TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3) **TSGR2#6(99)769**

Sophia Antipolis 16th to 20th August 1999

Agenda Item:

Source: Bosch

Title: CR to 25.301 on L3CE

Document for: Discussion and Decision

3GPP TSG-RAN meeting #5 *Document* ***RP-99???***

Korea, 6-8 October 1999

3G CHANGE REQUEST

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

TS 25.301	**CR**	**??**	Current Version: 3.1.0
3G specification number ↑		*↑ CR number as allocated by 3G support team*	

For submision to TSG RAN#5	for approval	X	*(only one box should*
list TSG meeting no. here ↑	for information		*be marked with an X)*

Form: 3G CR cover sheet, version 1.0 The latest version of this form is available from: ftp://ftp.3gpp.org/Information/3GCRF-xx.rtf

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

Source: TSG-RAN WG2 **Date:** 16/08/99

Subject: Introduction of L3CE layer in the protocol architecture

3G Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in a 2G specification	
B	Addition of feature	X
C	Functional modification of feature	
D	Editorial modification	

Reason for change: Following the decission to drop the LLC sublayer for UMTS a new sublayer (L3CE) is included in the access stratum u-plane (layer 3) to provide header compression for packet data.

Clauses affected: 3.2, 5.1, 5.4, 5.6

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other 2G 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:

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3 Definitions and Abbreviations

3.1 Definitions

See [3] for a definition of fundamental concepts and vocabulary.

3.2 Abbreviations

ARQ	Automatic Repeat Request
BCCH	Broadcast Control Channel
BCH	Broadcast Channel
C-	Control-
CC	Call Control
CCCH	Common Control Channel
CCH	Control Channel
CCTrCH	Coded Composite Transport Channel
CN	Core Network
CPCH	Common Packet channel
CRC	Cyclic Redundancy Check
CTCH	Common Traffic Channel
DC	Dedicated Control (SAP)
DCA	Dynamic Channel Allocation
DCCH	Dedicated Control Channel
DCH	Dedicated Channel
DL	Downlink
DRNC	Drift Radio Network Controller
DSCH	Downlink Shared Channel
DTCH	Dedicated Traffic Channel
FACH	Forward Link Access Channel
FAUSCH	Fast Uplink Signalling Channel
FCS	Frame Check Sequence
FDD	Frequency Division Duplex
GC	General Control (SAP)
HO	Handover

ITU	International Telecommunication Union
kbps	kilo-bits per second
L1	Layer 1 (physical layer)
L2	Layer 2 (data link layer)
L3	Layer 3 (network layer)
L3CE	Layer 3 Compatibility Entity
LAC	Link Access Control
LAI	Location Area Identity
MAC	Medium Access Control
MM	Mobility Management
Nt	Notification (SAP)
OCCCH	ODMA Common Control Channel
ODCCH	ODMA Dedicated Control Channel
ODCH	ODMA Dedicated Channel
ODMA	Opportunity Driven Multiple Access
ORACH	ODMA Random Access Channel
ODTCH	ODMA Dedicated Traffic Channel
PCCH	Paging Control Channel
PCH	Paging Channel
PDU	Protocol Data Unit
PU	Payload Unit
PHY	Physical layer
PhyCH	Physical Channels
RAB	Radio Access Bearer
RACH	Random Access Channel
RLC	Radio Link Control
RNC	Radio Network Controller
RNS	Radio Network Subsystem
RNTI	Radio Network Temporary Identity
RRC	Radio Resource Control
SAP	Service Access Point
SCCH	Synchronization Control Channel
SCH	Synchronization Channel
SDU	Service Data Unit

SRNC	Serving Radio Network Controller
SRNS	Serving Radio Network Subsystem
TCH	Traffic Channel
TDD	Time Division Duplex
TFCI	Transport Format Combination Indicator
TFI	Transport Format Indicator
TMSI	Temporary Mobile Subscriber Identity
TPC	Transmit Power Control
U-	User-
UE	User Equipment
UE_R	User Equipment with ODMA relay operation enabled
UL	Uplink
UMTS	Universal Mobile Telecommunications System
URA	UTRAN Registration Area
USCH	Uplink Shared Channel
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network

4 Assumed UMTS Architecture

Figure 1 shows the assumed UMTS architecture as outlined in TS 23.110 [1]. The figure shows the UMTS architecture in terms of its entities User Equipment (UE), UTRAN and Core Network. The respective reference points Uu (Radio Interface) and Iu (CN-UTRAN interface) are shown. The figure illustrates furthermore the high-level functional grouping into the Access Stratum and the Non-Access Stratum.

