TSG-RAN Meeting #6 ***TSGRP#6(99)629***

Nice, France, 13 – 15 December 1999

Title: **Agreed CRs of category "C" (Modification) and "F" (Correction) to TS 25.303**

Source: **TSG-RAN WG2**

Agenda item: **5.2.3**

Doc #	Status-	Spec	CR	Rev	Subject	Cat	Versio	Versio
R2-99j31	agreed	25.303	017	1	Support of shared channels and	C	3.1.0	3.2.0

3GPP TSG-RAN Meeting #6
Nice, France, 13 - 15 December 1999

Document (R2-99j31)
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.303	**CR**	**017r1**	Current Version:	3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑   *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN #6	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG   The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source:	TSG-RAN WG2	**Date:**	29/11/99
Subject:	Support of shared channel operation in TDD and alignment to Mac-c/sh merge		
Work item:			

Category:	F	Correction		**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature	X		Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: Mac-c and Mac-sh are combined into one functional block Mac-c/sh. This supports the definition of the SHCCH. Capacity requests for shared channels can be sent via USCH or RACH, and capacity allocations can be sent via DSCH or FACH.

Clauses affected: 6.1.1, 6.1.3.1, 6.1.3.2, 6.2.1.1, 6.2.1.2, 6.2.1.3, 6.2.2, 6.2.3, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.4.2, 6.4.8, 6.4.9, 6.4.10

Other specs affected:	Other 3G core specifications	X	→ List of CRs:	25.321CR025, 25.301CR026, 25.301CR027
	Other GSM core specifications		→ List of CRs:	
	MS test specifications		→ List of CRs:	
	BSS test specifications		→ List of CRs:	
	O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

6.1.1 RRC connection establishment

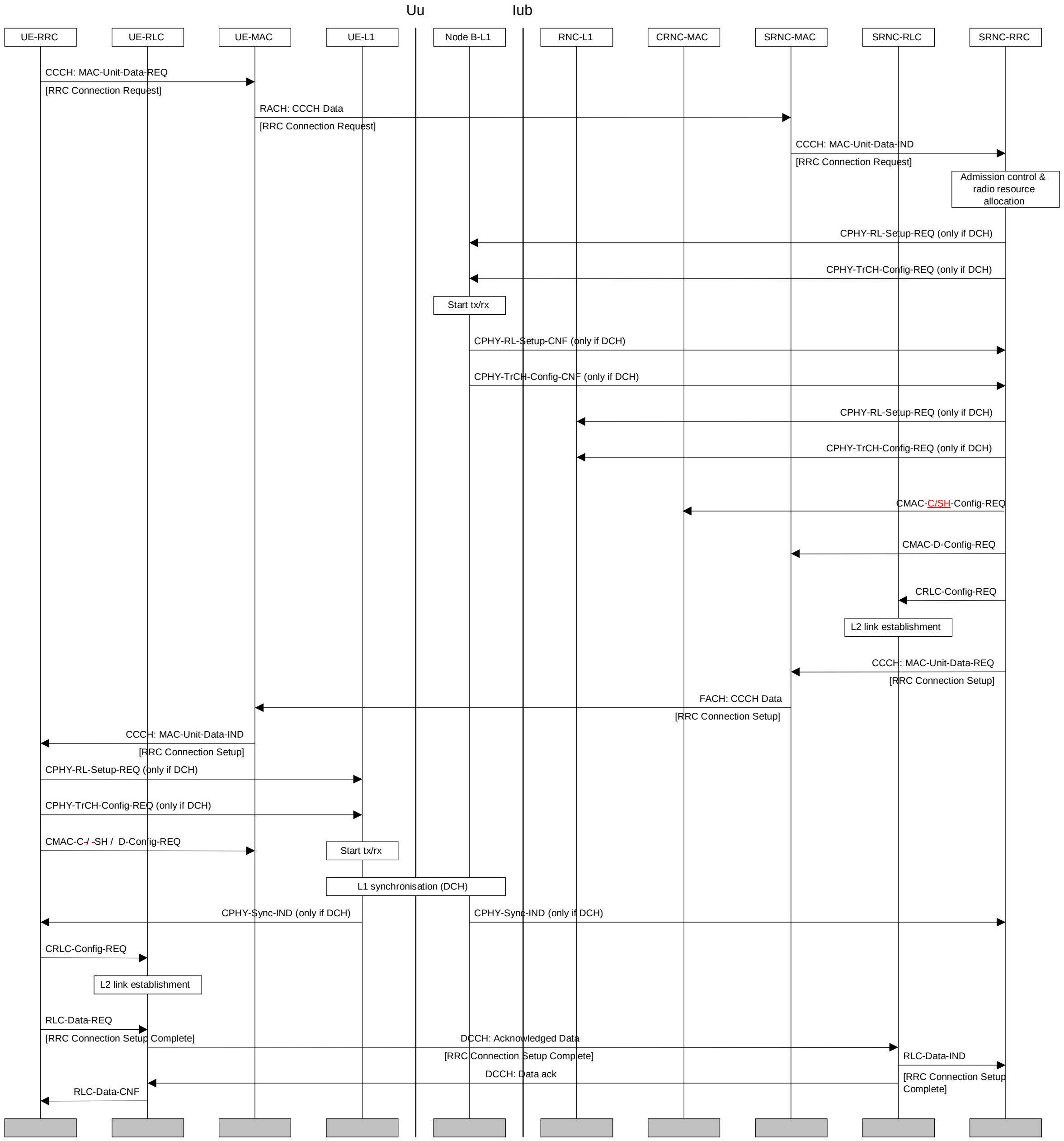
RRC connection establishment (see /5/) is shown in Figure 1 (protocol termination for common channels is shown according to former case A, case C can be found for comparison in Annex A). The RRC layer in the UE leaves the idle mode and initiates an RRC connection establishment by sending an RRC Connection Request message using the MAC SAP for the CCCH logical channel. MAC transmits the L3 message on the RACH transport channel.

[Note: The L23 EG has adopted a working assumption to use an identity from the Non-Access Stratum (such as TMSI+LAI) included in the RRC Connection Request message. A PRACH physical random access channel capable of transmitting 32 kbps is estimated to be suitable for the message, guidance on the preferability of this data rate is sought from the physical layer EG. Other alternatives exist, such as a random number.]

On the network side, upon the reception of RRC Connection Request, the RRC layer performs admission control, assigns an s-RNTI for the RRC connection and selects radio resource parameters (such as transport channel type, transport format sets etc). If a DCH is to be established, CPHY-RL-Setup and CPHY-TrCH-Config request primitives (transmitted as one RADIO LINK SETUP PDU) are sent to all Node B:s which would be involved in the channel establishment. The physical layer operation is started and confirmation primitives are returned from each Node B. RRC configures parameters on layer 2 to establish the DCCH logical channel locally. The selected parameters including the RNTI, are transmitted to the UE in an RRC Connection Setup message using the MAC SAP for the CCCH logical channel.

Upon reception of the RRC Connection Setup message, the RRC layer in the UE configures the L1 and L2 using these parameters to locally establish the DCCH logical channel. In case of DCH, layer 1 indicates to RRC when it has reached synchronisation. The need for the synchronisation indication on the network side is FFS.

The RLC signalling link is locally established on both sides. The establishment can be mapped on either RACH / FACH, RACH+FAUSCH / FACH or DCH by MAC. When the UE has established the RLC signalling link, it transmits an RRC Connection Setup Complete message to the network using acknowledged mode on the DCCH.


Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
CCCH: MAC-Unit-Data-REQ
[RRC Connection Request]
RACH: CCCH Data
[RRC Connection Request]
CCCH: MAC-Unit-Data-IND
[RRC Connection Request]
Admission control & radio resource allocation
CPHY-RL-Setup-REQ (only if DCH)
CPHY-TrCH-Config-REQ (only if DCH)
Start tx/rx
CPHY-RL-Setup-CNF (only if DCH)
CPHY-TrCH-Config-CNF (only if DCH)
CPHY-RL-Setup-REQ (only if DCH)
CPHY-TrCH-Config-REQ (only if DCH)
CMAC-C/SH-Config-REQ
CMAC-D-Config-REQ
CRLC-Config-REQ
L2 link establishment
CCCH: MAC-Unit-Data-REQ
[RRC Connection Setup]
FACH: CCCH Data
[RRC Connection Setup]
CCCH: MAC-Unit-Data-IND
[RRC Connection Setup]
CPHY-RL-Setup-REQ (only if DCH)
CPHY-TrCH-Config-REQ (only if DCH)
CMAC-C-/ -SH / D-Config-REQ
Start tx/rx
L1 synchronisation (DCH)
CPHY-Sync-IND (only if DCH)
CPHY-Sync-IND (only if DCH)
CRLC-Config-REQ
L2 link establishment
RLC-Data-REQ
[RRC Connection Setup Complete]
DCCH: Acknowledged Data
[RRC Connection Setup Complete]
RLC-Data-IND
[RRC Connection Setup Complete]
DCCH: Data ack
RLC-Data-CNF

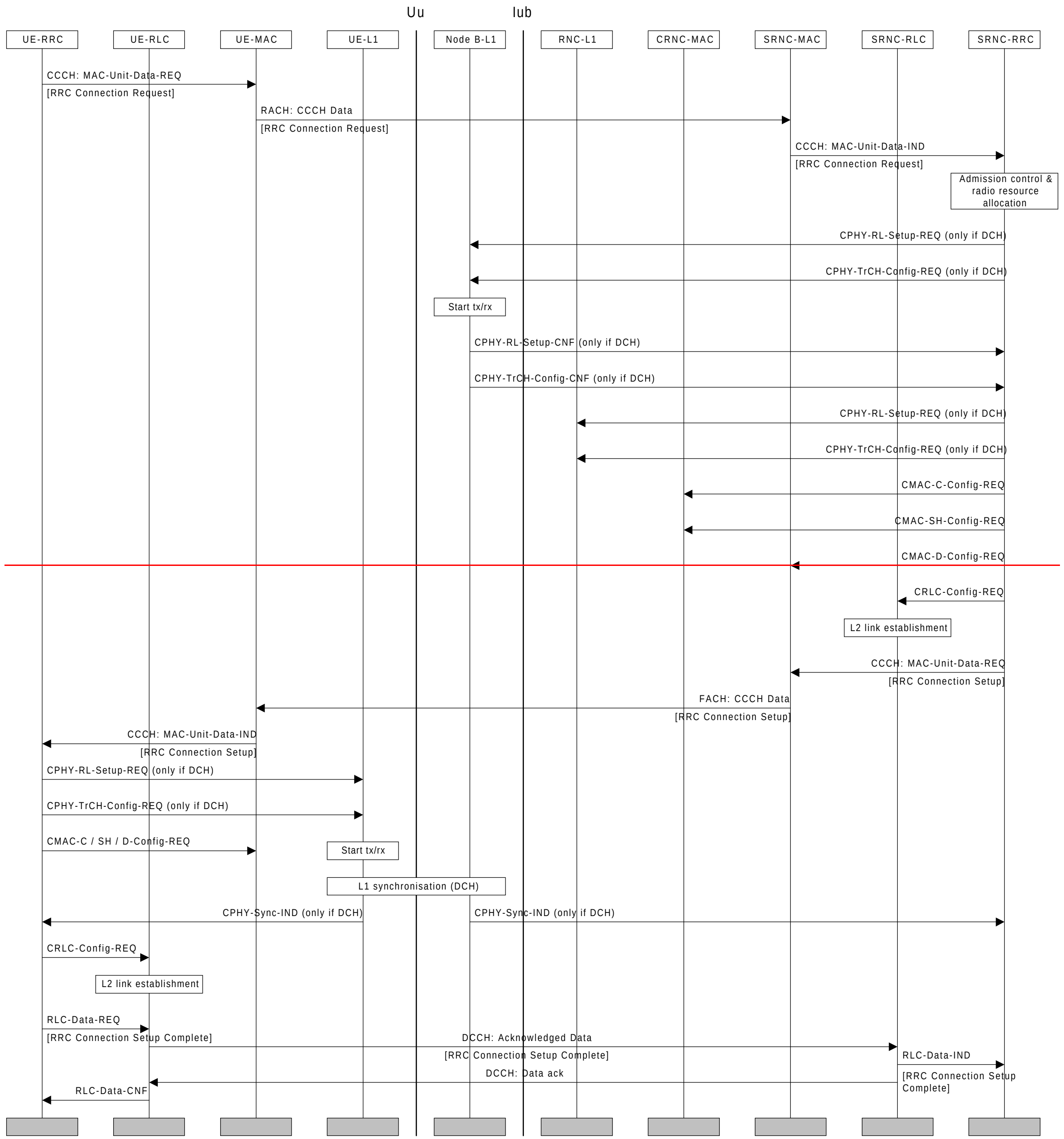
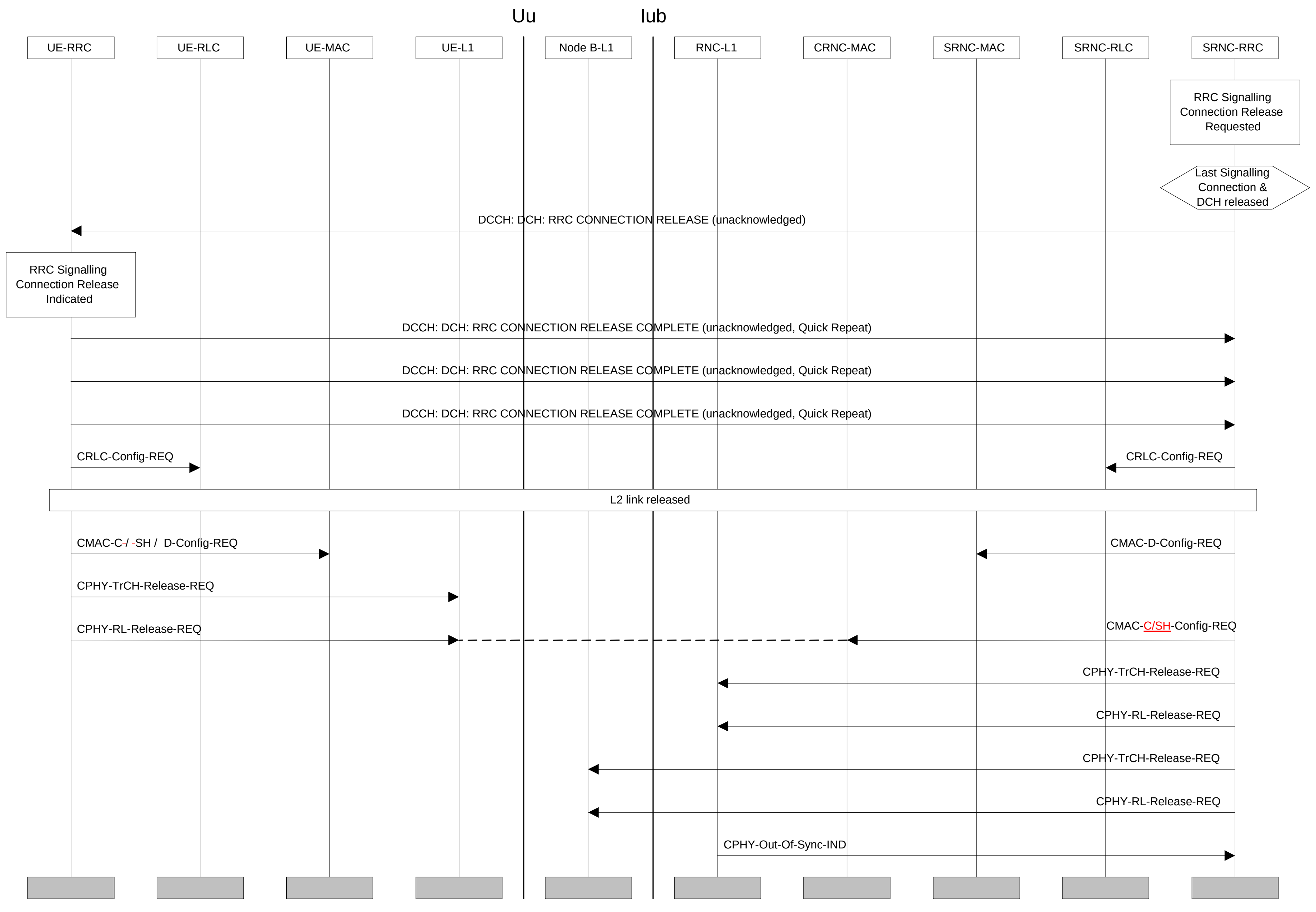

Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
CCCH: MAC-Unit-Data-REQ
[RRC Connection Request]
RACH: CCCH Data
[RRC Connection Request]
CCCH: MAC-Unit-Data-IND
[RRC Connection Request]
Admission control & radio resource allocation
CPHY-RL-Setup-REQ (only if DCH)
CPHY-TrCH-Config-REQ (only if DCH)
Start tx/rx
CPHY-RL-Setup-CNF (only if DCH)
CPHY-TrCH-Config-CNF (only if DCH)
CPHY-RL-Setup-REQ (only if DCH)
CPHY-TrCH-Config-REQ (only if DCH)
CMAC-C-Config-REQ
CMAC-SH-Config-REQ
CMAC-D-Config-REQ
CRLC-Config-REQ
L2 link establishment
CCCH: MAC-Unit-Data-REQ
[RRC Connection Setup]
FACH: CCCH Data
[RRC Connection Setup]
CCCH: MAC-Unit-Data-IND
[RRC Connection Setup]
CPHY-RL-Setup-REQ (only if DCH)
CPHY-TrCH-Config-REQ (only if DCH)
CMAC-C / SH / D-Config-REQ
Start tx/rx
L1 synchronisation (DCH)
CPHY-Sync-IND (only if DCH)
CPHY-Sync-IND (only if DCH)
CRLC-Config-REQ
L2 link establishment
RLC-Data-REQ
[RRC Connection Setup Complete]
DCCH: Acknowledged Data
[RRC Connection Setup Complete]
RLC-Data-IND
[RRC Connection Setup Complete]
DCCH: Data ack
RLC-Data-CNF

Figure 1. RRC connection establishment (with common channel termination case A)

6.1.3.1 RRC Connection Release from Dedicated Physical Channel


Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
RRC Signalling Connection Release Requested
Last Signalling Connection & DCH released
DCCH: DCH: RRC CONNECTION RELEASE (unacknowledged)
RRC Signalling Connection Release Indicated
DCCH: DCH: RRC CONNECTION RELEASE COMPLETE (unacknowledged, Quick Repeat)
DCCH: DCH: RRC CONNECTION RELEASE COMPLETE (unacknowledged, Quick Repeat)
DCCH: DCH: RRC CONNECTION RELEASE COMPLETE (unacknowledged, Quick Repeat)
CRLC-Config-REQ
CRLC-Config-REQ
L2 link released
CMAC-C-/ -SH / D-Config-REQ
CMAC-D-Config-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
CMAC-C/SH-Config-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
CPHY-Out-Of-Sync-IND


Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
RRC Signalling Connection Release Requested
Last Signalling Connection & DCH released
DCCH: DCH: RRC CONNECTION RELEASE (unacknowledged)
RRC Signalling Connection Release Indicated
DCCH: DCH: RRC CONNECTION RELEASE COMPLETE (unacknowledged, Quick Repeat)
DCCH: DCH: RRC CONNECTION RELEASE COMPLETE (unacknowledged, Quick Repeat)
DCCH: DCH: RRC CONNECTION RELEASE COMPLETE (unacknowledged, Quick Repeat)
CRLC-Config-REQ
CRLC-Config-REQ
L2 link released
CMAC-C / SH / D-Config-REQ
CMAC-D-Config-REQ
CPHY-TrCH-Release-REQ
CMAC-C-Config-REQ
CPHY-RL-Release-REQ
CMAC-SH-Config-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
CPHY-Out-Of-Sync-IND

Figure 3. RRC Connection Release from Dedicated Physical Channel

The RRC layer entity in the network issues an RRC CONNECTION RELEASE message using unacknowledged 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 the UE RRC enters Idle Mode.

