TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3)   ***TSGR2#2(99)113***
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Title: Procedures to release a dedicated physical channel

Document for: Decision

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1. Introduction

The current version of S2.03 /1/ includes two procedures where a dedicated physical channel is released during the procedure. This can happen either through release of the RRC Connection when a dedicated physical channel exists or as a release during experienced period of no activity in a packet connection.

To prevent problems with closed-loop power control the UE always has to be the first to release a dedicated channel. The present procedures rely on MPH_out_of_sync indication from NW L1 to indicate that the UE has indeed executed the release. The question on time vs. reliability of out-of-sync detection has been liaisoned to L1, but no detailed answer is available at the time of this writing.

2. Proposal

This contribution incorporates the following principles:

- The COMPLETE-messages from UE to NW shall be used as the primary way to detect the release of a dedicated channel. To prevent any synchronization problems, these messages are transmitted in unacknowledged-mode so that upon successful reception the NW can assume that the channel has been released.
- In the case of RRC Connection Release the Quick Repeat function (currently included as FFS in the RLC functions of S2.01 /2/) can be applied to improve the reliability of the COMPLETE-message. This repetition is accomplished by RRC on L3.
- To properly optimise the use of radio resources, the COMPLETE-message should be transmitted on the dedicated channel before it is released. The subsequent local release primitives in the UE have no error situations that would require reporting to the network.
- If a COMPLETE-message is lost, the out-of-sync indication will tell that the channel has been released.
- The absence of both a COMPLETE-message and the out-of-sync indication is an error situation left FFS at this moment. A likely solution is to re-initiate the procedure.

3. Changes to S2.03

The following sections show in the form of both figures and text the changes needed in /1/ to incorporate the principles outlined in the proposal.

3.1 RRC Connection Release from Dedicated Physical Channel

The RRC layer entity in the network issues an RRC CONNECTION RELEASE message using acknowledged mode on the DCCH. Upon reception of this message the UE-RRC sends an RRC Signalling Connection Release Indication primitive to NAS.

The UE replies with an RRC CONNECTION RELEASE COMPLETE message, which is sent in unacknowledged-mode on the dedicated channel. To improve the reliability of the message, quick repeat on RRC-level can be used. The UE will then proceed to release RLC(s), MAC and the radio link(s) after which and requests the release of the radio link(s), MAC and RLC(s). After that the UE RRC enters Idle Mode.