The Access Stratum offers services through the following Service Access Points (SAP) to the Non-Access Stratum:

- General Control (GC) SAPs,
- Notification (Nt) SAPs and
- Dedicated Control (DC) SAPs

The SAPs are marked with circles in Figure 1. The services provided to the non-access stratum by the GC, Nt, and DC SAPs, from a radio interface protocol perspective, are assumed to be provided by the Radio Resource Control (RRC) to the higher protocol layer. It is however assumed that at the network side, the RRC layer terminates in the UTRAN (cf. Sec. 5.1).

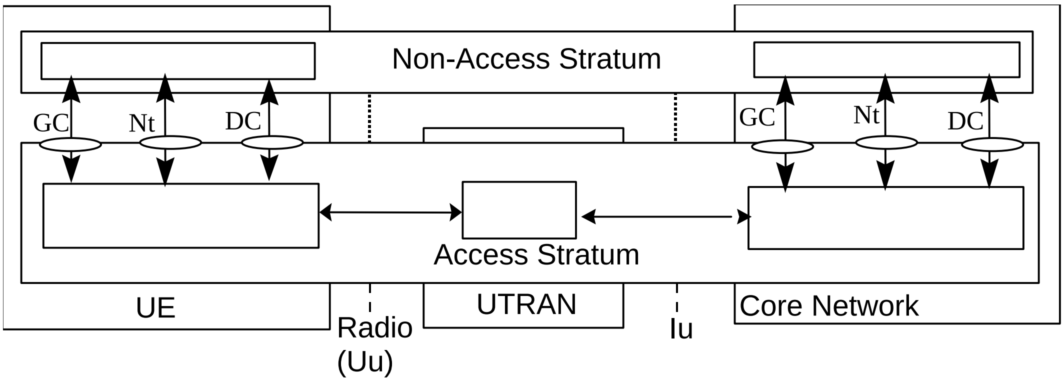


Figure 1: Assumed UMTS Architecture

5 Radio interface protocol architecture

5.1 Overall protocol structure

The radio interface is layered into three protocol layers:

- the physical layer (L1),
- the data link layer (L2),
- network layer (L3).

Layer 2 is split into two sublayers, Radio Link Control (RLC) and Medium Access Control (MAC).

Layer 3 and RLC are divided into Control (C-) and User (U-) planes.

In the C-plane, Layer 3 is partitioned into sublayers where the lowest sublayer, denoted as Radio Resource Control (RRC), interfaces with layer 2. The higher layer signalling such as Mobility Management (MM) and Call Control (CC) are assumed to belong to the non-access stratum, and therefore not in the scope of 3GPP TSG RAN.

In the U-plane data may be transfered through the Layer 3 Compatibility Entity (L3CE) to or from RLC. On the general level, the protocol architecture is similar to the current ITU-R protocol architecture, ITU-R M.1035.

Figure 2 shows the radio interface protocol architecture. Each block in Figure 2 represents an instance of the respective protocol. Service Access Points (SAP) for peer-to-peer communication are marked with circles at the interface between sublayers. The SAP between MAC and the physical layer provides the transport channels (cf. Sec. **Error! Reference source not found.**). The SAPs between RLC and the MAC sublayer provide the logical channels (cf. Sec. **Error! Reference source not found.**). In the C-plane, the interface between RRC and higher L3 sublayers (CC, MM) is defined by the General Control (GC), Notification (Nt) and Dedicated Control (DC) SAPs.

Also shown in the figure are connections between RRC and MAC as well as RRC and L1 providing local inter-layer control services. An equivalent control interface exists between RRC and the RLC sublayer. These interfaces allow the RRC to control the configuration of the lower layers. For this purpose separate Control SAPs are defined between RRC and each lower layer (RLC, MAC, and L1). It is assumed that for RLC and MAC one Control SAP each is provided per UE.

[Note1: Control of RLC entities in C and U planes needs to be clarified further. Also, the multiplicity of Control SAPs (necessity of one SAP per UE) at the UTRAN side may need to be reconsidered.]

{Note2: Whether a separate Control SAP between RRC and L3CE is necessary is to be decided]

The RLC sublayer provides ARQ functionality closely coupled with the radio transmission technique used. There is no difference between RLC instances in C and U planes.

The UTRAN can be requested by the CN to prevent all loss of data (i.e. independently of the handovers on the radio interface), as long as the Iu connection point is not modified. This is a basic requirement to be fulfilled by the UTRAN retransmission functionality as provided by the RLC sublayer.

However, in case of the Iu connection point is changed (e.g. SRNS relocation, streamlining), the prevention of the loss of data may not be guaranteed autonomously by the UTRAN but would rely on some functions in the CN. In this case, a mechanism to achieve the requested QoS may require support from the CN. Such mechanisms to protect from data loss due to SRNS relocation or streamlining are for further study.