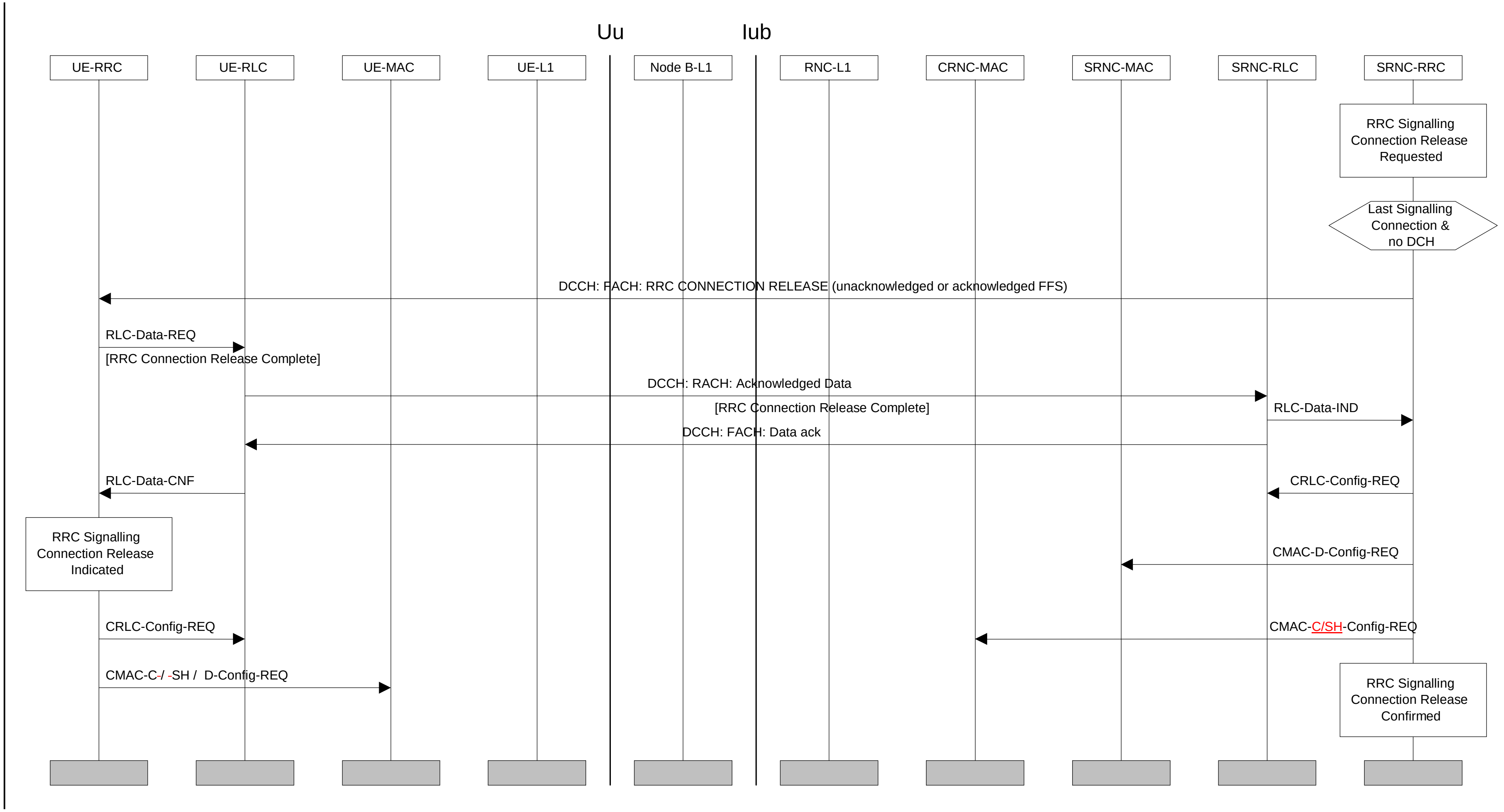
The primary method to detect the release of the signalling link in the NW is the RRC CONNECTION RELEASE COMPLETE-message from the UE. Should the message be lost despite the use of quick repeat, the release of the signalling link is detected by the out-of-sync primitive from either Node-B L1 or RNC-L1 (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.

6.1.3.2 RRC Connection Release without Dedicated Physical Channel

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

[Note: Depending on RLC design, the acknowledgement to RRC CONNECTION RELEASE could be piggybacked to the RRC CONNECTION RELEASE COMPLETE MESSAGE, resulting in no additional messages. Therefore acked / unacked transmission is considered FFS.]

After receiving the RRC CONNECTION RELEASE COMPLETE message the network RRC layer releases L2 resources, sends an RRC Signalling Connection Release confirmation to DC-SAP and goes to Idle Mode (more precisely: only the RRC entity dedicated to this UE goes to Idle Mode).


Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
RRC Signalling Connection Release Requested
Last Signalling Connection & no DCH
DCCH: FACH: RRC CONNECTION RELEASE (unacknowledged or acknowledged FFS)
RLC-Data-REQ
[RRC Connection Release Complete]
DCCH: RACH: Acknowledged Data
[RRC Connection Release Complete]
RLC-Data-IND
DCCH: FACH: Data ack
RLC-Data-CNF
CRLC-Config-REQ
RRC Signalling Connection Release Indicated
CMAC-D-Config-REQ
CRLC-Config-REQ
CMAC-C/SH-Config-REQ
CMAC-C-/ -SH / D-Config-REQ
RRC Signalling Connection Release Confirmed

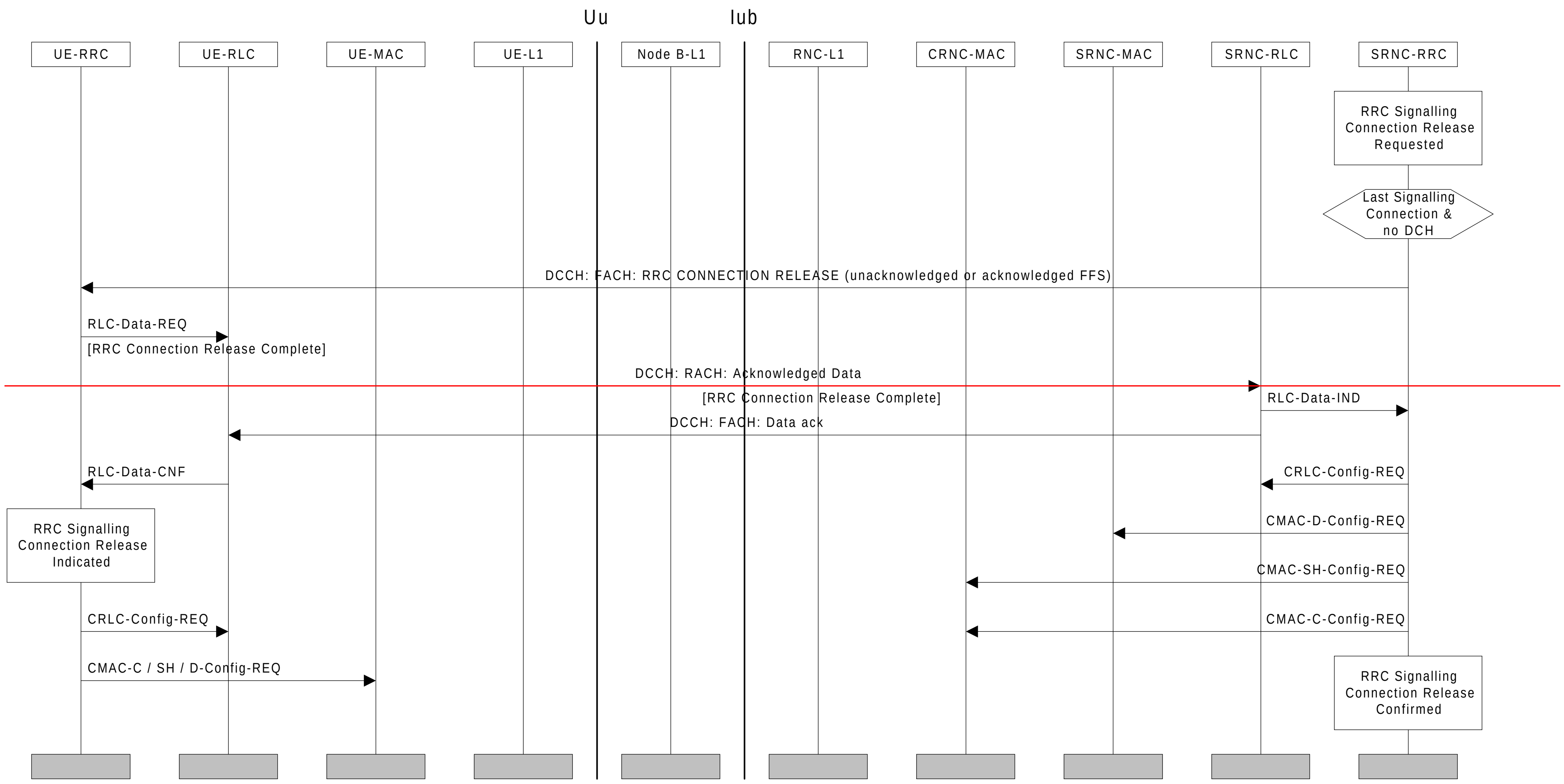


Figure 4: RRC Connection Release without Dedicated Physical Channel

6.2 Radio Bearer Procedures

6.2.1 Radio Bearer Configuration

6.2.1.1 Radio Bearer Establishment

The procedures for establishing radio bearers may vary according to the relation between the radio bearer and a dedicated transport channel. Depending on the QoS parameters, there may or may not be a permanently allocated dedicated channel associated with the RB. Circuit-switched bearers, or bearers classified as real-time services typically need a permanent association to a DCH to meet the delay requirements. Packet-switched bearers, or bearers classified as non-real-time services can in many cases be served as best-effort, requesting capacity from an associated DCH based on need.

When establishing an RB together with a DCH, the DCH may be attached to either a newly activated physical channel or it may be accommodated by modifying an existing physical channel. The modification is further broken down into two different options: synchronised and unsynchronised. If the old and new physical channel settings are compatible (TFCI etc.) in the sense that executing the modification in the NW and the UE with arbitrary timing does not introduce transmission errors, the unsynchronised procedure can be applied. If the old and new settings are incompatible, due to e.g. assignment of the same TFCI value to a new set of physical layer configuration, the synchronised procedure must be used.

6.2.1.1.1 Radio Bearer Establishment with Dedicated Physical Channel Activation

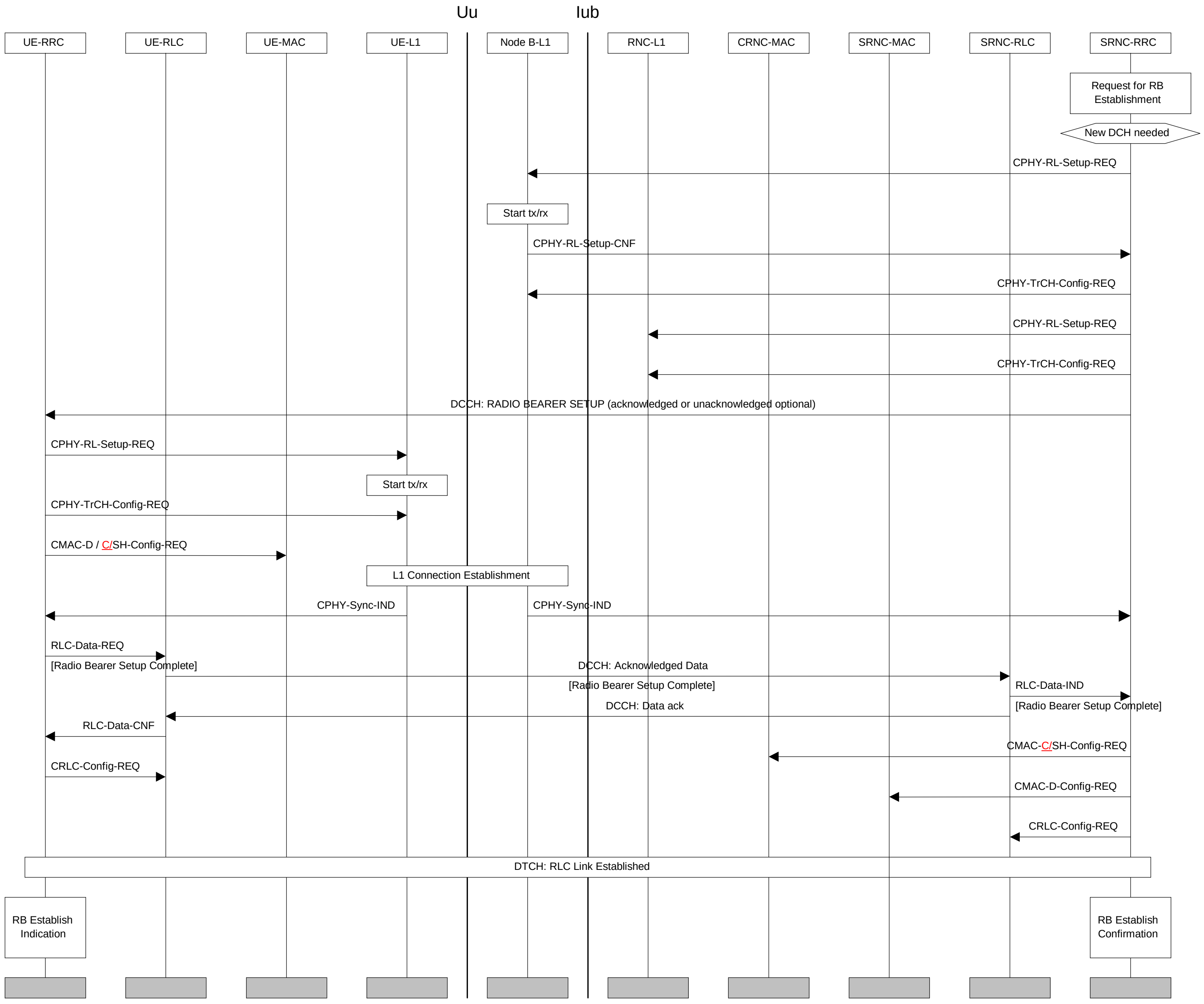

Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
Request for RB Establishment
New DCH needed
CPHY-RL-Setup-REQ
Start tx/rx
CPHY-RL-Setup-CNF
CPHY-TrCH-Config-REQ
CPHY-RL-Setup-REQ
CPHY-TrCH-Config-REQ
DCCH: RADIO BEARER SETUP (acknowledged or unacknowledged optional)
CPHY-RL-Setup-REQ
Start tx/rx
CPHY-TrCH-Config-REQ
CMAC-D / C/SH-Config-REQ
L1 Connection Establishment
CPHY-Sync-IND
CPHY-Sync-IND
RLC-Data-REQ
[Radio Bearer Setup Complete]
DCCH: Acknowledged Data
[Radio Bearer Setup Complete]
RLC-Data-IND
[Radio Bearer Setup Complete]
DCCH: Data ack
RLC-Data-CNF
CMAC-C/SH-Config-REQ
CRLC-Config-REQ
CMAC-D-Config-REQ
CRLC-Config-REQ
DTCH: RLC Link Established
RB Establish Indication
RB Establish Confirmation

Figure 5: Radio Bearer Establishment with Dedicated Physical Channel Activation

The procedure in Figure 5 is applied when a new physical channel needs to be created for the radio bearer. A Radio Bearer Establishment is initiated when an RB Establish Request primitive is received from the DC-SAP on the network side of the RRC layer. This primitive contains a bearer reference and QoS parameters. Based on these QoS parameters, L1 and L2 parameters are chosen by the RRC entity on the network side.

The physical layer processing on the network side is started with the CPHY-RL-Setup request primitive issued to all applicable Node B:s. If any of the intended recipients is / are unable to provide the service, it will be indicated in the confirmation primitive(s).After setting up L1 including the start of tx / rx in Node B, the NW-RRC sends a RADIO BEARER SETUP message to its peer entity (acknowledged or unacknowledged transmission optional for the NW). This message contains L1, MAC and RLC parameters. After receiving the message, the UE-RRC configures L1 and MAC.

When L1 synchronisation is indicated *[Note: Need for sync_ind on NW-side FFS]*, the UE sends a RADIO BEARER SETUP COMPLETE message in acknowledged-mode back to the network. The NW-RRC configures MAC and RLC on the network side.

After receiving the confirmation for the RADIO BEARER SETUP COMPLETE, the UE-RRC creates a new RLC entity associated with the new radio bearer. The applicable method of RLC establishment may depend on RLC transfer mode. The RLC connection can be either implicitly established, or explicit signalling can be applied. The exact procedure is FFS. *[Note2: Not needed for transparent mode but may be needed for non- transparent mode.]*

Finally, an RB Establish Indication primitive is sent by UE-RRC and an RB Establish Confirmation primitive is issued by the RNC-RRC.

6.2.1.1.2 Radio Bearer Establishment with Unsynchronised Dedicated Physical Channel Modification

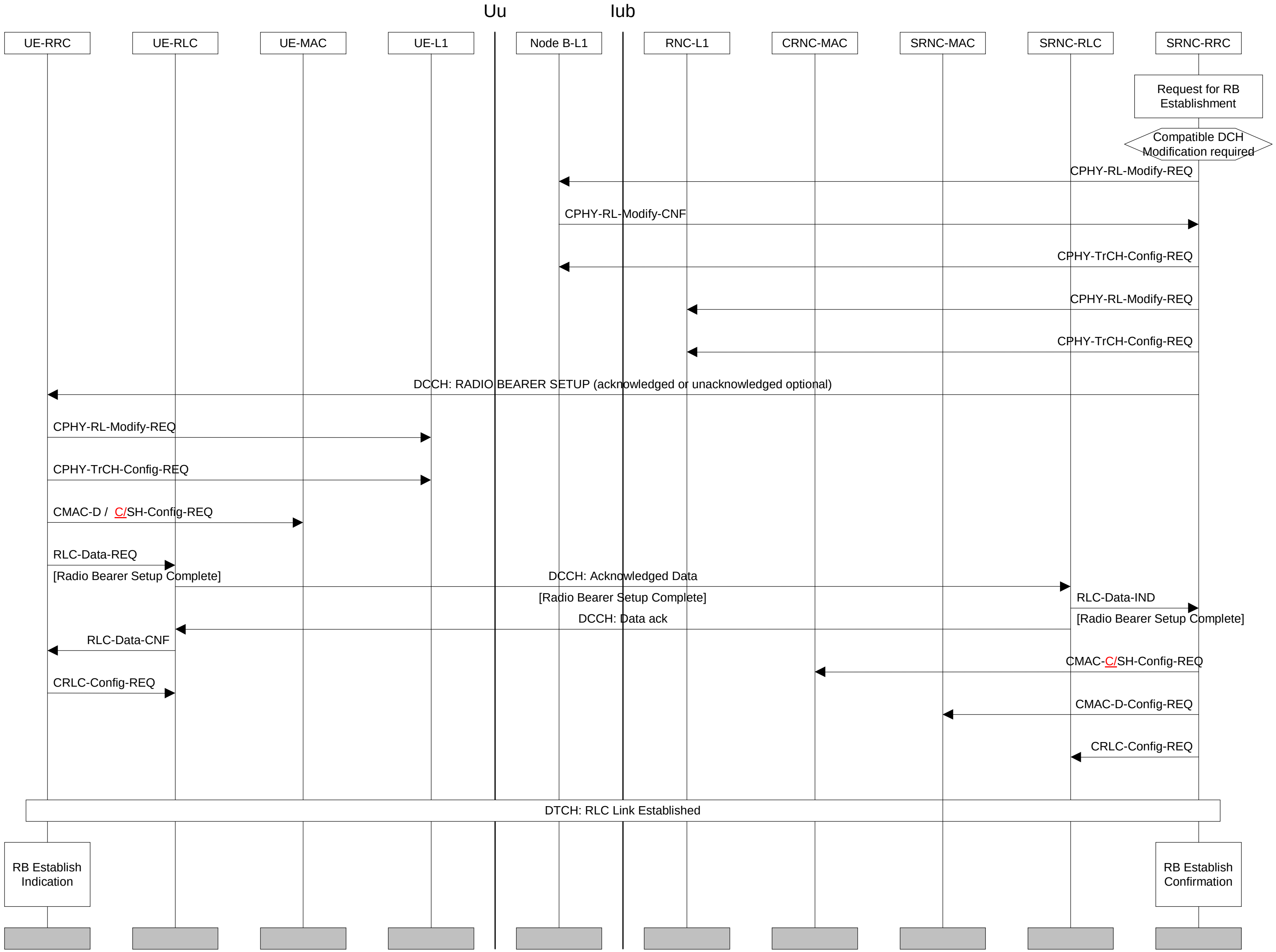
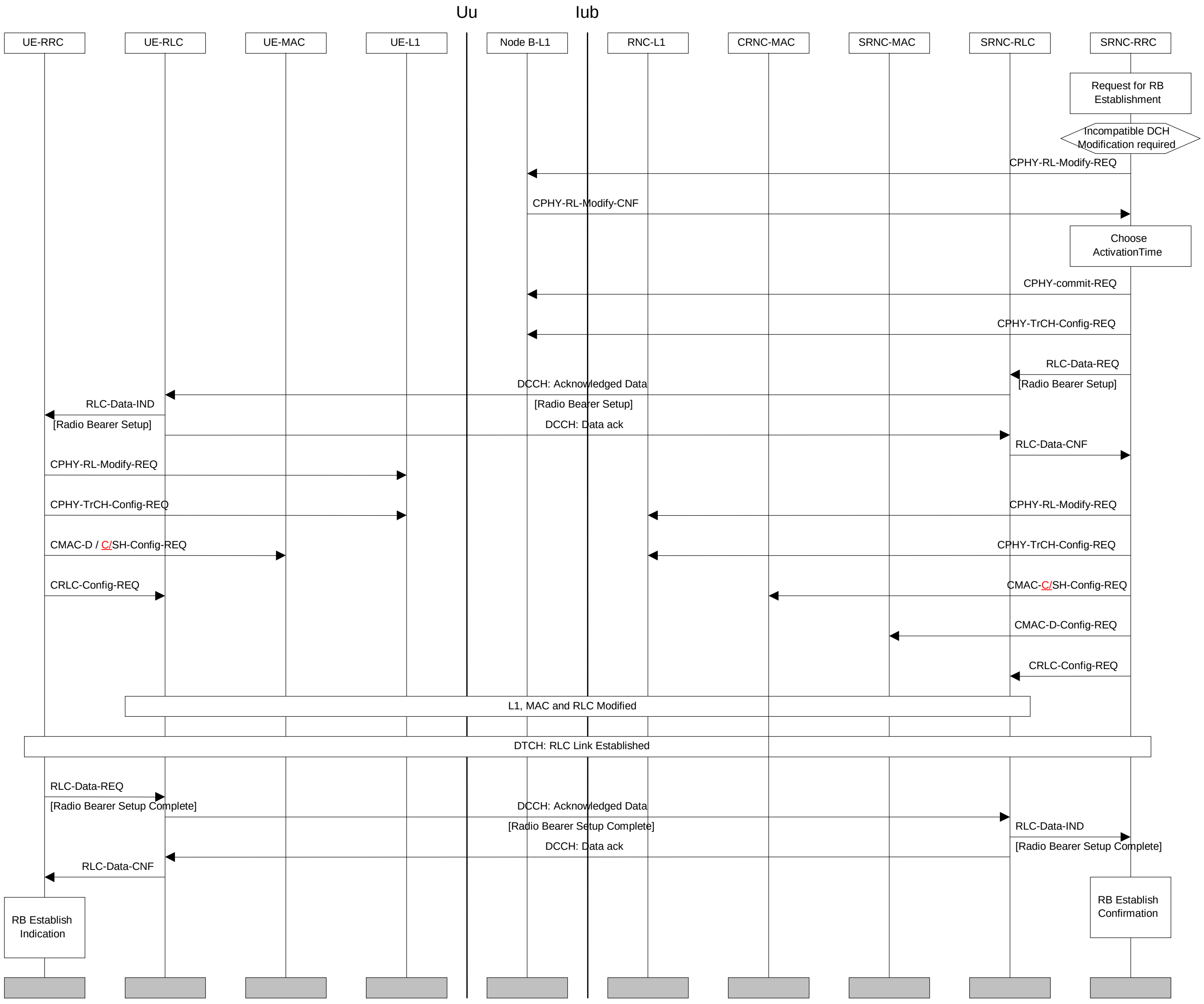

Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
Request for RB Establishment
Compatible DCH Modification required
CPHY-RL-Modify-REQ
CPHY-RL-Modify-CNF
CPHY-TrCH-Config-REQ
CPHY-RL-Modify-REQ
CPHY-TrCH-Config-REQ
DCCH: RADIO BEARER SETUP (acknowledged or unacknowledged optional)
CPHY-RL-Modify-REQ
CPHY-TrCH-Config-REQ
CMAC-D / C/SH-Config-REQ
RLC-Data-REQ
[Radio Bearer Setup Complete]
DCCH: Acknowledged Data
[Radio Bearer Setup Complete]
RLC-Data-IND
[Radio Bearer Setup Complete]
DCCH: Data ack
RLC-Data-CNF
CMAC-C/SH-Config-REQ
CRLC-Config-REQ
CMAC-D-Config-REQ
CRLC-Config-REQ
DTCH: RLC Link Established
RB Establish Indication
RB Establish Confirmation

Figure 6: Radio Bearer Establishment with Unsynchronised Dedicated Physical Channel Modification

The establishment of a radio bearer, when unsynchronised physical channel modification is applicable, is shown in Figure 6. If the old and new physical layer configurations are compatible in the sense that they can coexist in the peer entities, an unsynchronised procedure for radio bearer establishment can be applied. In this case no fixed activation time is required.

The modifications on the physical layer in the network are done in response to an CPHY_ modify request. Failure to comply is indicated in the confirmation primitive. In an error-free case the RADIO BEARER SETUP message on L3 is transmitted. Acknowledged or unacknowledged transmission is a network option. Configuration changes on the UE-side proceed after this message has been received. Reception of the RADIO BEARER SETUP COMPLETE message triggers configuration changes in MAC and RLC in the network.

6.2.1.1.3 Radio Bearer Establishment with Synchronised Dedicated Physical Channel Modification



Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
Request for RB Establishment
Incompatible DCH Modification required
CPHY-RL-Modify-REQ
CPHY-RL-Modify-CNF
Choose ActivationTime
CPHY-commit-REQ
CPHY-TrCH-Config-REQ
RLC-Data-REQ
[Radio Bearer Setup]
DCCH: Acknowledged Data
[Radio Bearer Setup]
RLC-Data-IND
[Radio Bearer Setup]
DCCH: Data ack
RLC-Data-CNF
CPHY-RL-Modify-REQ
CPHY-TrCH-Config-REQ
CMAC-D / C/SH-Config-REQ
CRLC-Config-REQ
CPHY-RL-Modify-REQ
CPHY-TrCH-Config-REQ
CMAC-C/SH-Config-REQ
CMAC-D-Config-REQ
CRLC-Config-REQ
L1, MAC and RLC Modified
DTCH: RLC Link Established
RLC-Data-REQ
[Radio Bearer Setup Complete]
DCCH: Acknowledged Data
[Radio Bearer Setup Complete]
RLC-Data-IND
[Radio Bearer Setup Complete]
DCCH: Data ack
RLC-Data-CNF
RB Establish Indication
RB Establish Confirmation

Figure 7: Radio Bearer Establishment with Synchronised Dedicated Physical Channel Modification

In case the old and the new physical channel configurations are incompatible with each other (due to different DPCCH format, TFCI patterns or similar differences), the modification on physical layer and L2 require exact synchronisation between the UE and the NW, as shown in Figure 7.

In this case the CPHY-RL-Modify request doesn't immediately cause any changes in the physical layer configuration, it only checks the availability of the requested configuration and makes a "reservation". After the confirmations have been received from all applicable Node B:s, the RRC chooses the appropriate "activation time" when the new configuration can be activated. This information is signalled to MAC, RLC and also the physical layer (CPHY_Commit request primitive).

After the RADIO BEARER SETUP message (acknowledged transmission on L2 required) between peer L3 entities the setup proceeds on the UE-side. The new configuration is now available both on the UE and the network side, and at the scheduled activation time the new configuration is assumed by all applicable peer entities. *[Note: The method of synchronisation is a subject of current study.]*

6.2.1.1.4 Radio Bearer Establishment without Dedicated Physical Channel

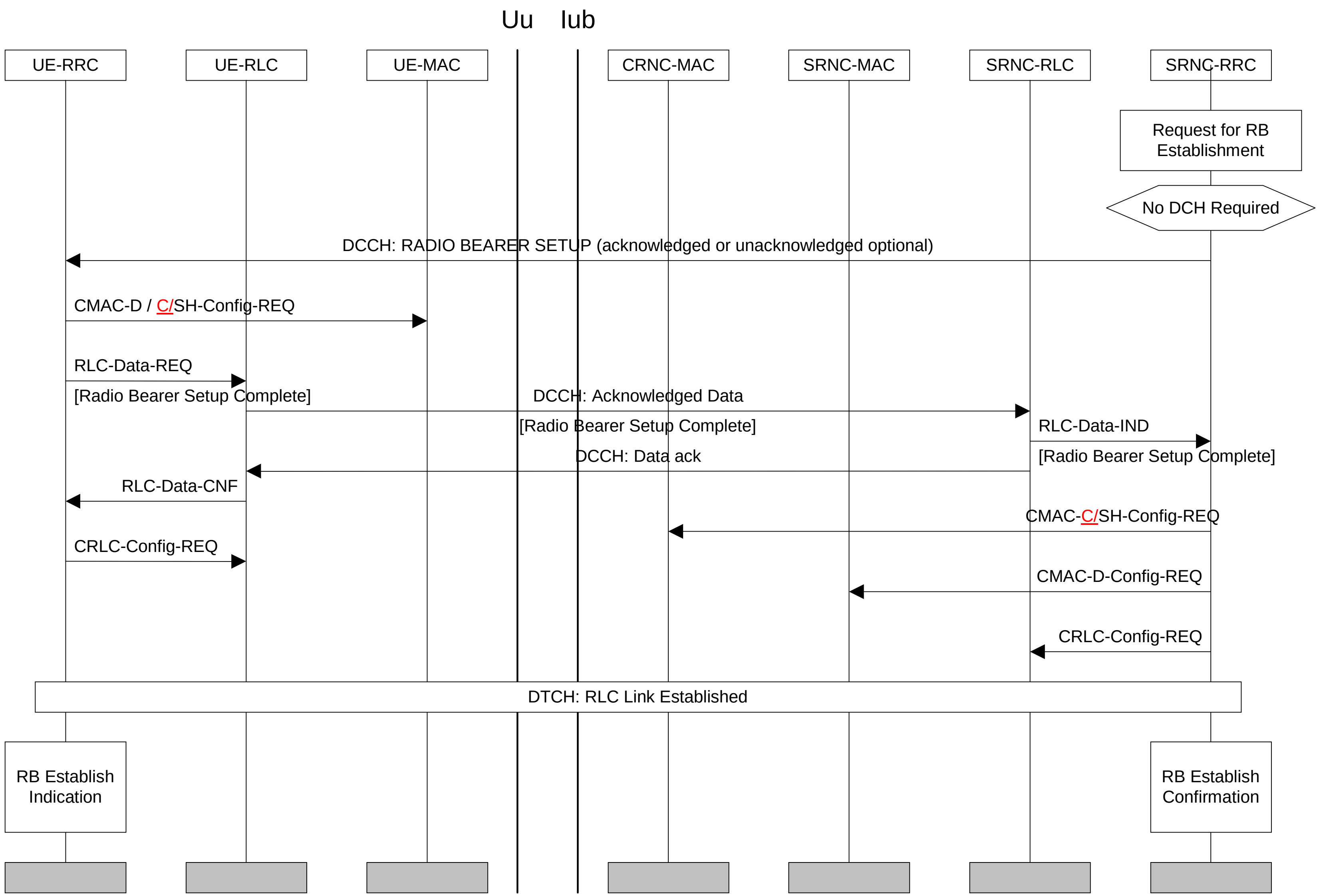


Figure 8: Radio Bearer Establishment without Dedicated Physical Channel

For some radio bearers dedicated radio resources are not permanently associated. Therefore the setting up of the physical resource is separate from the actual radio bearer setup, which involves only RLC and MAC.

MAC can be initially configured to operate either on existing dedicated transport and physical channels or on common channels.

6.2.1.1.5 Radio Bearer Establishment with CPCH Channel Allocation

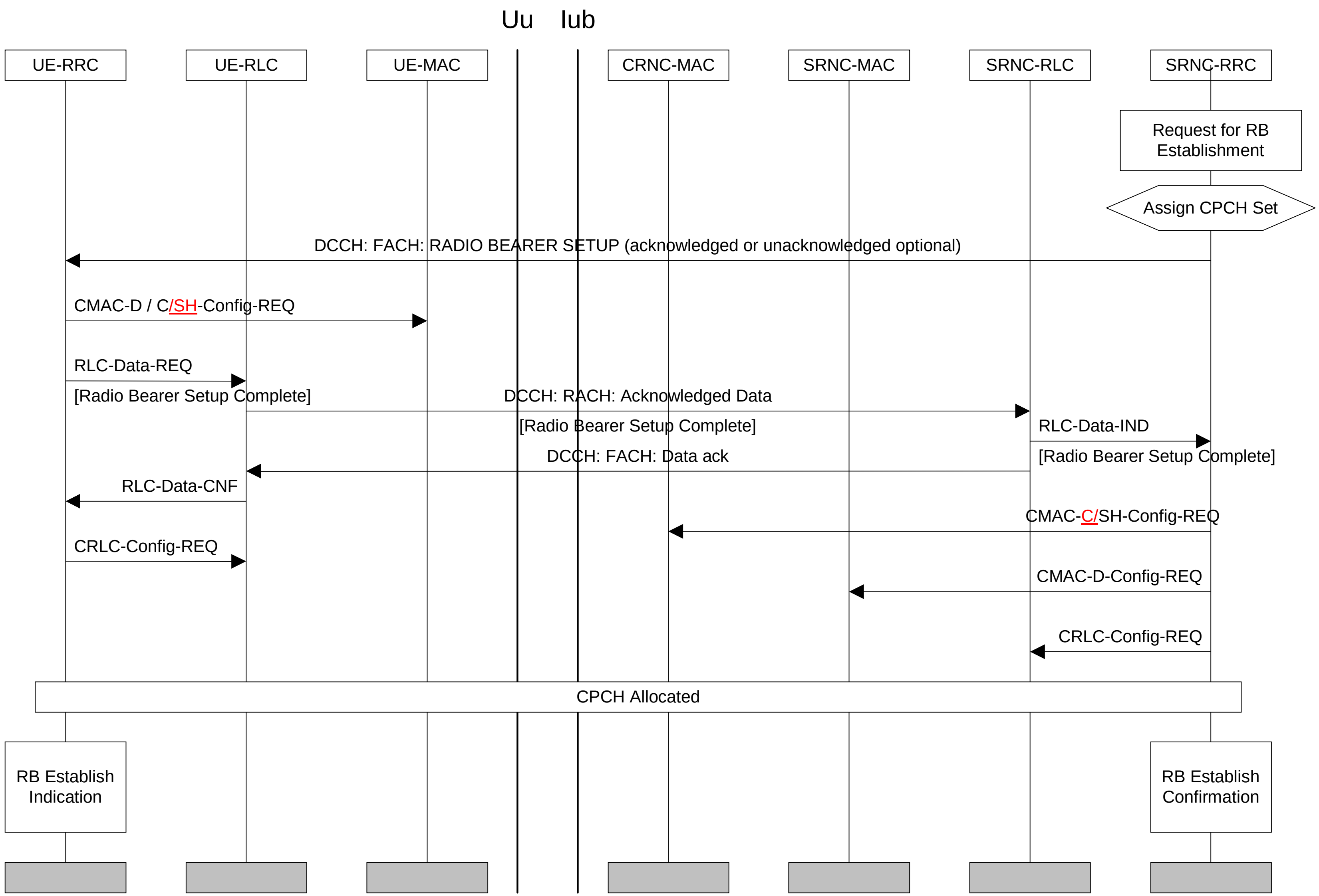


Figure 9: Radio Bearer Establishment with CPCH Channel Allocation

When the RNC determines the need to assign CPCH UL resources to a UE, the RNC sends an RB Setup message to the UE. Since the CPCH physical parameters are broadcast in the BCCH, the RB Setup message does not include a DPCH part. The Transport Channel information includes the CPCH set (CPCH Set ID#) to which the UE is to be assigned. MAC entities are configured: MAC-D and MAC-C/SH in the UE, MAC-C/SH in the CRNC, and MAC-D in the SRNC. Node B MAC controls access to the individual CPCH channels in the CPCH set. However, Node B MAC does not require configuration, since it was configured to control the CPCH set when the CPCH set was initially allocated to that cell. The Node B MAC can function independently of the number of UEs assigned to the CPCH set. Once the RB setup is complete, the UE may access the CPCH when the logical channel for this RB next presents data to send in the uplink direction.

The message flow diagram for RB setup for CPCH is similar to the RB Setup without Dedicated Physical Channel (cf 7.2.1.1.4).

6.2.1.2 Radio Bearer Release

Similar as for Radio Bearer Establishment procedure, the Radio Bearer Release can include physical channel modification or physical channel deactivation depending on the differences between new and old QoS parameters. These can also be both synchronised and unsynchronised.

The Radio Bearer Release procedure is initiated when the release is requested from the RRC layer on the NW side. This request contains a bearer reference, and on retrieval a RB Release Confirm primitive is immediately returned to the Non-Access Stratum.

New L1 and L2 parameters may be chosen for remaining radio bearers if any. A RADIO BEARER RELEASE message is sent from the RRC layer in the network to its peer entity in the UE. This message includes possible new L1, MAC and RLC parameters for remaining radio bearers and indentification of the radio bearer to be released. *[Note1: In synchronised case a specific activation time would be needed for the change of L1 and L2 configuration to avoid data loss.]* An RB Release Indication is sent by the UE-RRC.

The RRC on the UE side configures L1 and MAC, and releases the RLC entity associated to the released radio bearer. After receiving a RADIO BEARER RELEASE COMPLETE message from the UE, the NW-RRC does a similar reconfiguration also on the network side.

6.2.1.2.1 Radio Bearer Release with Unsynchronised Dedicated Physical Channel Modification

The example in Figure 10 shows the case where release can be executed as an unsychronised physical channel modification, i.e. without physical channel deactivation.

After notifying upper layers of the release, a RADIO BEARER RELEASE message (acknowledged or unacknowledged transmission optional for the network) is sent to the UE triggering the reconfiguration in the UE. When this is finalised the UE sends a RADIO BEARER RELEASE COMPLETE message to the network, after which the reconfiguration is executed in the network.

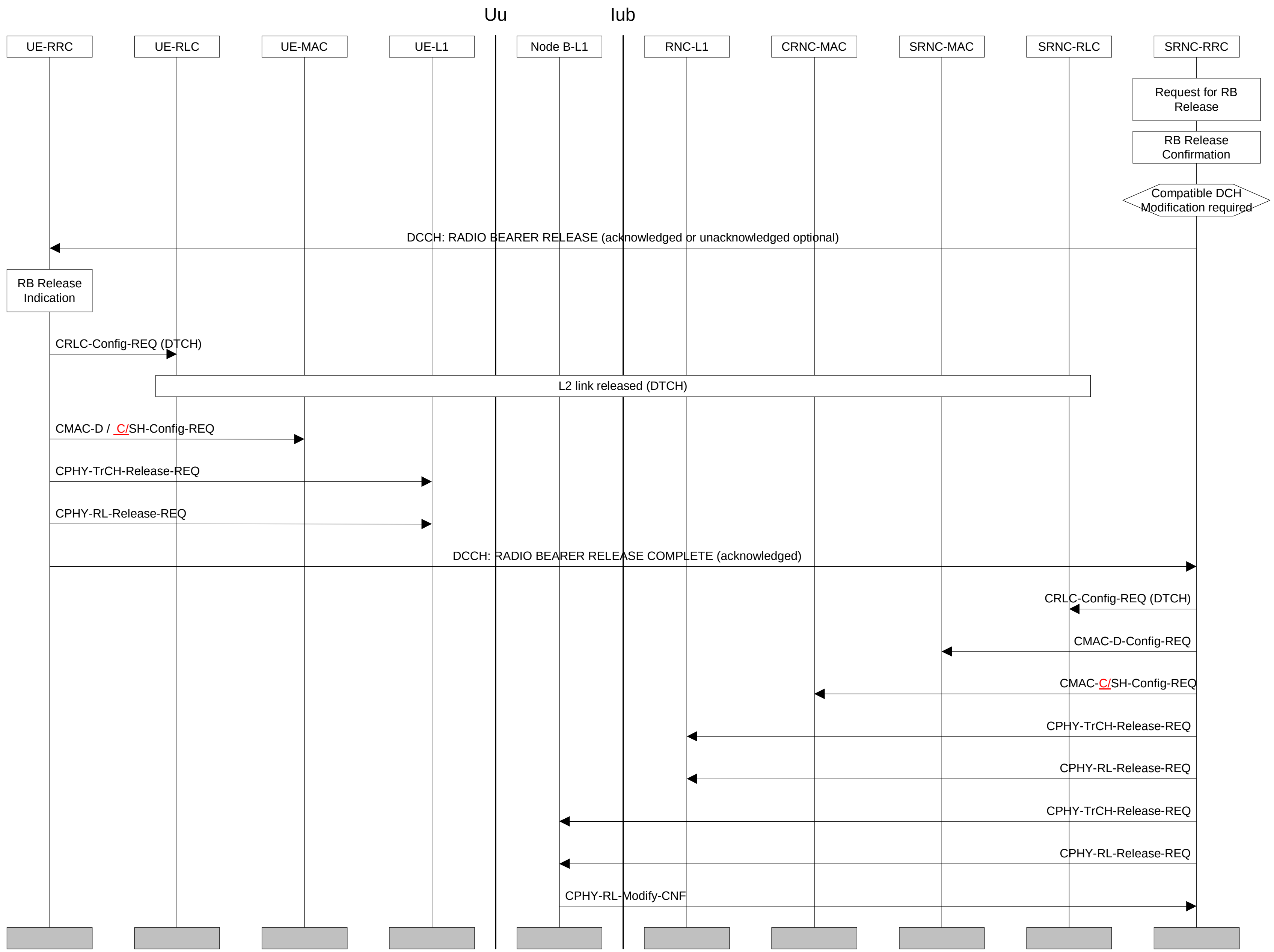

Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
Request for RB Release
RB Release Confirmation
Compatible DCH Modification required
DCCH: RADIO BEARER RELEASE (acknowledged or unacknowledged optional)
RB Release Indication
CRLC-Config-REQ (DTCH)
L2 link released (DTCH)
CMAC-D / C/SH-Config-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
DCCH: RADIO BEARER RELEASE COMPLETE (acknowledged)
CRLC-Config-REQ (DTCH)
CMAC-D-Config-REQ
CMAC-C/SH-Config-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
CPHY-TrCH-Release-REQ
CPHY-RL-Release-REQ
CPHY-RL-Modify-CNF

Figure 10: Radio Bearer Release with Unsynchronised Dedicated Physical Channel Modification

6.2.1.3 Bearer Reconfiguration

For Bearer Reconfiguration, both synchronised and unsynchronised procedures are applicable. The unsynchronised procedure is shown as an example.