The primary method to detect the release of the signalling link in the NW is the RRC CONNECTION RELEASE COMPLETE-message from the UE. Should the message be lost despite the use of quick repeat, tThe release of the signalling link is detected in the UTRAN by the out-of-sync primitive from either Node-B L1 or RNC-L1 (FFS) to RNC RRC. After receiving this primitive, the RNC-RRC layer releases L2 and L1 resources on the network side and enters the idle mode.
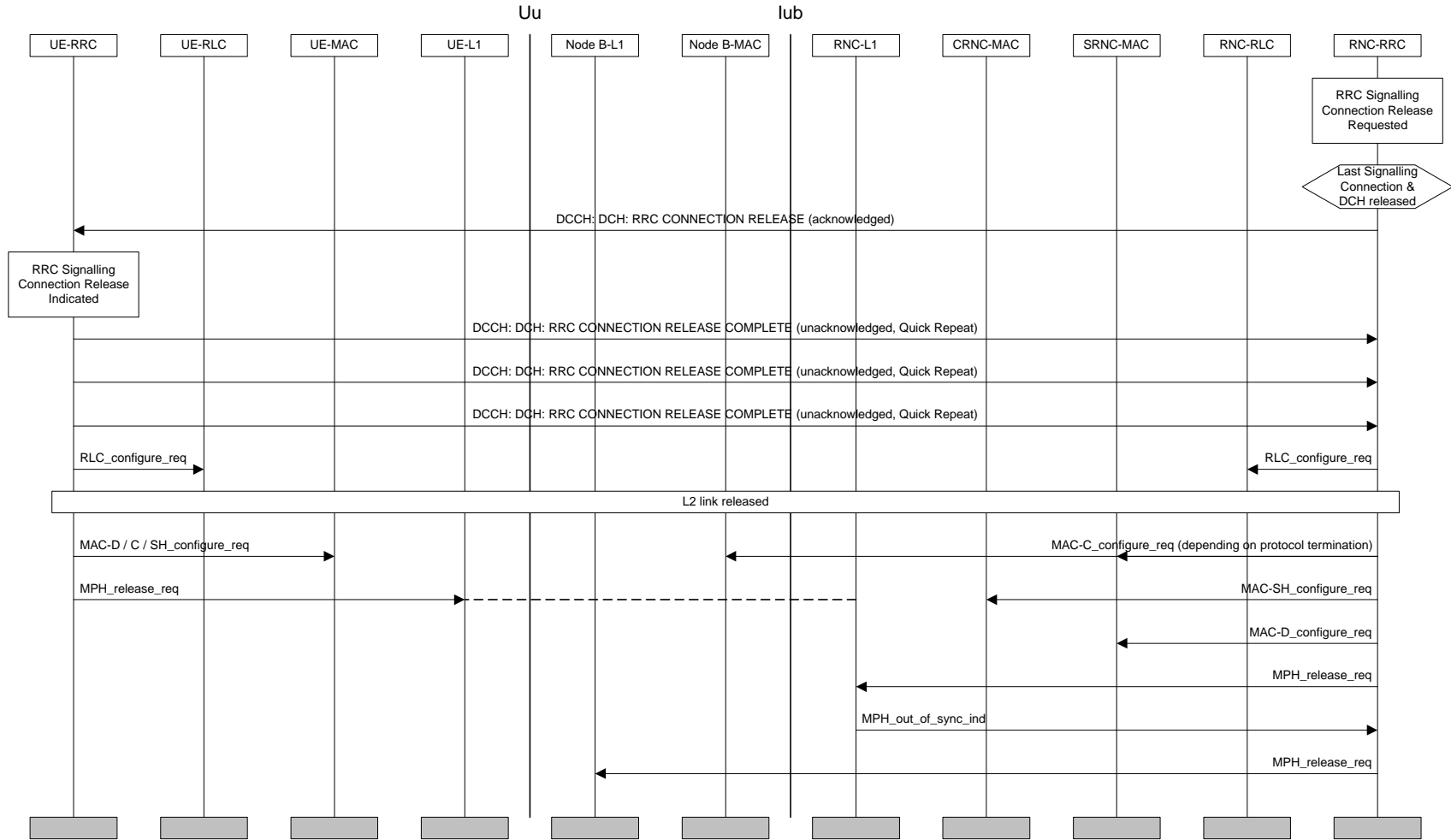
Figure 1: RRC Connection release from a dedicated channel

3.2 UE-Terminated DCH Release

Figure 2 illustrates an example of a procedure for a switch from dedicated (DCH) to common (RACH/FACH) channels. All DCHs used by a UE are released and all dedicated logical channels are transferred to RACH/FACH instead. Triggering of this procedure could for example be an inactivity timer.

A switch from DCH to common channels is decided and a PHYSICAL CHANNEL RECONFIGURE message is sent (acknowledged or unacknowledged data transfer is a network option) from the RRC layer in the network to the UE. This message is sent on DCCH mapped on DCH. *[Note1: This message does not include new transport formats. If a change of these is required due to the change of transport channel, this is done with the separate procedure Transport Channel Reconfiguration. This procedure only handles the change of transport channel.]*

[Note2: If the loss of L1 sync is used to detect in the NW that the UE has released the DCH:s, as is one possibility in the figure, then there may be a need to configure the Node B L1 to a short timeout for detecting loss of sync. This is presented by the MPH_out_of_sync_configure primitives in the figure. The L23 group is seeking guidance from the L1 group relating to the time required for reliable out-of-sync detection.]

After reception of the PHYSICAL CHANNEL RECONFIGURE the PHYSICAL CHANNEL RECONFIGURE COMPLETE message to the NW is sent on the existing DCH prior to release in unacknowledged mode. UE reconfigures L2~~1~~ and L1~~2~~ to release old DCH resources. The PHYSICAL CHANNEL RECONFIGURE COMPLETE ~~(need FFS)~~ message to the network ~~is here sent on DCCH mapped on RACH (message acknowledgement on FACH). This message~~ triggers a normal release of L2~~1~~ and L1~~2~~ resources in the network associated with the dedicated channel. If the L3 COMPLETE message is lost~~doesn't exist~~, the MPH_out_of_sync_ind from the physical layer is~~must be~~ applied.

