume that the extremely low cost/complexity NB-IoT devices will not support LTE DC, let alone LTE-NR tight interworking.

Observation 4 SRB1bis is not needed for the direct RRC message transport between the UE and SN.

Figure 1 illustrates the SRB structure for LTE-NR interworking based on the above observations, where there is only one SRB terminating at the SN. Also note that SRB1 and SRB2 between the MN and UE could be optionally split for the sake of faster transmission or increased reliability (i.e. duplication).

Based on the observations above, we propose:

Proposal 1 For LTE-NR tight interworking where LTE is the MN and where direct RRC messaging between the UE and the SN is configured, only one SRB is required on the SN side.

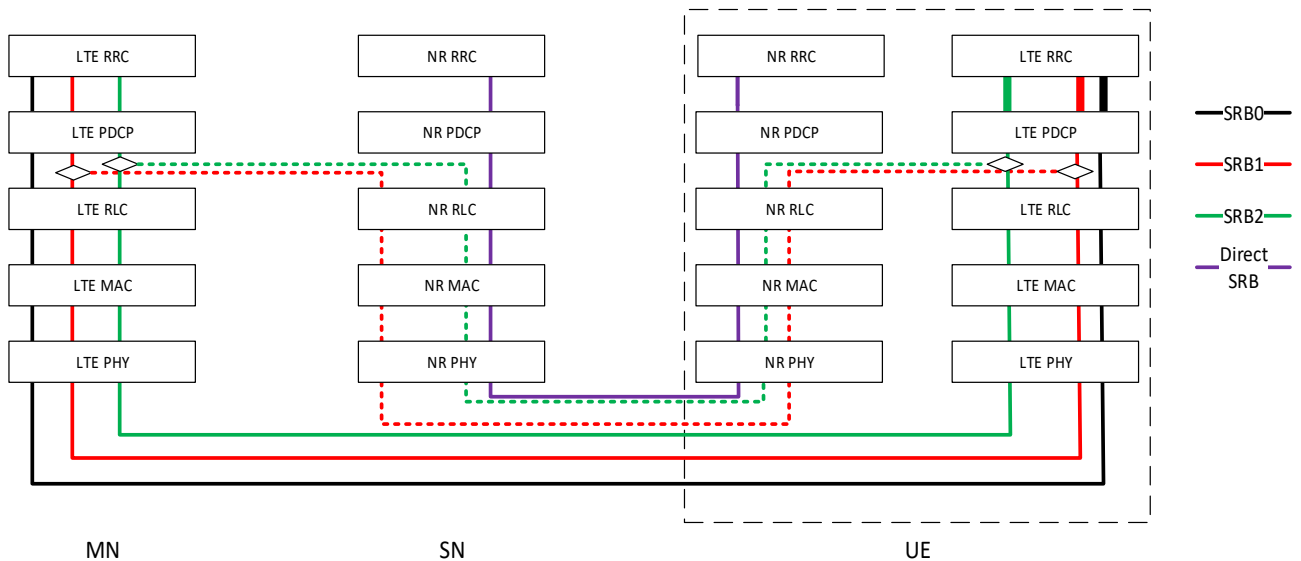


Figure 1: SRBs for LTE-NR tight interworking

3 Conclusion

In RAN2#97, it was agreed to support direct RRC message transfer between the UE and the SN. The needed SRBs for transporting such messages were discussed and it was observed that:

- Observation 1** SRB0 is not needed for the direct RRC message transport between the UE and SN.
- Observation 2** SRB1 is needed for the direct handling of RRC messages between the UE and SN.
- Observation 3** SRB2 is not needed for the direct RRC message transport between the UE and SN.
- Observation 4** SRB1bis is not needed for the direct RRC message transport between the UE and SN.

Based on the observations above, we propose:

- Proposal 1** For LTE-NR tight interworking where LTE is the MN and where direct RRC messaging between the UE and the SN is configured, only one SRB is required on the SN side.

4 References

- [1] 3GPP TS 36.331, "RRC Protocol Specification"
- [2] R2-1702705, "SCG SRB configuration and use in LTE-NR interworking", RAN2 #97bis, Ericsson