6.2.1.3.1 Unsynchronised Radio Bearer Reconfiguration

Because of the unsynchronised nature of the procedure in Figure 11, there is no activation time and no separate commit request for the Node B physical layer is needed. The possibility for executing the requested modification will be reported in the confirmation primitives from the physical layer. If the modification involves the release of an old configuration, the release can be postponed to the end of the procedure. After the reception of a RADIO BEARER RECONFIGURATION from the RNC-RRC (acknowledged or unacknowledged transmission optional for the network), the UE executes the modifications on L1 and L2.

Upon reception of a RADIO BEARER RECONFIGURATION COMPLETE message from the UE-RRC, the NW-RRC executes the modifications on L1 and L2. Finally the old configuration, if any, is released from Node B-L1.

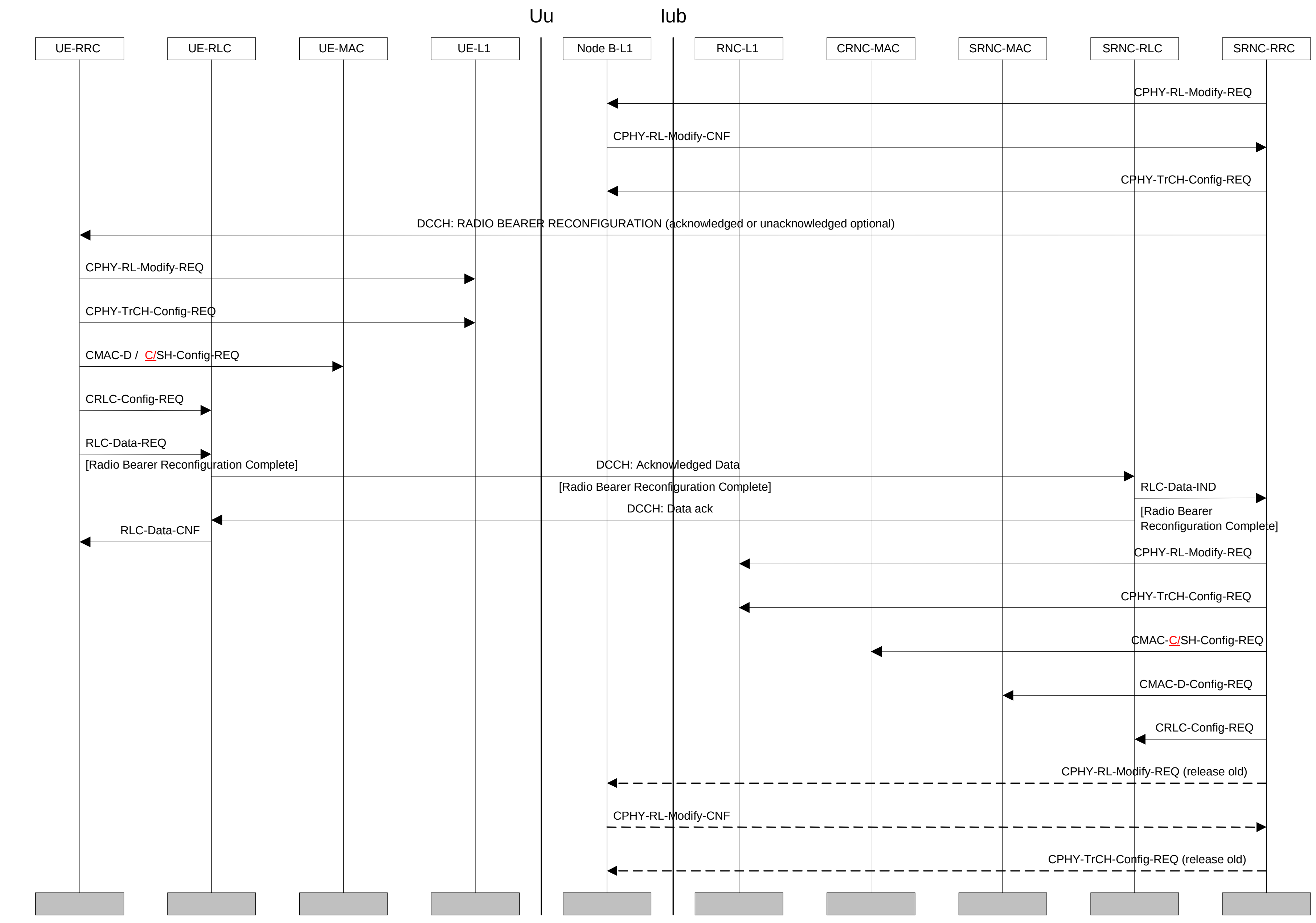

Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
CPHY-RL-Modify-REQ
CPHY-RL-Modify-CNF
CPHY-TrCH-Config-REQ
DCCH: RADIO BEARER RECONFIGURATION (acknowledged or unacknowledged optional)
CPHY-RL-Modify-REQ
CPHY-TrCH-Config-REQ
CMAC-D / C/SH-Config-REQ
CRLC-Config-REQ
RLC-Data-REQ
[Radio Bearer Reconfiguration Complete]
DCCH: Acknowledged Data
[Radio Bearer Reconfiguration Complete]
RLC-Data-IND
[Radio Bearer Reconfiguration Complete]
DCCH: Data ack
RLC-Data-CNF
CPHY-RL-Modify-REQ
CPHY-TrCH-Config-REQ
CMAC-C/SH-Config-REQ
CMAC-D-Config-REQ
CRLC-Config-REQ
CPHY-RL-Modify-REQ (release old)
CPHY-RL-Modify-CNF
CPHY-TrCH-Config-REQ (release old)

Figure 11: Unsynchronised Radio Bearer Reconfiguration

6.2.2 Transport Channel Reconfiguration

For transport channel reconfiguration, both synchronised and unsynchronised procedures are applicable.

6.2.2.1 Unsynchronised Transport Format Set Reconfiguration

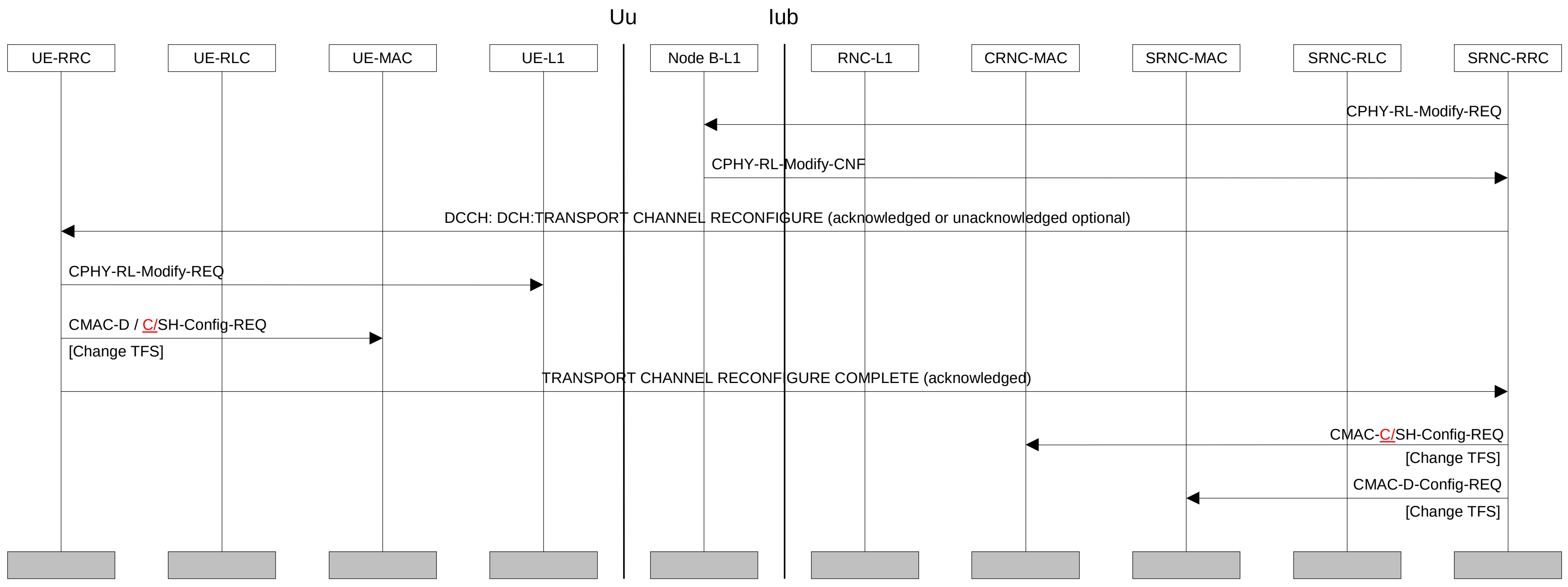


Figure 12: Unsynchronised Transport Format Set Reconfiguration

Figure 12 illustrates an example of a procedure for a change of the Transport Format Set for one transport channel. This is done with the Transport Channel Reconfiguration procedure.

A change of the transport format set for a transport channel is triggered in the RRC layer in the network. A TRANSPORT CHANNEL RECONFIGURE message is sent from the RRC layer in the network to its peer entity (acknowledged or unacknowledged transmission is a network option). This message contains the new transport format set and a new transport format combination Set, i.e. new parameters for L1 and MAC. *[Note1: In a synchronised procedure a specific activation time is needed for the change of L1 and L2 configuration to avoid data loss.]* When this message is received in the UE a reconfiguration of L1 and MAC is done. A similar reconfiguration is also done on the network side after the reception of a TRANSPORT CHANNEL RECONFIGURE COMPLETE message.

During the reconfiguration of the transport format set for a transport channel, radio traffic on this channel could be halted temporarily since the UE and the network are not necessarily aligned in their configuration. This traffic can resume after the COMPLETE-message.

6.2.2.2 Asymmetric transport channel reconfiguration

[Note : This procedure is considered for Release 00]

The RNC has initially sent one or more channel configurations (cfg1, cfg2, cfg3...) to each Node B and to the UE, e.g. at RB Setup.

When a DCH configuration is to be modified, the RNC sends a TRANSPORT CHANNEL RECONFIGURE message to the UE, indicating the new configuration to be applied (e.g. change from cfg3 to cfg2). Each Node B can then configure its physical layer to receive in the new configuration mode at a given radio frame number.

Upon reception of the TRANSPORT CHANNEL RECONFIGURE message, the UE reconfigures uplink L1 and L2 resources and starts to transmit data with the new configuration. In downlink, the UE can switch to the new configuration after a certain time which corresponds basically to the round trip delay. The UE may also avoid any data loss by temporarily performing double decoding.

When a Node B detects the new configuration at the specified radio frame, this is signalled to the RNC over the Iub. If the expected configuration is not detected, then the Node B can revert back to the old configuration. When the RNC detects, from one or more Node Bs, that the new configuration is applied by the UE on the uplink, it starts sending to every Node B, downlink DCH Iub frames with an indication of the new mode to be applied.

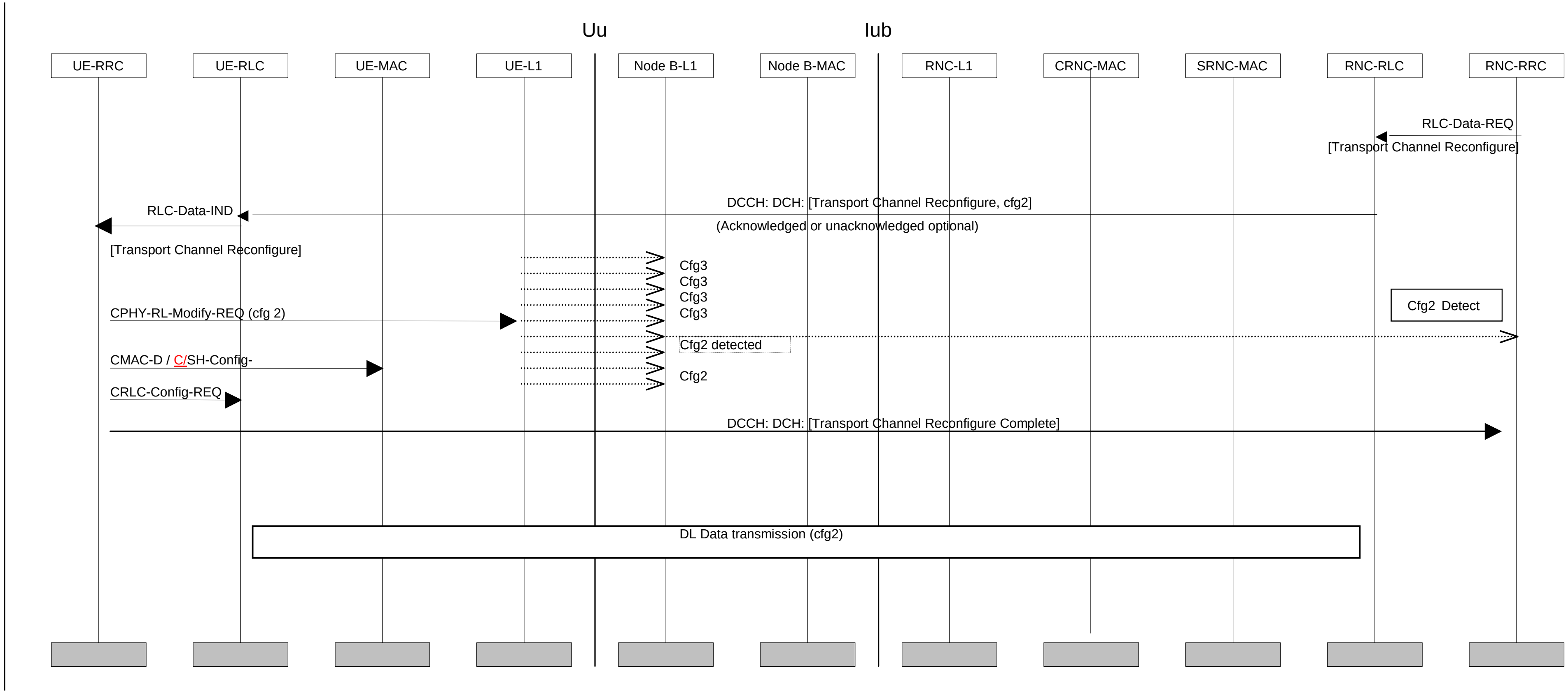


Figure 13: Asymmetric DCH Reconfiguration

6.2.3 Physical Channel Reconfiguration

For physical channel reconfiguration, both synchronised and unsynchronised procedures are applicable.

6.2.3.1 UE-Originated DCH Activation

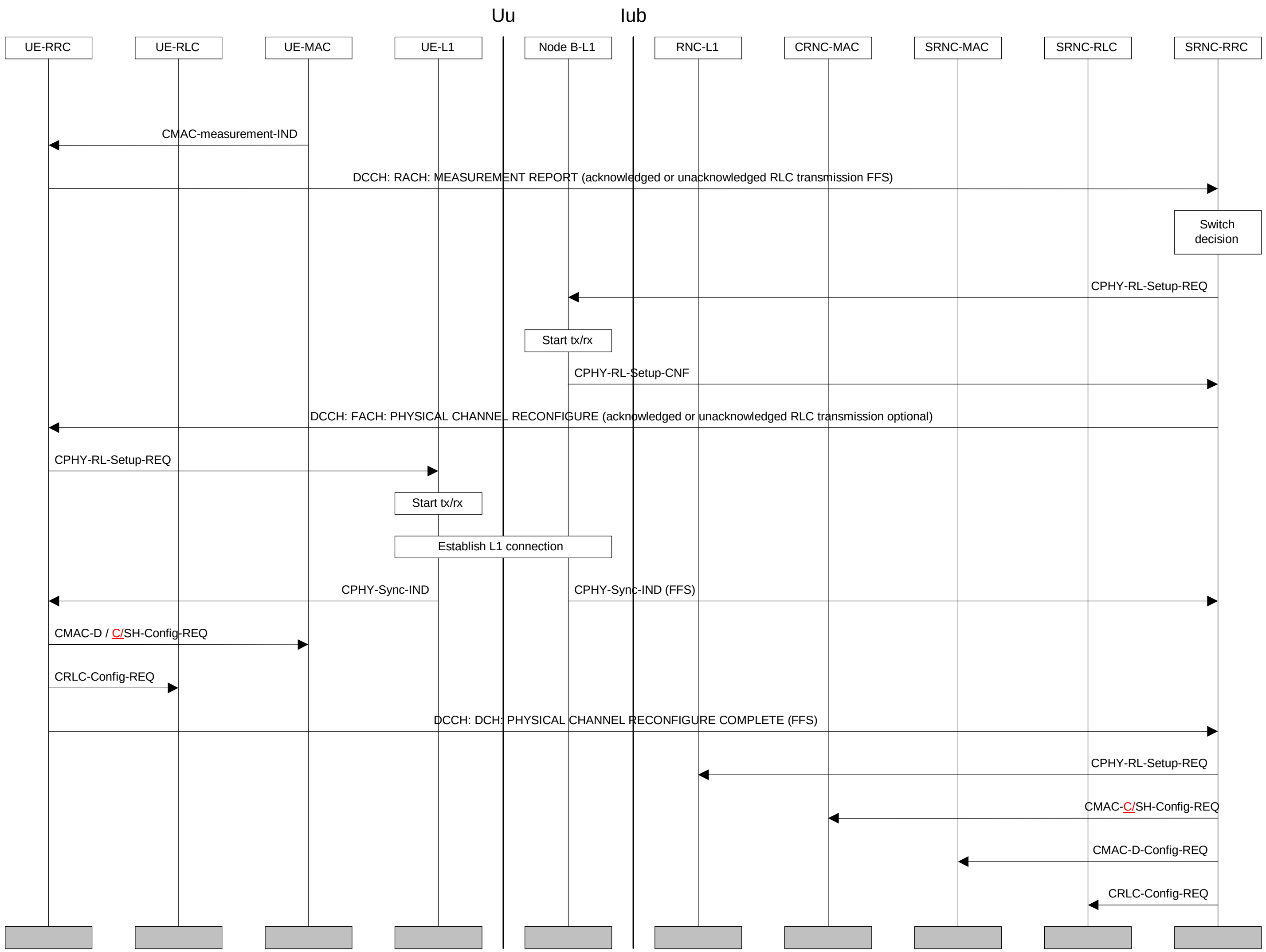


Figure 14: UE-Originated DCH Activation

Figure 14 illustrates an example of a procedure for a switch from common channels (RACH/FACH) to dedicated (DCH) channels.

In the UE the traffic volume measurement function decides to send a MEASUREMENT REPORT message to the network. In the network this measurement report could trigger numerous different actions. For example the network could do a change of transport format set, channel type switching or, if the system traffic is high, no action at all. In this case a switch from RACH/FACH to DCH/DCH is initiated.

Whether the report should be sent with acknowledged or unacknowledged data transfer or if the network should be able to configure data transfer mode for the report is FFS.

First, the modifications on L1 are requested and confirmed on the network side with CPHY-RL-Setup primitives.

The RRC layer on the network side sends a PHYSICAL CHANNEL RECONFIGURE message to its peer entity in the UE (acknowledged or unacknowledged transmission optional to the network). This message is sent on DCCH mapped to FACH. The message includes information about the new physical channel, such as codes and the period of time for which the DCH is activated. *[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.]*

When the UE has detected synchronisation on the new dedicated channel L2 is configured on the UE side and a PHYSICAL CHANNEL RECONFIGURE COMPLETE message can be sent on DCCH mapped on DCH to RRC in the network (need FFS). Depending on whether the complete-message is applied, the need for an indication of the synchronisation on the NW side is also FFS. Triggered by either the NW CPHY_sync_ind or the L3 complete message, the RNC-L1 and L2 configuration changes are executed in the NW.

When applying the FAUSCH, the “DCCH: RACH: MEASUREMENT REPORT” is replaced by a “DCCH: FAUSCH: DCH REQUEST” message that is transmitted on the FAUSCH in unacknowledged mode. In this case rather than giving a measurement report for the NW to process, the FAUSCH indicates a request for a DCH of predefined capacity.