[Note2~~3~~: In this procedure no quick repeat is currently thought to be necessary for the PHYSICAL CHANNEL RECONFIGURE COMPLETE message.~~When a Switch to RACH/FACH is done it is important to free the old code as fast as possible so that it can be reused. Therefore instead of waiting for the Physical Channel Reconfigure Complete message the network can reconfigure L1 and L2 when the acknowledged data confirmation arrives and the network is sure that the UE has received the Physical Channel Reconfigure message.~~ To be even more certain that the UE has released the old DCH resources the network can wait until after the Out of sync Indication from L1.

~~These steps including a timer starting when the Physical Channel Reconfigure is sent, gives the network four different indications that the released DCH is really released, and that resources can be reused.]~~
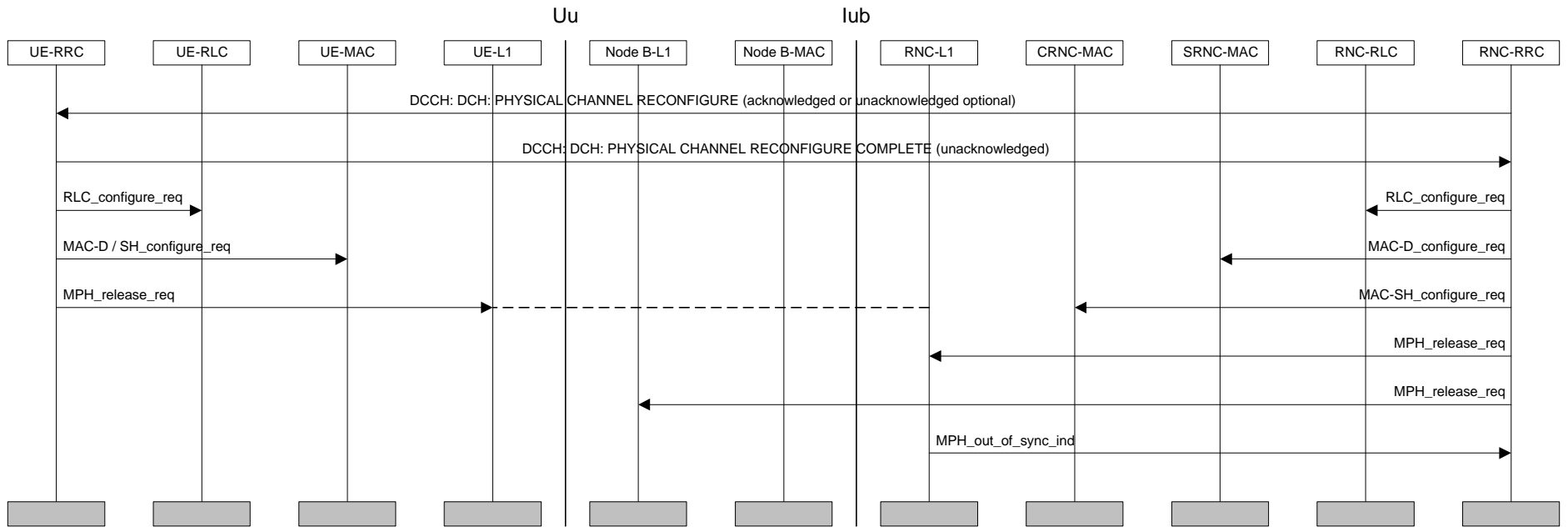
Figure 2: UE-terminated DCH release

4. Conclusion

Change proposals to S2.03 to improve the examples on dedicated physical channel release procedures have been shown for incorporation to S2.03.

5. References

/1/   S2.03, "UE Functions and Interlayer Procedures in Connected Mode", v. 0.0.2, March 1999
/2/   S2.01, "Radio Interface Protocol Architecture", v. 0.1.0, March 1999