[Note: Such mechanisms need to be specified jointly with 3GPP TSGs CN and SA. The implied functionality would be applied in the U plane. Applicability in the C plane is for further study.]

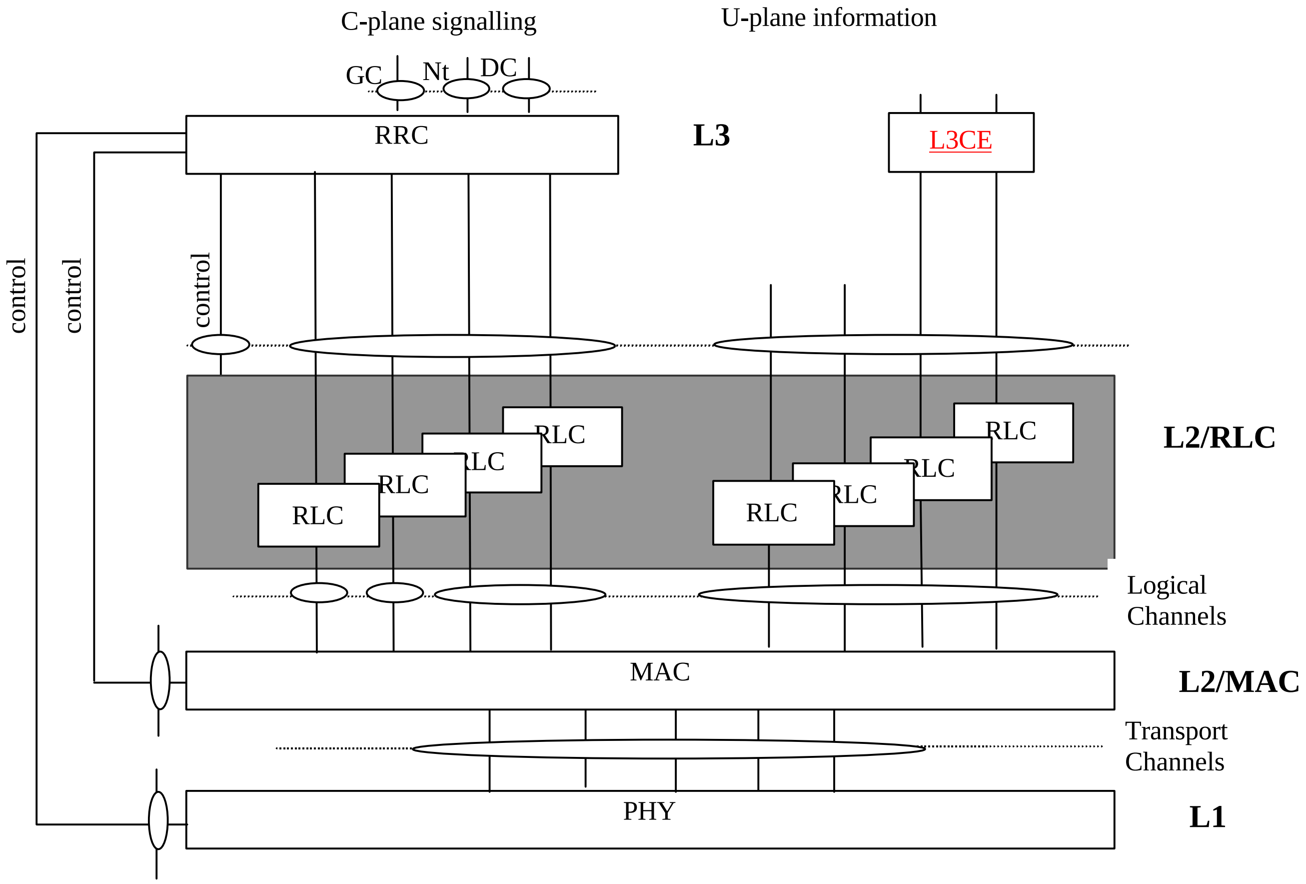


Figure 2: Radio Interface protocol architecture (Service Access Points marked by circles)

5.1.1 Service access points and service primitives

Each layer provides services at Service Access Points (SAPs). A service is defined by a set of service primitives (operations) that a layer provides to upper layer(s).

Control services, allowing the RRC layer to control lower layers locally (i.e. not requiring peer-to-peer communication) are provided at Control SAPs (C-SAP). Note that C-SAP primitives can bypass one or more sublayers, see Figure 2.

In the radio interface protocol specifications, the following naming conventions for primitives shall be applicable:

- Primitives provided by SAPs between adjacent layers shall be prefixed with the name of the service-providing layer, i.e. PHY, MAC, ~~or~~ RLC or L3CE.
- Primitives provided by Control SAPs, in addition to the name of the service-providing layer, shall be prefixed with a "C", i.e. CPHY, CMAC or CRLC.