6.2.3.2 UE-terminated synchronised DCH Modify

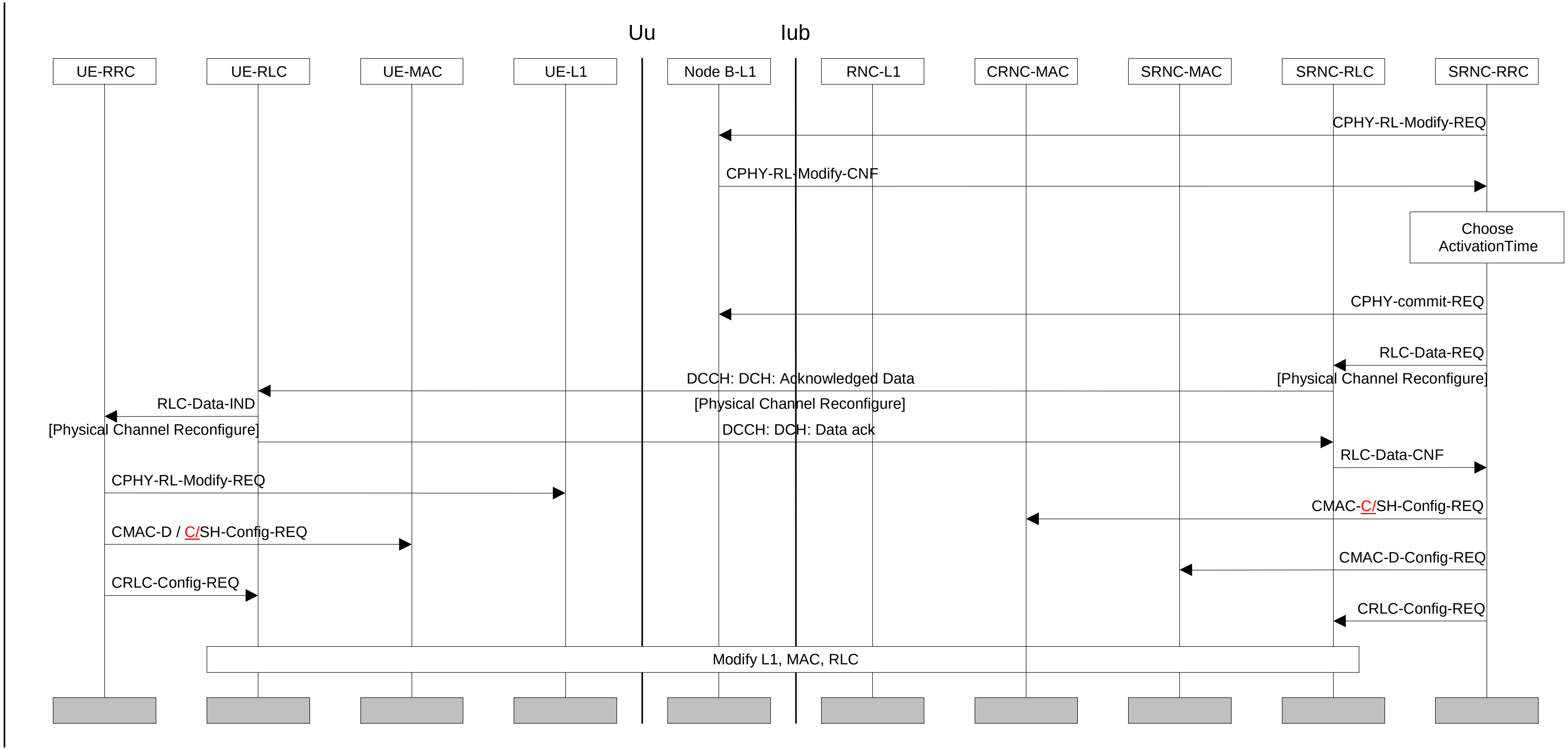


Figure 15: UE-terminated synchronised DCH Modify

Figure 15 illustrates an example of a synchronised procedure for DCH modification. Triggering of this procedure could for example be accomplished by an inactivity timer. The procedure can e.g. release all transport formats of a radio bearer without releasing the DCH, due to another bearer using it. The synchronised procedure is applied in the case when the old and new configurations are not compatible e.g. change of channelization code.

After the CPHY-RL-Modify requests have been confirmed, an activation time is chosen by NW-RRC. After deciding upon the activation time, the NW-RRC sends a PHYSICAL CHANNEL RECONFIGURE message as acknowledged data transfer to the UE. In both uplink and downlink this message is sent on DCCH mapped on DCH.

After reception the UE reconfigures L1 and L2 to DCH resources. The need for a Physical Channel Reconfigure Complete message to the network is FFS (not shown here). If a complete message is used it would be sent on DCCH mapped on DCH. In the unsynchronised case this message could trigger a modification of L1 and L2 resources in the network associated with the dedicated channel.

6.2.3.3 UE-terminated DCH Release

Figure 16 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 CPHY_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 the UE reconfigures L1 and L2 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 L1 and L2 resources in the network associated with the dedicated channel. If the L3 COMPLETE message doesn’t exist, the CPHY_out_of_sync_ind from the physical layer must be applied.

[Note3: 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.]

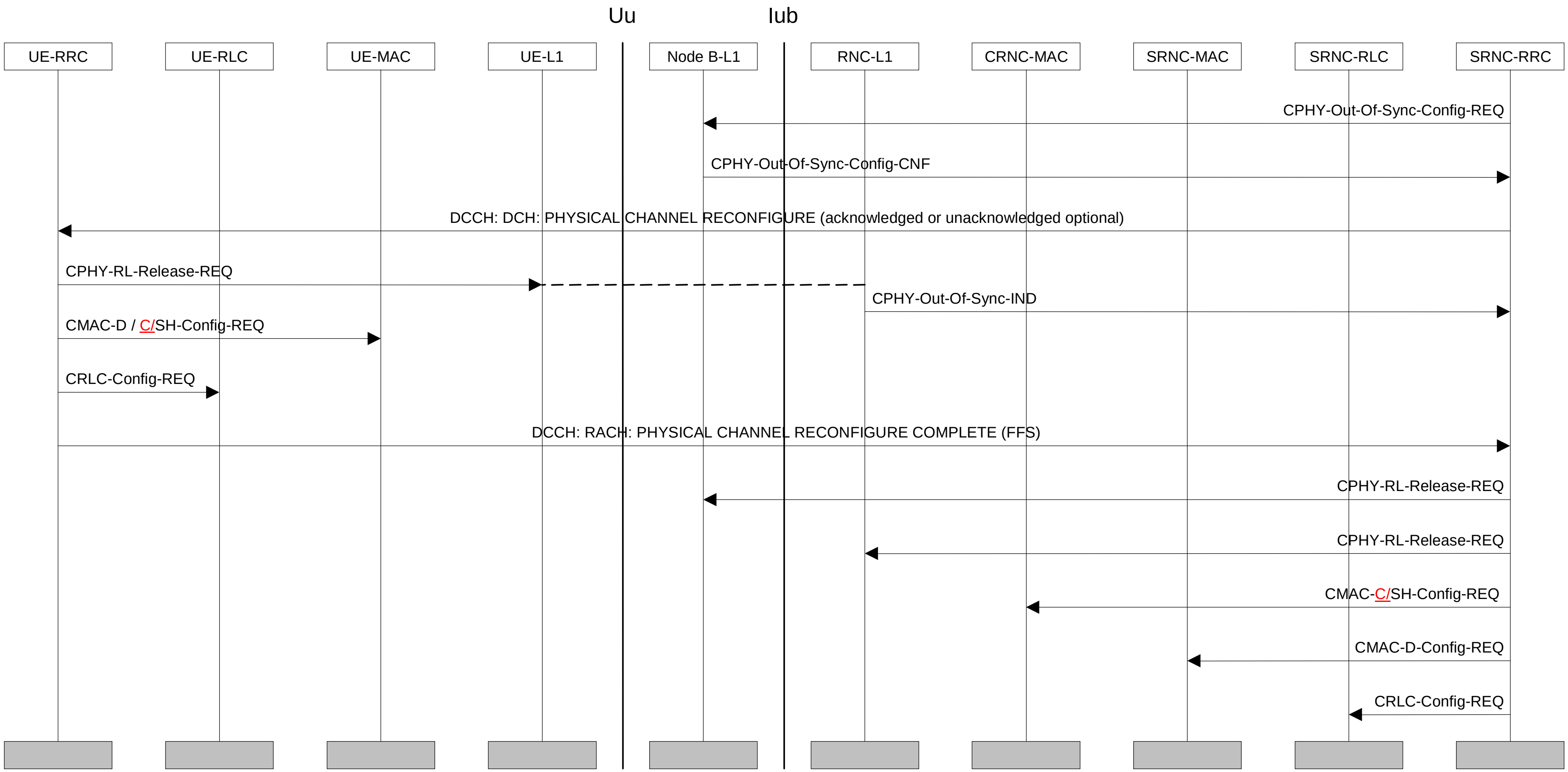


Figure 16: UE-terminated DCH Release

6.3 Data transmission

6.3.1 Acknowledged-mode data transmission in DCH / DCH + DSCH

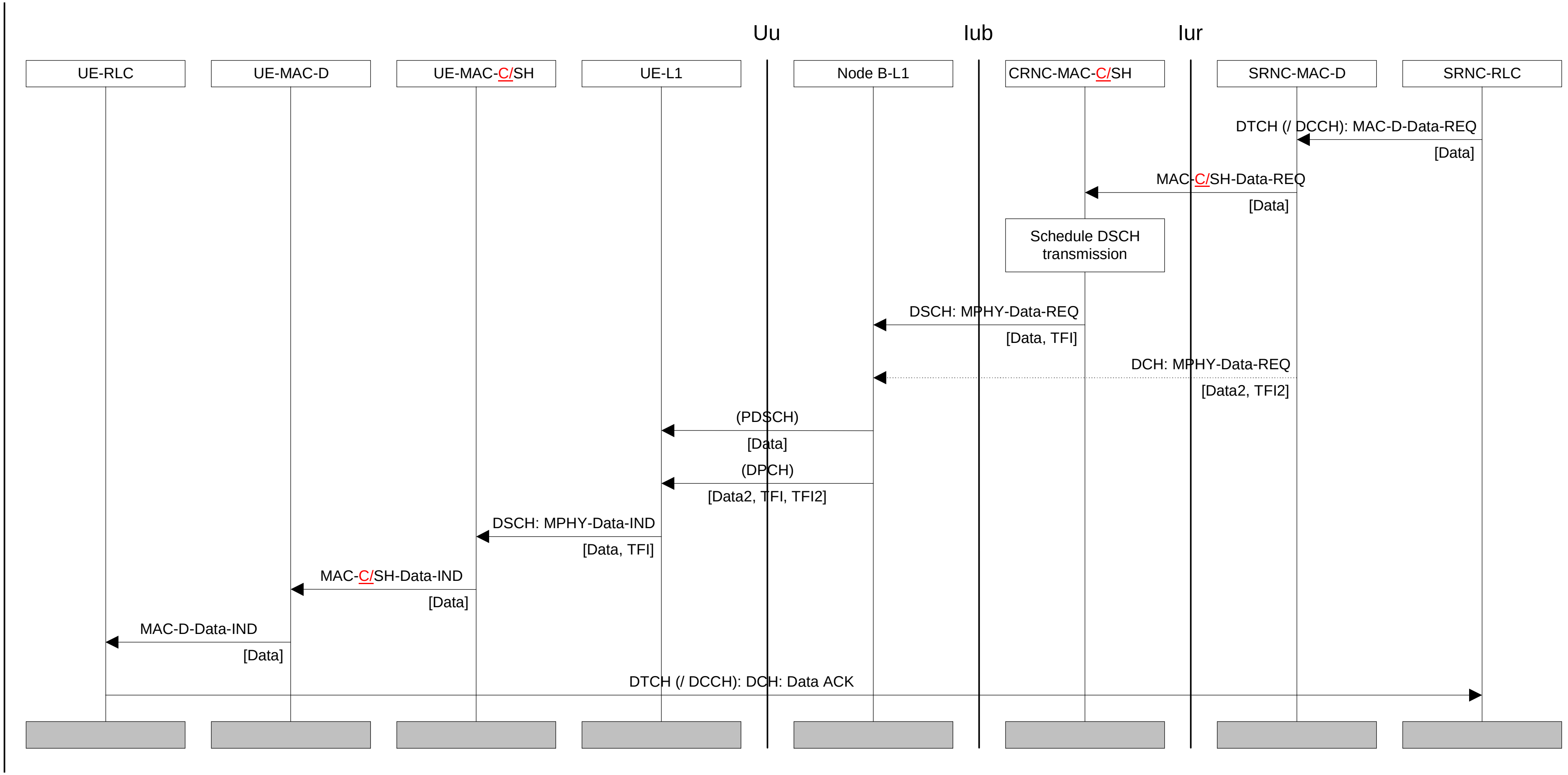


Figure 19: Example of acknowledged-mode data transmission on DSCH

Figure 19 shows an example of acknowledged-mode data transmission on DSCH in the DCH / DCH + DSCH substate. First RLC in SRNC requests data transmission locally from MAC-d. MAC-d routes the request either locally or across the Iur to MAC-c/sh in CRNC, where DSCH transmission scheduling takes place. MAC-c/shSH determines the TFI for the data and requests data transmission across Iub from the physical layer in Node B. At the same time data for an associated dedicated channel may arrive in Node B.

TFI for the DSCH and TFI2 for the DCH are combined in the physical layer and transmitted on the DPCCH (dedicated physical control channel) of the associated DPCH (dedicated physical channel). The DSCH data is transmitted separately on the PDSCH (physical downlink shared channel). TFI is used to decode DSCH data, which is then forwarded through MAC-c/sh and MAC-d to the receiving RLC. An acknowledgement is eventually sent by the UE-RLC mapped to a DCH, unless the DCH is released before the acknowledgement.

6.3.2 Acknowledged-mode data transmission in DCH / DCH + DSCH with one TFCI

[Note: For release-99 this example is only valid in the case where SRNC = CRNC.]

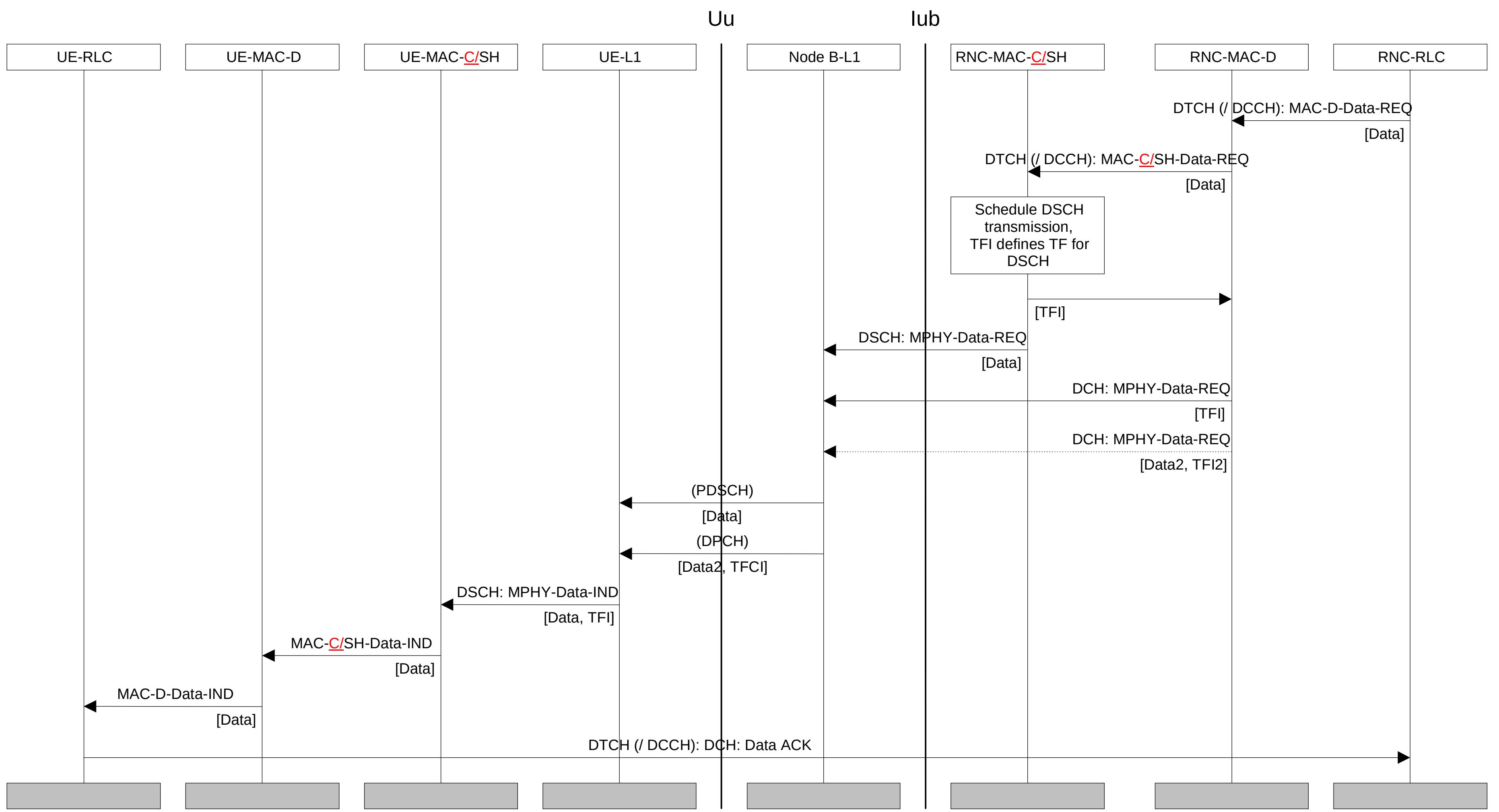


Figure 20: Example of acknowledged-mode data transmission on DSCH

Figure 20 shows an example of acknowledged-mode data transmission on DSCH in the DCH / DCH + DSCH substate. First RLC in SRNC requests data transmission from MAC-d. MAC-d passes the data on to MAC-c/sh, which schedules the DSCH transmission and determines the TFI for the data. The TFI and CFN (connection frame number) for transmission are given back to MAC-d.

MAC-c/sh selects the TFI and transmits the data for DSCH while MAC-d transmits the TFI synchronised with the transmission of any DCH data and TFI:s intended for transmission in the same frame. TFI for the DSCH and TFI2 for the DCH are combined into the same TFCI on the physical layer and transmitted on the DPCCH (dedicated physical control channel) of the associated DPCH (dedicated physical channel). The DSCH data is transmitted separately on the PDSCH (physical downlink shared channel). TFI is used to decode DSCH data, which is then forwarded through MAC-c/sh and MAC-d to the receiving RLC. An acknowledgement is eventually sent by the UE-RLC mapped to a DCH, unless the DCH is released before the acknowledgement.

6.3.3 Acknowledged-mode data transmission in CPCH/FACH

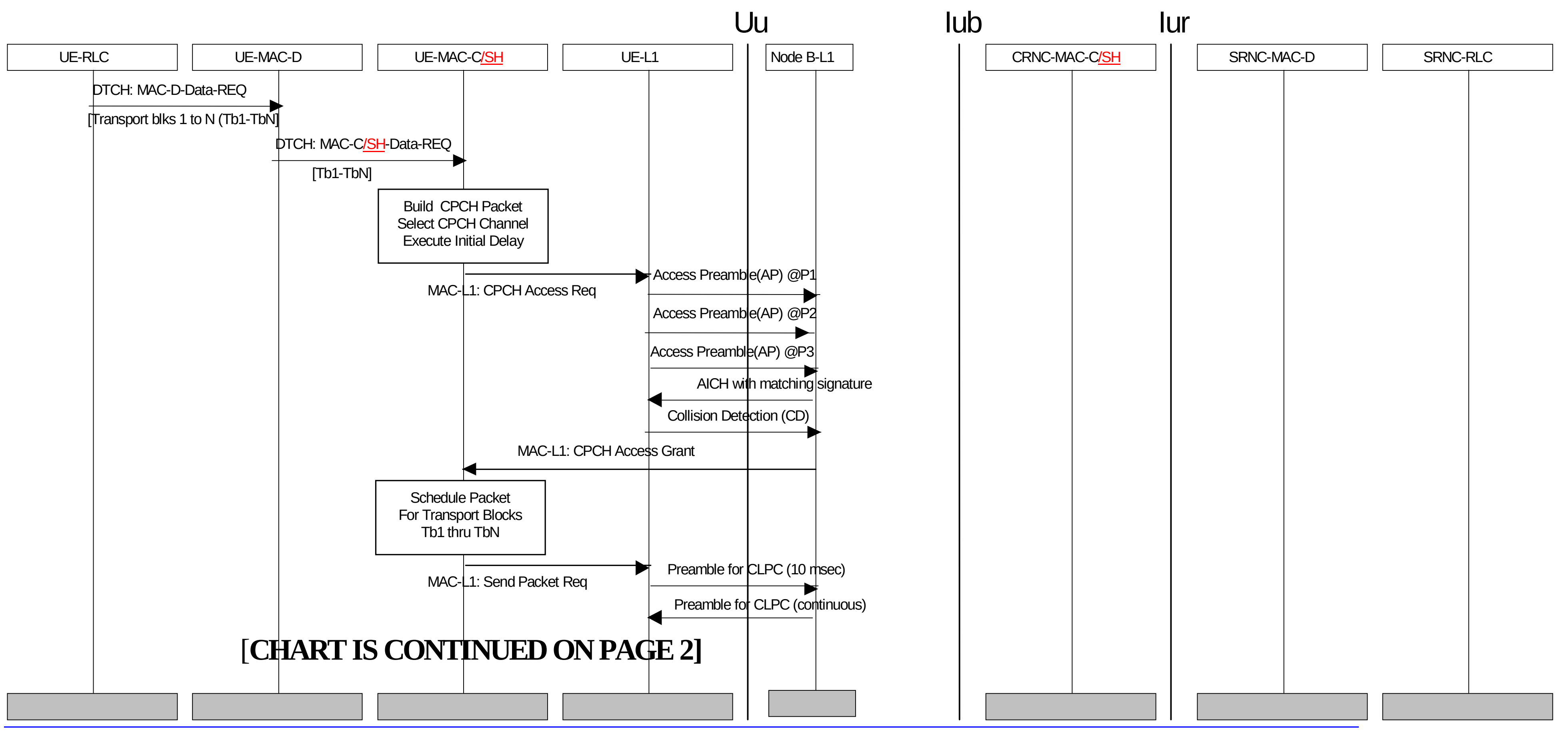


Figure 21: Example of acknowledged-mode data transmission on RACH+CPCH/FACH (page 1 of 2)

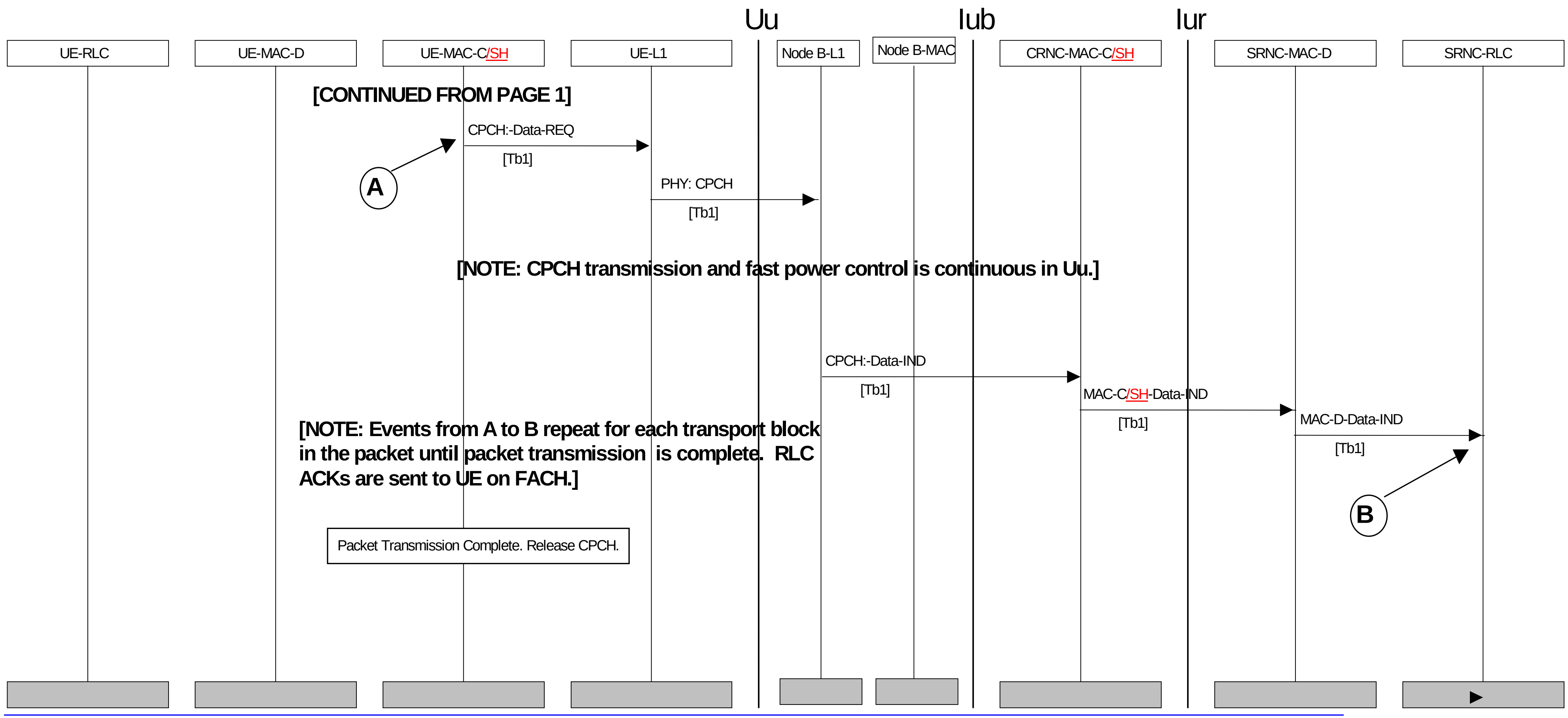
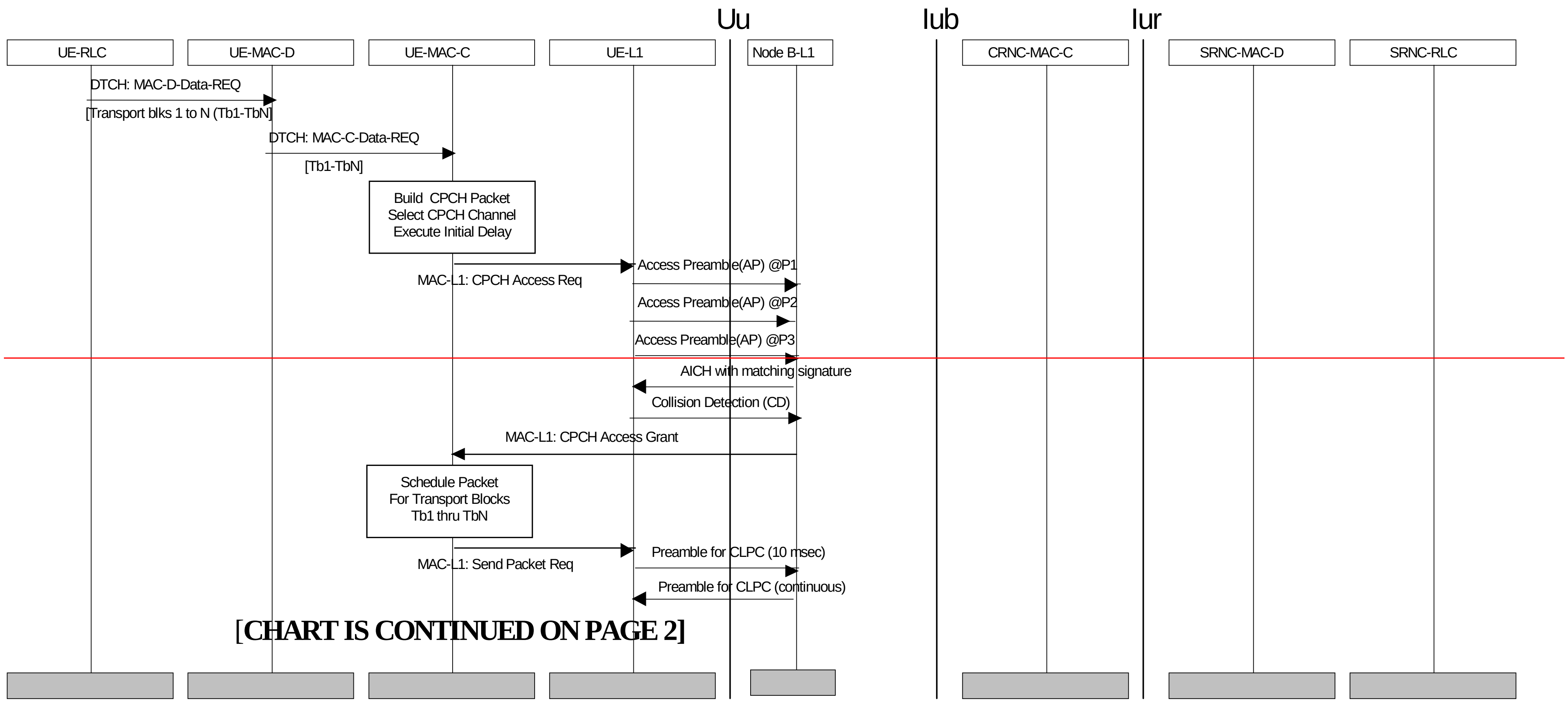


Figure 22: Example of acknowledged-mode data transmission on RACH+CPCH/FACH (page 2 of 2)



[CHART IS CONTINUED ON PAGE 2]

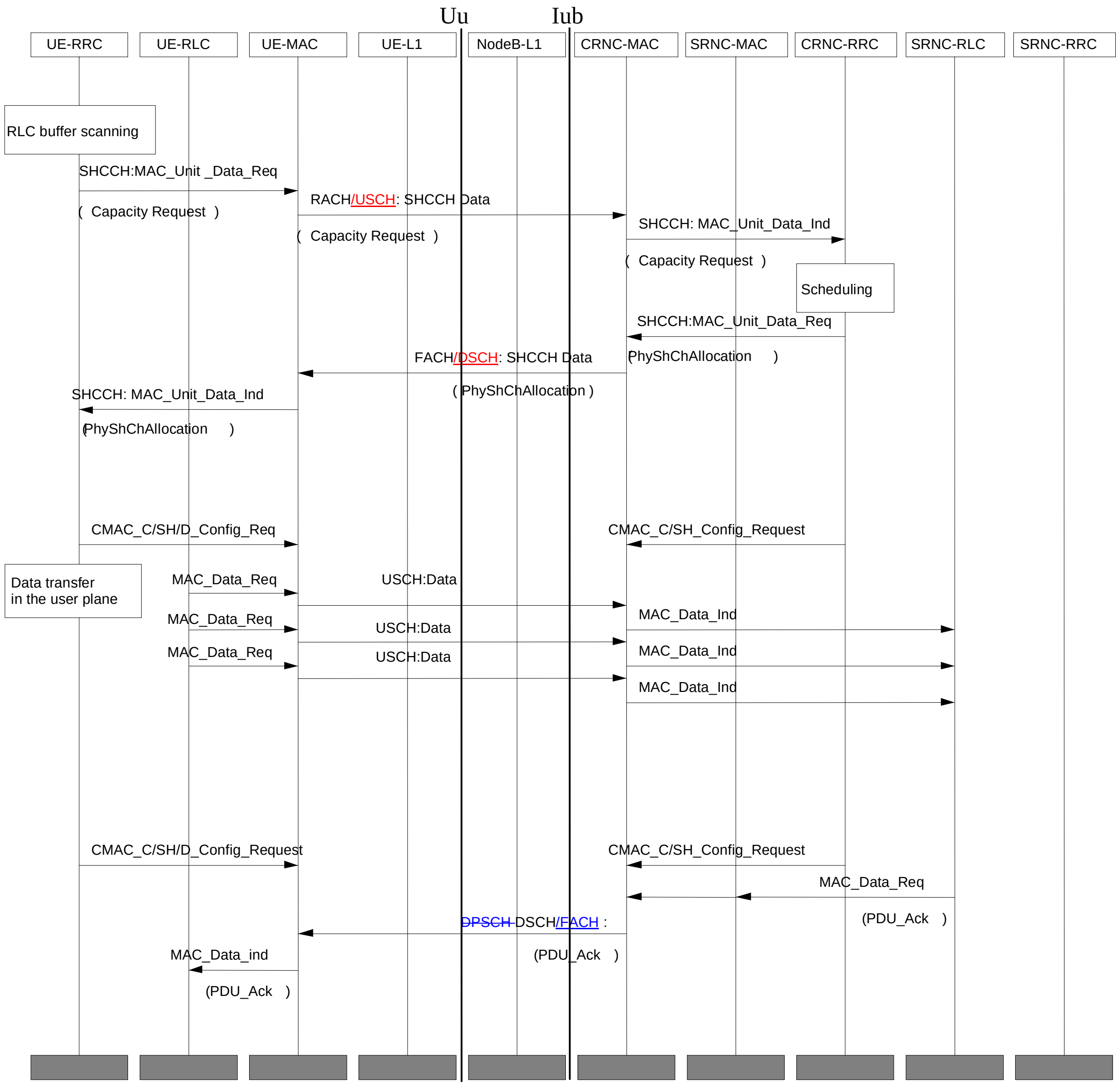
~~Figure 21~~ Figure 21 shows an example of acknowledged-mode data transmission on CPCH while in the RRC Connected state, the RACH+CPCH/FACH substate with CPCH resources assigned to UE (RACH+CPCH/FACH mode). An RB setup has allocated CPCH resources to the logical channel sourcing the data to be transmitted. First RLC in UE requests data transmission locally from MAC-d. MAC-d routes the request to MAC-c/sh, where CPCH packet building is done. When the packet size (bytes in PHY for TFI chosen by MAC-c/sh) is known, MAC-c/sh selects one of the available CPCH channels from the CPCH set it has been assigned to use for this logical channel. Priority access procedure is performed to execute an initial access delay. Then the CPCH access procedure is performed between UE and NB to request and obtain the CPCH for transmission. The CPCH access procedure includes an AP, AICH-ack, CD, and ASSIGN premable messages. When the CPCH channel has been assigned, MAC-c/sh schedules the packet for transmission by L1. [NOTE: if the requested channel could not be assigned, MAC-c/sh may select an alternate CPCH channel which may have lower capacity. If the lower rate CPCH channel were assigned by NB, MAC-c/sh would segment the packet based on the CPCH capacity and schedule only the highest priority packet head. The lower priority packet tail would be saved in a MAC queue for later packet transmission.]

After the 10msec period to close the TPC loops on both the CPCH UL and CPCCH DL, transport blocks are transmitted, frame by frame, unitl all the packet data is sent. SRNC RLC uses the DCCH to send RLC ACKs to the UE RLC using the FACH DL channel.

6.3.4 Data transfer on USCH/DSCH (TDD only)

In Figure 23 a data transfer procedure on USCH/DSCH is presented. It is assumed that the RAB establishment has been performed for example with the RAB Establishment procedure without Dedicated Physical Channel as illustrated in 76.2.1.1.4 and that the RAB is mapped on the USCH and DSCH transport channels.
Use of the USCH is possible with or without an associated DCH.
In the UE the traffic measurement function decides to send a Capacity Request .to the network using the SHCCH logical channel mapped on the RACH or USCH . In the C-RRC the USCH/DSCH scheduling function will decide to allocate physical resources to this logical channel and RRC in C-RNC sends a PhyShChAllocation to its peer entity in the UE. This message specifies the physical resources and the period of time the MAC-c/sh can transfer the data on the USCH transport channel.
Both RRC in the CRNC and the UE configure their respective Layer 1 and MAC for the data transfer on the USCH and at the specified time MAC-c/sh in the UE conveys the data using the specified PUSCH resources.
This operation may be repeated several times till the RLC buffer is empty.
In the diagram it is assumed that the PhyShChAllocation has allocated additionally to the PUSCH resources some PDSCH resources, so that at the time specified in the allocation message both RRC in the CRNC and the UE configure their respective Layer 1 and MAC for the data transfer on the DSCH and at the specified time MAC-c/sh in the UE C-RNC conveys the acknowledgement message of the UTRAN RLC to its UE peer entity using the specified PDSCH resources.
Transmitting the acknowledgement message via FACH is also possible.

Note: The exact content of the message PhyShChAllocation is ffs.



Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
NodeB-L1
CRNC-MAC
SRNC-MAC
CRNC-RRC
SRNC-RLC
SRNC-RRC
RLC buffer scanning
SHCCH:MAC_Unit _Data_Req
(Capacity Request)
RACH/USCH: SHCCH Data
(Capacity Request)
SHCCH: MAC_Unit_Data_Ind
(Capacity Request)
Scheduling
SHCCH:MAC_Unit_Data_Req
(PhyShChAllocation)
FACH/DSCH: SHCCH Data
(PhyShChAllocation)
SHCCH: MAC_Unit_Data_Ind
(PhyShChAllocation)
CMAC_C/SH/D_Config_Req
CMAC_C/SH_Config_Request
Data transfer in the user plane
MAC_Data_Req
USCH:Data
MAC_Data_Ind
MAC_Data_Req
USCH:Data
MAC_Data_Ind
MAC_Data_Req
USCH:Data
MAC_Data_Ind
CMAC_C/SH/D_Config_Request
CMAC_C/SH_Config_Request
MAC_Data_Req
(PDU_Ack)
DPSCH DSCH/FACH :
(PDU_Ack)
MAC_Data_ind
(PDU_Ack)

Figure 23: Data transfer on USCH/DSCH

6.3.5 Data transfer on DSCH (TDD only)

In Figure 24 a data transfer procedure on DSCH is presented. It is assumed that the RB establishment has been performed for example with the RB Establishment procedure without Dedicated Physical Channel as illustrated in 6.2.1.1.4 and that the RB is mapped on the USCH and DSCH transport channels.

Use of the DSCH is possible with or without an associated DCH.

In the C-RRC the USCH/DSCH scheduling function will decide to allocate physical resources in the downlink and RRC in C-RNC sends a PhyShChAllocation message to its peer entity in the UE using SHCCH mapped on the FACH or DSCH. This message specifies the physical resources and the period of time the MAC-c/sh can transfer the data on the DSCH transport channel.

Both RRC in the CRNC and the UE configure their respective Layer 1 and MAC for the data transfer on the DSCH and at the specified time MAC-c/sh in the C-RNC conveys the data using the specified PDSCH resources.

This operation may be repeated several times till the RLC buffer is empty.

In the diagram it is assumed that the PhyShChAllocation has allocated additionally to the PDSCH resources some PUSCH resources, so that at the time specified in the allocation message both RRC in the CRNC and the UE configure their respective Layer 1 and MAC for the data transfer on the USCH and at the specified time MAC-c/sh in the UE conveys the acknowledgement message of the UE to its C-RNC peer entity using the specified PUSCH resources.

Transmitting the acknowledgement message via RACH is also possible.

AC_Data_Ind

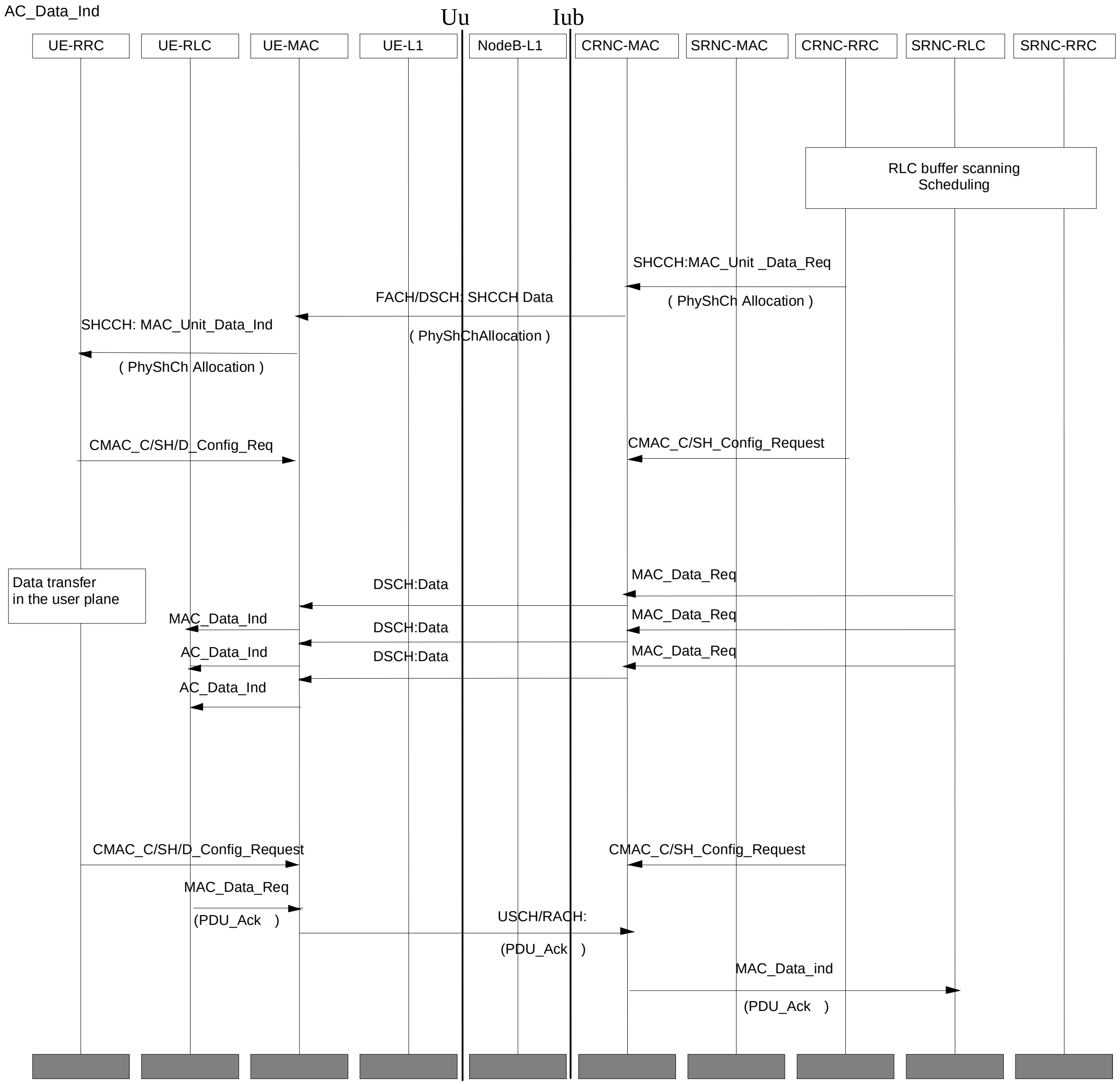

Uu
Iub
UE-RRC
UE-RLC
UE-MAC
UE-L1
NodeB-L1
CRNC-MAC
SRNC-MAC
CRNC-RRC
SRNC-RLC
SRNC-RRC
RLC buffer scanning
Scheduling
SHCCH:MAC_Unit _Data_Req
(PhyShCh Allocation)
FACH/DSCH: SHCCH Data
(PhyShChAllocation)
SHCCH: MAC_Unit_Data_Ind
(PhyShCh Allocation)
CMAC_C/SH/D_Config_Req
CMAC_C/SH_Config_Request
Data transfer
in the user plane
MAC_Data_Req
DSCH:Data
MAC_Data_Ind
MAC_Data_Req
DSCH:Data
AC_Data_Ind
MAC_Data_Req
DSCH:Data
AC_Data_Ind
CMAC_C/SH/D_Config_Request
CMAC_C/SH_Config_Request
MAC_Data_Req
(PDU_Ack)
USCH/RACH:
(PDU_Ack)
MAC_Data_ind
(PDU_Ack)

Figure 24: Data transfer on DSCH

6.4.2 Cell Update

[Note: This example currently applies only in the case of URA change.]

Figure 25 illustrates an example of a cell update procedure.

The cell update procedure is triggered by the cell re-selection function in the UE, which notifies which cell the UE should switch to. The UE reads the broadcast information of the new cell. Subsequently, the UE RRC layer sends a CELL UPDATE message to the UTRAN RRC via the CCCH logical channel and the RACH transport channel. The RACH transmission includes the current S-RNTI and the SRNC Identity.

Upon reception of the CELL UPDATE, the UTRAN registers the change of cell. If the registration is successful it replies with a CELL UPDATE CONFIRM message transmitted on the DCCH/FACH to the UE. The message includes the current S-RNTI and SRNC Identities and it may also include new S-RNTI and / or S-RNTI + SRNC Identities. By using DCCH for the confirm message the contents of the message can be ciphered.

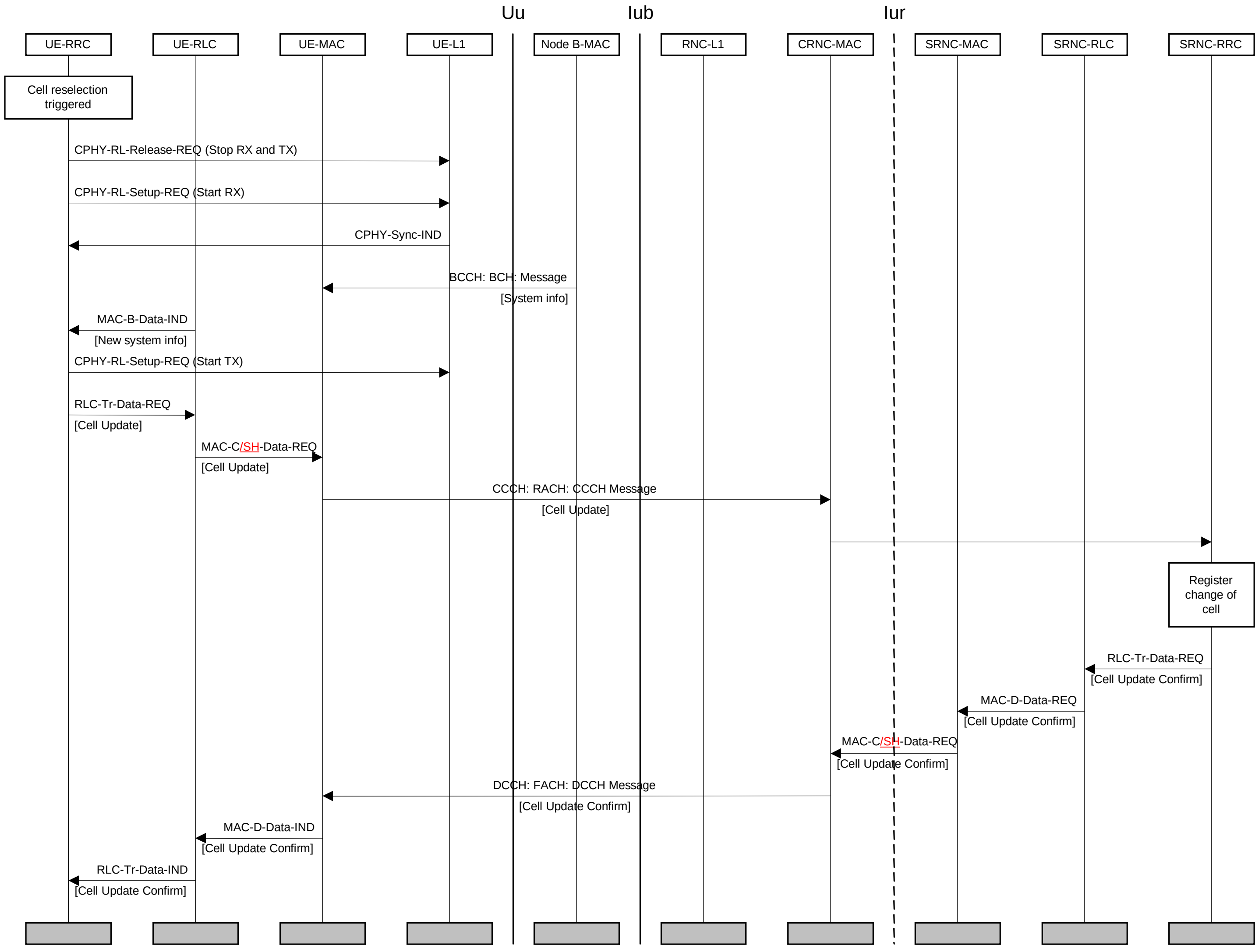
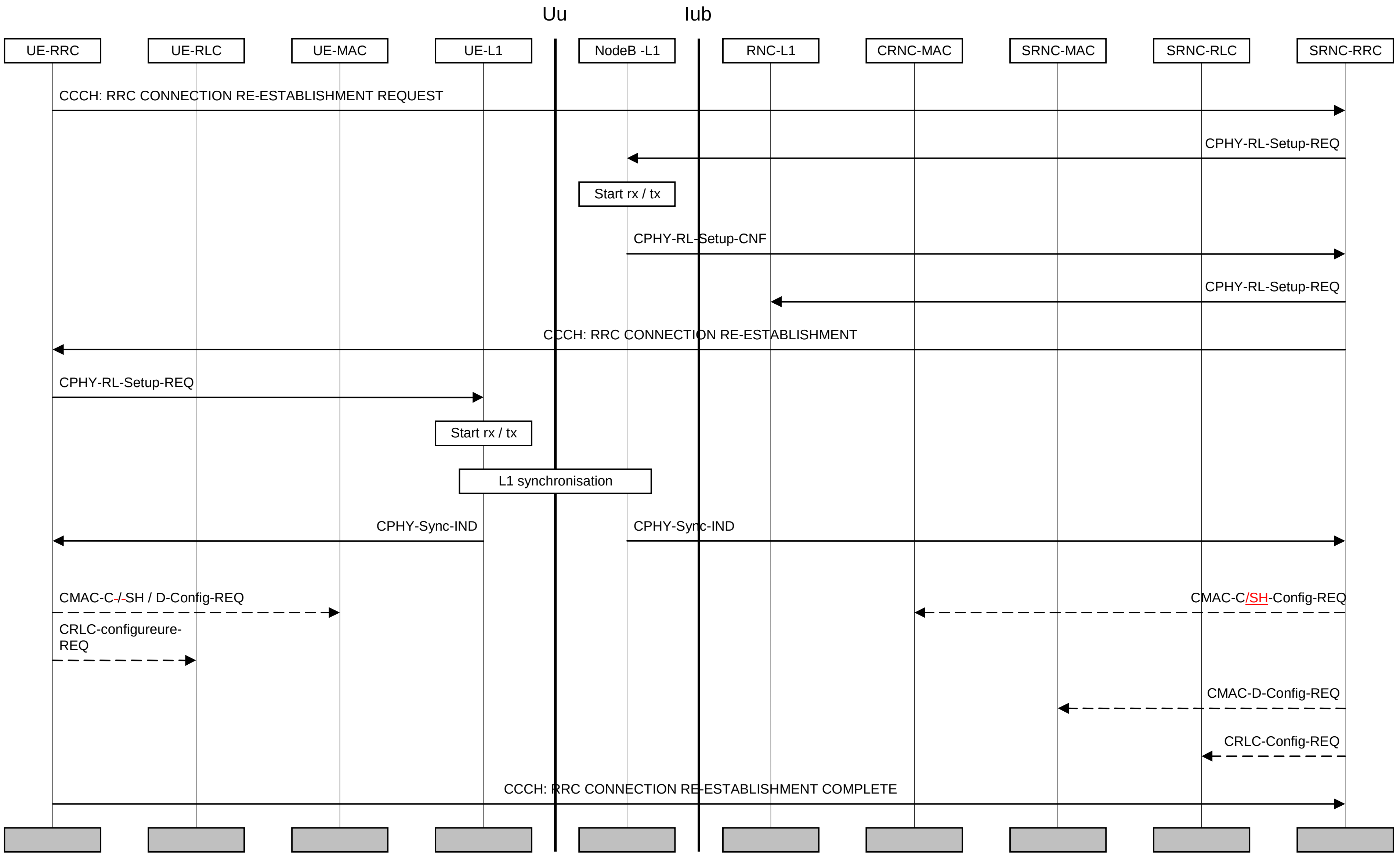


Figure 25: Cell update procedure

6.4.8 RRC Connection re-establishment



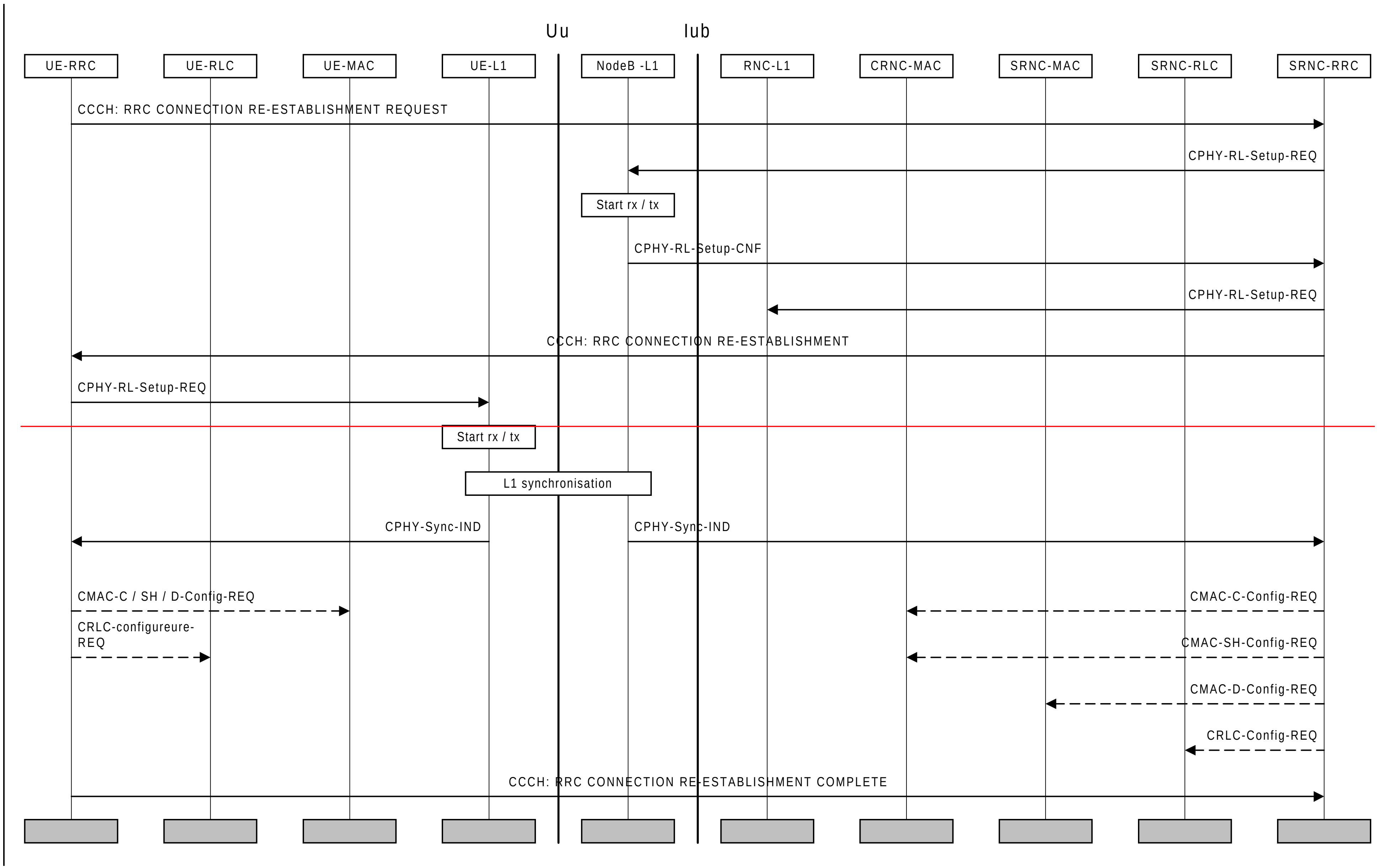
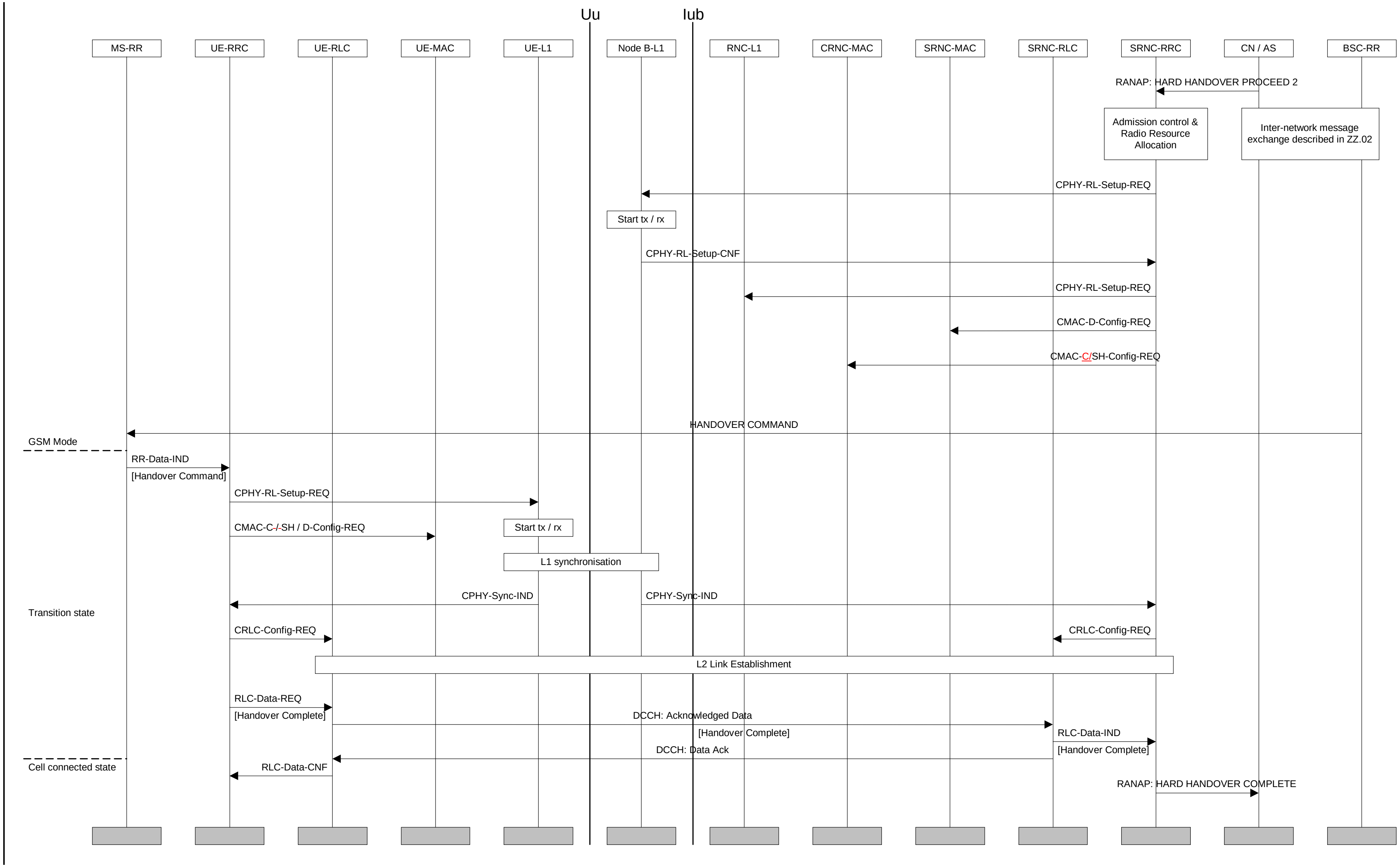


Figure 33: RRC connection re-establishment

Figure 33 shows an example of an RRC connection re-establishment procedure. RRC connection re-establishment is needed, when a UE loses radio connection due to e.g. radio link failure. After having selected a new cell, the UE RRC sends the NW RRC an RRC CONNECTION RE-ESTABLISHMENT REQUEST message. The NW RRC configures the NW and acknowledges the connection re-establishment to the UE RRC with an RRC CONNECTION RE-ESTABLISHMENT message. The UE RRC configures the UE L1 to activate the new radio link(s). After the UE has synchronised to at least one radio link, the MAC and RLC layers can be configured (if necessary).

When the procedure is completed on the UE side, an RRC CONNECTION RE-ESTABLISHMENT COMPLETE message is sent.

6.4.9 Inter-system Handover: GSM/BSS to UTRAN



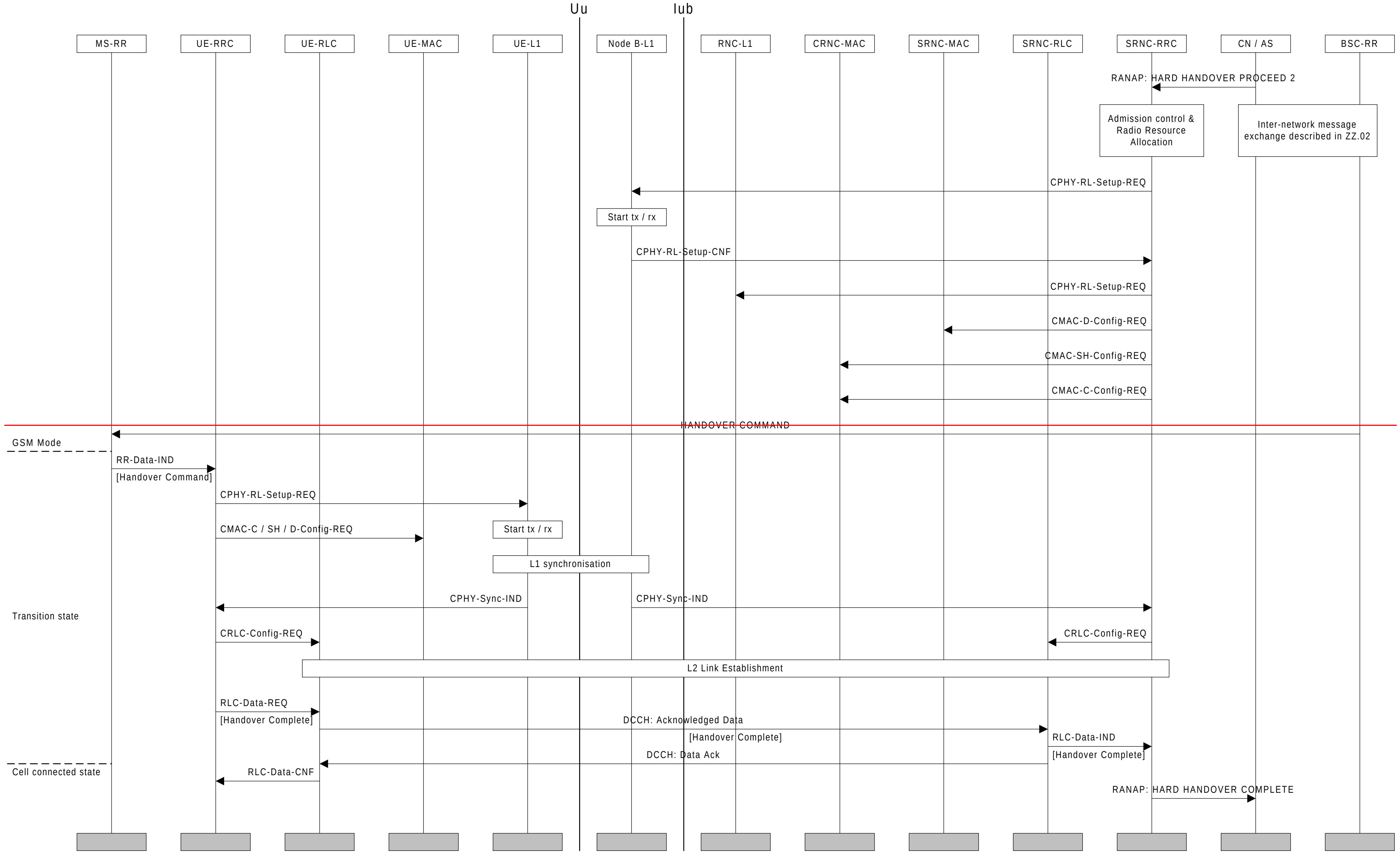


Figure 34: GSM to UMTS inter-system handover

The handover from GSM/BSS to UTRAN for a dual-mode GSM MS / UMTS UE is illustrated in Figure 34. On the network side, upon the reception of a HARD HANDOVER

PROCEED 2 command through the RANAP protocol, the RRC layer performs admission control and radio resource allocation assigning an RNTI for the RRC connection and selecting radio resource parameters (such as transport channel type, transport format sets, etc). RRC configures these parameters on layer 1 and layer 2 to locally establish the DCH logical channel.

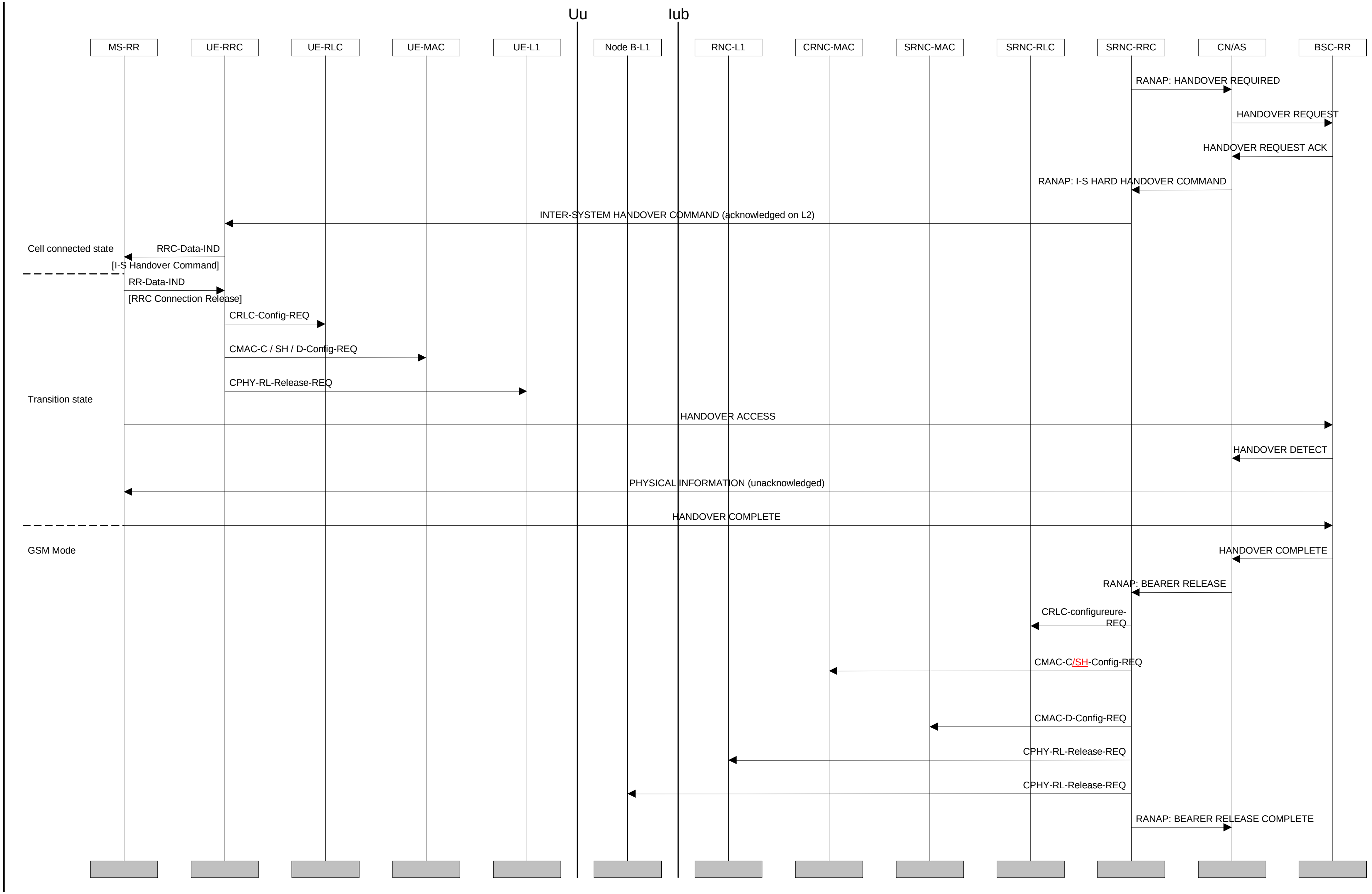
The selected parameters including the RNTI, were previously transmitted to UE via RANAP message HARD HANDOVER PROCEED 1 and GSM upgraded message HANDOVER COMMAND.

Upon reception of the HANDOVER COMMAND message, the GSM RR layer transmits the required parameters to the UMTS RRC layer using an RR-Data-IND primitive. UE RRC configures L1 and L2 using these parameters to locally establish the DCH logical channel. Layer 1 indicates to RRC when it has reached synchronisation. An RLC signalling link establishment is then initiated by the UE. A HANDOVER COMPLETE message is finally sent by the UE.

6.4.10 Inter-System Handover: UTRAN to GSM/BSS, PSTN/ISDN domain services

[Note: The scope of this description is restricted to a UE having a connection only to PSTN/ISDN services, i.e. no simultaneous IP connection]

For PSTN/ISDN domain services UTRAN Inter-System Handover procedure is based on measurement reports from the UE but initiated from the UTRAN. INTER-SYSTEM HANDOVER COMMAND is sent using acknowledged data transfer on the DCCH. The UE transition from UTRAN Connected Mode starts when an INTER-SYSTEM HANDOVER COMMAND is received. The transition to GSM Connected mode is finished when HANDOVER COMPLETE message is sent from the UE.


Uu
Iub
MS-RR
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
CN/AS
BSC-RR
RANAP: HANDOVER REQUIRED
HANDOVER REQUEST
HANDOVER REQUEST ACK
RANAP: I-S HARD HANDOVER COMMAND
INTER-SYSTEM HANDOVER COMMAND (acknowledged on L2)
Cell connected state
RRC-Data-IND
[I-S Handover Command]
RR-Data-IND
[RRC Connection Release]
CRLC-Config-REQ
CMAC-C-/-SH / D-Config-REQ
CPHY-RL-Release-REQ
Transition state
HANDOVER ACCESS
HANDOVER DETECT
PHYSICAL INFORMATION (unacknowledged)
HANDOVER COMPLETE
GSM Mode
HANDOVER COMPLETE
RANAP: BEARER RELEASE
CRLC-configureure-REQ
CMAC-C/SH-Config-REQ
CMAC-D-Config-REQ
CPHY-RL-Release-REQ
CPHY-RL-Release-REQ
RANAP: BEARER RELEASE COMPLETE

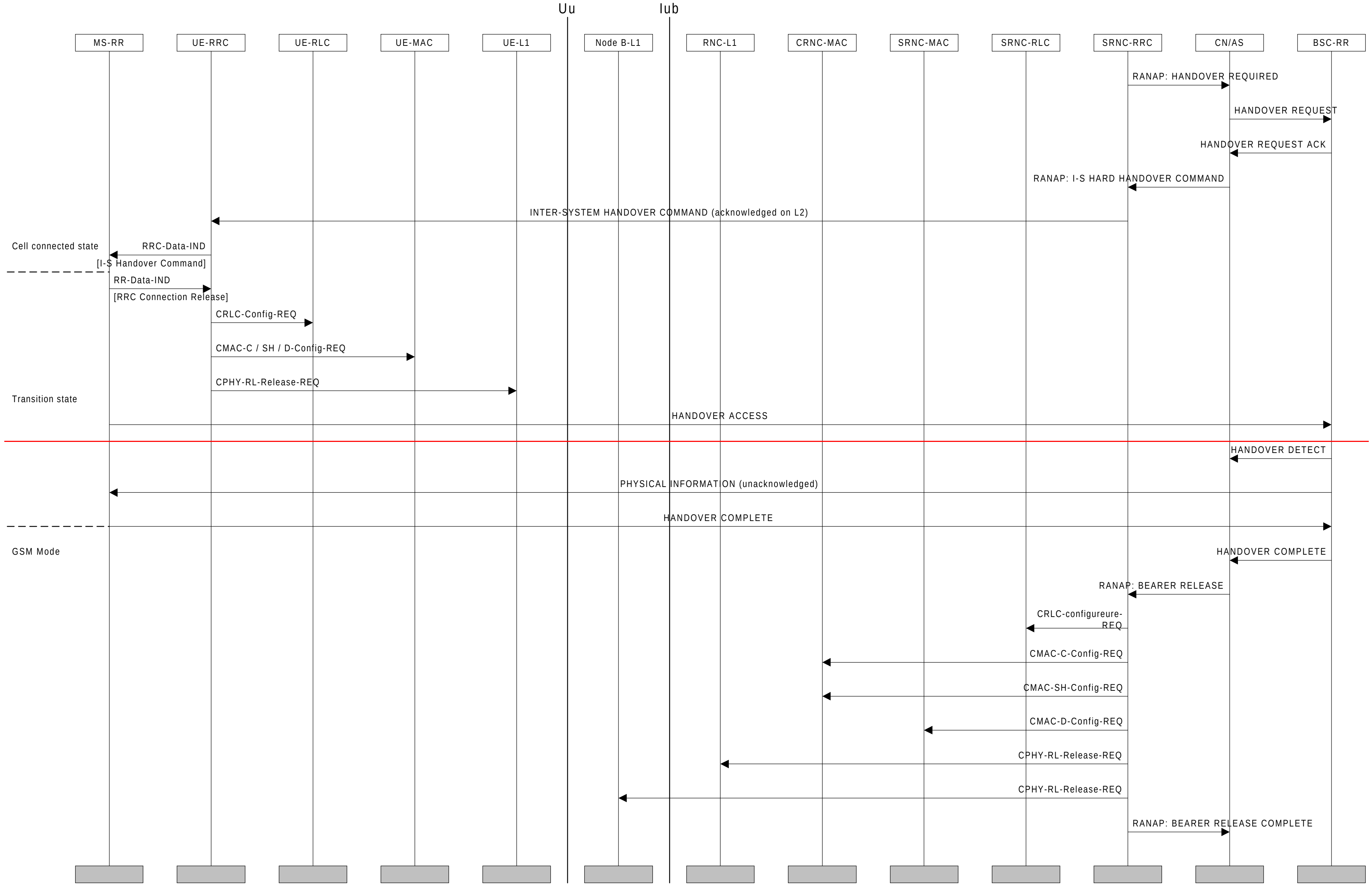

Uu
Iub
MS-RR
UE-RRC
UE-RLC
UE-MAC
UE-L1
Node B-L1
RNC-L1
CRNC-MAC
SRNC-MAC
SRNC-RLC
SRNC-RRC
CN/AS
BSC-RR
RANAP: HANDOVER REQUIRED
HANDOVER REQUEST
HANDOVER REQUEST ACK
RANAP: I-S HARD HANDOVER COMMAND
INTER-SYSTEM HANDOVER COMMAND (acknowledged on L2)
Cell connected state
RRC-Data-IND
[I-S Handover Command]
RR-Data-IND
[RRC Connection Release]
CRLC-Config-REQ
CMAC-C / SH / D-Config-REQ
CPHY-RL-Release-REQ
Transition state
HANDOVER ACCESS
HANDOVER DETECT
PHYSICAL INFORMATION (unacknowledged)
HANDOVER COMPLETE
GSM Mode
HANDOVER COMPLETE
RANAP: BEARER RELEASE
CRLC-configureure-REQ
CMAC-C-Config-REQ
CMAC-SH-Config-REQ
CMAC-D-Config-REQ
CPHY-RL-Release-REQ
CPHY-RL-Release-REQ
RANAP: BEARER RELEASE COMPLETE

Figure 35: UMTS to GSM inter-system handover

UTRAN sends a HANDOVER REQUIRED to CN/AS. This message contains information needed for the GSM system to be able to perform a handover (e.g. serving cell, target cell). Some parts of this information (e.g. MS classmark) have been obtained at call setup of the UTRAN Connection and are stored in CN.

The CN/AS sends a HANDOVER REQUEST message to BSC-RR allocating the necessary resources to be able to receive the GSM MS and acknowledge this by sending HANDOVER REQUEST ACKNOWLEDGE to CN/AS. The HANDOVER REQUEST ACKNOWLEDGE contains all radio-related information that the UE needs for the handover.

CN/AS sends a INTER-SYSTEM HANDOVER COMMAND (type UTRAN-to-BSS HARD HANDOVER) to the UE to start the execution of the handover. This message contains all the information needed for the UE to be able to switch to the GSM cell and perform a GSM handover.

Upon reception of the HANDOVER COMMAND message, UMTS RRC forwards the handover mparameters to the GSM RR layer using an RRC-Data-IND primitive. To release the resources from UMTS the RR layer transmits to the UMTS RRC an RRC Connection Release message using an RR-Data-IND primitive. The RRC layer can then locally release the resources on the RLC, MAC and physical layers of the UE.

After having switched to the assigned GSM channel received in the INTER-SYSTEM HANDOVER COMMAND, the GSM MS sends HANDOVER ACCESS in successive layer 1 frames, just as it typically would have done for a conventional GSM handover initiation.

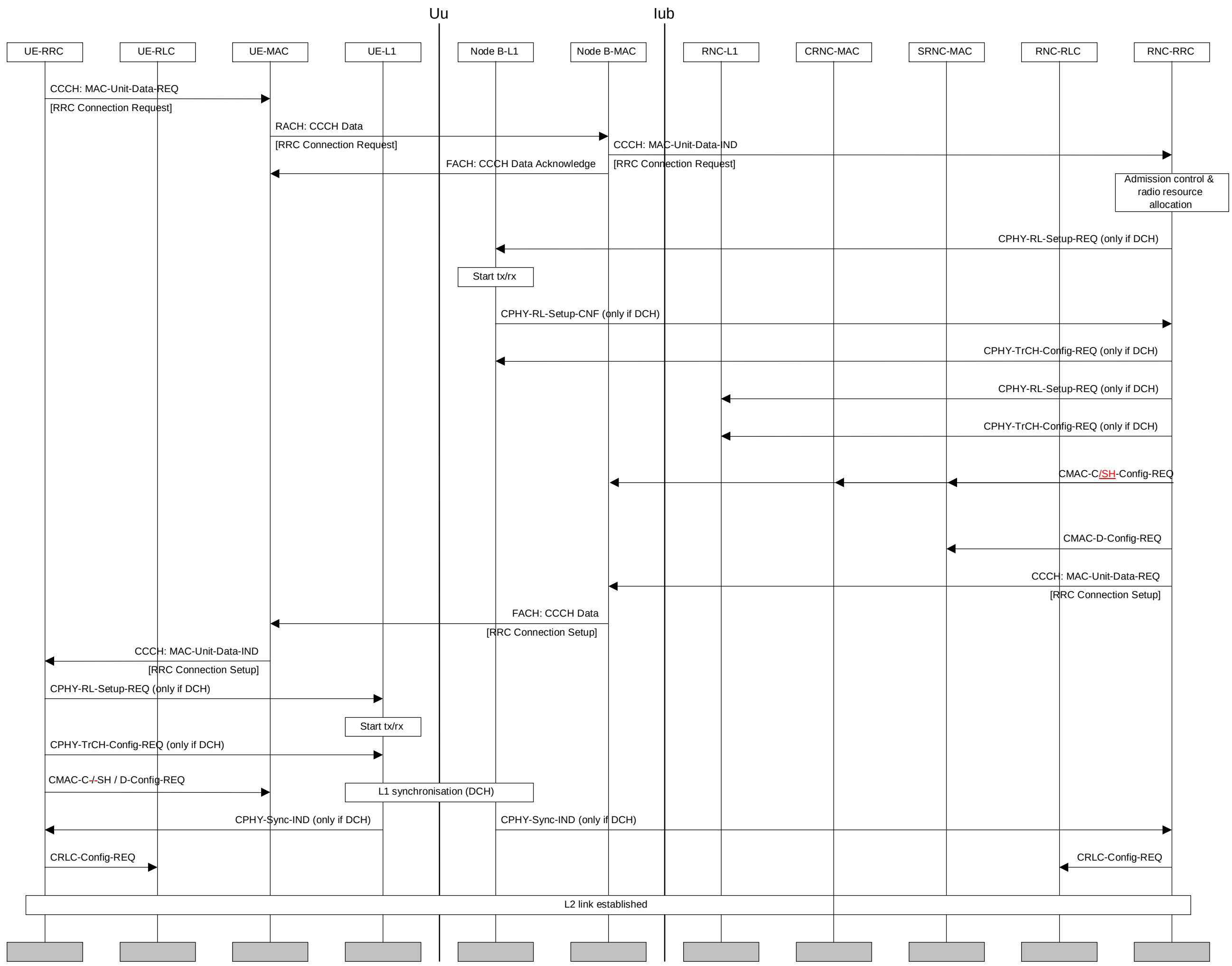
When the BSC-RR has received the HANDOVER ACCESS it indicates this to the CN/AS by sending a HANDOVER DETECT message. The BSC-RR sends a PHYSICAL INFORMATION message to the GSM MS in unacknowledged mode that contains various fields of physical layer -related information allowing a proper transmission by the MS.

After layer 1 and 2 connections are successfully established, the GSM MS returns the HANDOVER COMPLETE message.

CN/AS is then able to release the UTRAN resources that were used for the UE in UTRAN Connected Mode. The CN/AS send a BEARER RELEASE command to UTRAN, after which UTRAN can release all NW resources from RLC, MAC and the physical layer. When the release operation is complete, a BEARER RELEASE COMPLETE message is sent to CN / AS.

Annex A (informative): RRC Connection Establishment - Case C

This protocol termination case has been excluded from the initial UMTS release, thus the procedure is captured here for information.



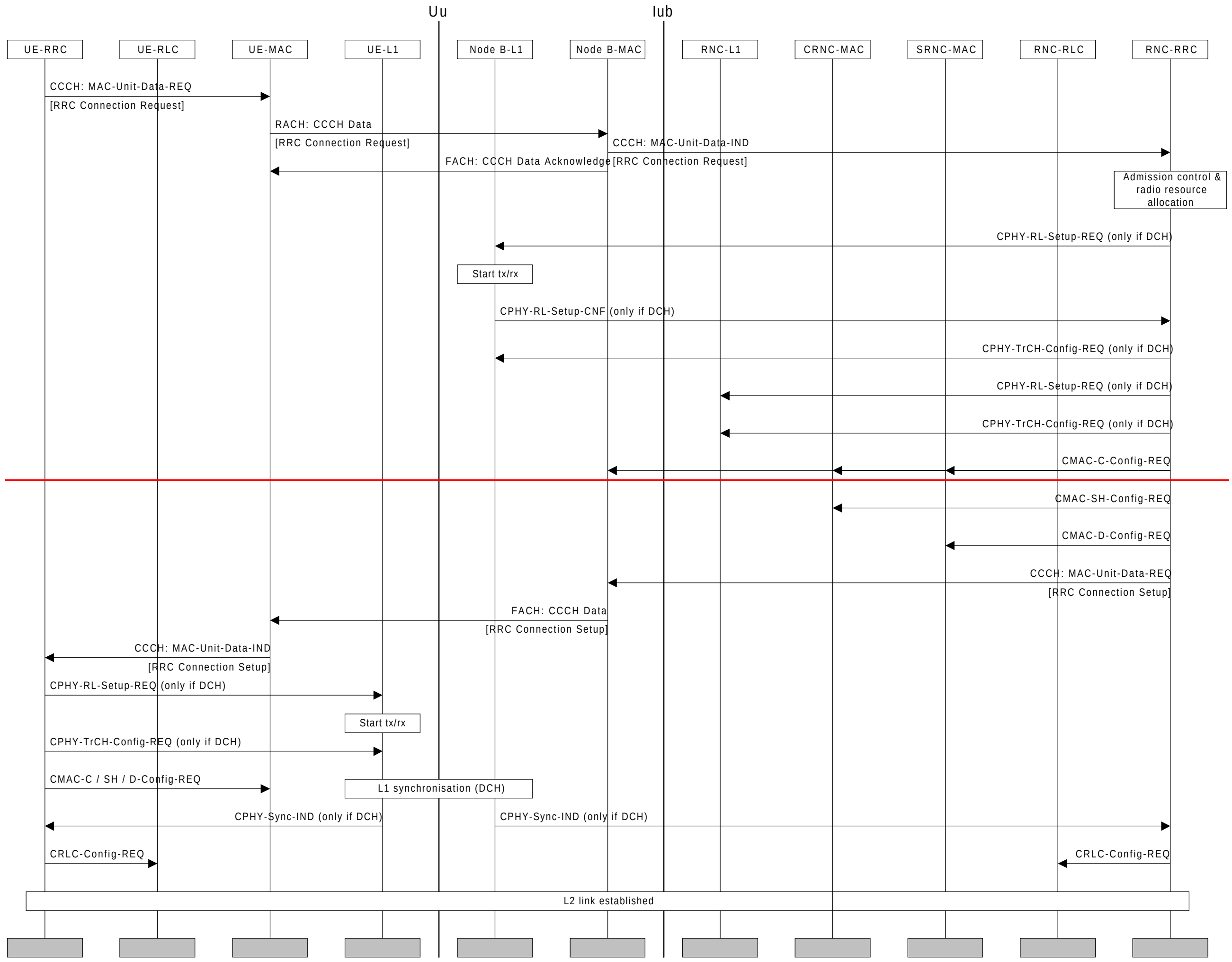


Figure 42: RRC connection establishment with common channel termination case C

The difference between case A and case C common channel termination points is that in case C RACH and FACH transport channels are terminated in Node B. An Access Acknowledgement message is sent from Node B to the UE to acknowledge the reception of the Access request. Similarily, the Access Grant message from the network is transmitted via the Node-B MAC.