This principle leads to the following notations, where <Type> corresponds to request, indication, response or confirm type of primitives:

Primitives between PHY and MAC:
PHY- <Generic name> – <Type>

Primitives between PHY and RRC (over C-SAP):
CPHY- <Generic name> - <Type>

Primitives between MAC and RLC:
MAC- <Generic name> - <Type>

Primitives between MAC and RRC (over C-SAP):
CMAC- <Generic name> - <Type>

Primitives between RLC and non-access stratum, ~~and~~ between RLC and RRC for data transfer and between RLC and L3CE :
RLC- <Generic name> - <Type>

Primitives between RLC and RRC for control of RLC (over C-SAP):
CRLC- <Generic name> – <Type>

Primitives between L3CE and non-access stratum:
L3CE- <Generic name> - <Type>

5.4 Layer 3 - ~~RRC~~ Services and Functions

5.4.1 RRC Services and Functions

This sections provides an overview on services and functions provided by the RRC layer. A detailed description of the RRC protocol is given in 3GPP TS 25.331 [9]. Examples of structured procedures involving RRC in Idle Mode and Connected Mode are described in 3GPP TS 25.303 [5] and 3GPP TS 25.304 [6], respectively.

~~5.4.1~~5.4.1.1 RRC services

~~5.4.1.1~~5.4.1.1.1 General Control

The GC SAP provides an information broadcast service. This service broadcasts information to all UEs in a certain geographical area. The basic requirements from such service are:

- It should be possible to broadcast non-access stratum information in a certain geographical area.
- The information is transferred on an unacknowledged mode link. Unacknowledged mode means that the delivery of the broadcast information can not be guaranteed (typically no retransmission scheme is used). It seems reasonable to use an unacknowledged mode link since the information is broadcast to a lot of UEs and since broadcast information often is repeated periodically.
- It should be possible to do repeated transmissions of the broadcast information (how it is repeated is controlled by the non-access stratum).
- The point where the UE received the broadcast information should be included, when the access stratum delivers broadcast information to the non-access stratum.

~~5.4.1.2~~5.4.1.1.2 Notification

The Nt SAP provides paging and notification broadcast services. The paging service sends information to a specific UE(s). The information is broadcast in a certain geographical area but addressed to a specific UE(s). The basic requirements from such service are:

- It should be possible to broadcast paging information to a number of UEs in a certain geographical area.
- The information is transferred on an unacknowledged mode link. It is assumed that the protocol entities in non-access stratum handle any kind of retransmission of paging information.

The notification broadcast service broadcasts information to all UEs in a certain geographical. The basic requirements from this service are typically the same as for the information broadcast service of the GC SAP:

- It should be possible to broadcast notification information in a certain geographical area.
- The information is transferred on an unacknowledged mode link.

~~5.4.1.3~~5.4.1.1.3 Dedicated Control

The DC SAP provides services for establishment/release of a connection and transfer of messages using this connection. It should also be possible to transfer a message during the establishment phase. The basic requirements from the establishment/release services are:

- It should be possible to establish connections (both point and group connections).
- It should be possible to transfer an initial message during the connection establishment phase. This message transfer has the same requirements as the information transfer service.
- It should be possible to release connections.

The information transfer service sends a message using the earlier established connection. According to [1] it is possible to specify the quality of service requirements for each message. A finite number of quality of service classes will be specified in [1], but currently no class has been specified. In order to get an idea of the basic requirements, the CC and MM protocols in GSM are used as a reference. A GSM based core network is chosen since it is one main option for

UMTS. Considering the existing GSM specification of CC and MM the basic requirements from the information transfer service are (these are some the services provided by RR and the data link layer in GSM):

- Acknowledged mode link for transfer of messages
  This acknowledged mode link guarantees that the CC and MM messages are transferred to the corresponding side. Acknowledged mode means that the delivery of upper layer information can be guaranteed (some kind of retransmission scheme is used). A connection between two DC SAPs using an acknowledged mode link is called *signalling connection*. This link should also guarantee that no messages are lost or duplicated during handover.
- Preserved message order
  The order of the transferred messages is preserved.
- Priority handling
  If SMS messages should be transported through the control plane it should be possible to give higher priority to signalling messages.

The CC and MM protocols also expect other services, which can not be supported by the current primitives of the DC SAP, e.g. indication of radio link failure.

~~5.4.2~~5.4.1.2 RRC functions

The Radio Resource Control (RRC) layer handles the control plane signalling of Layer 3 between the UEs and UTRAN. The RRC performs the following functions:

- **Broadcast of information provided by the non-access stratum (Core Network).** The RRC layer performs system information broadcasting from the network to all UEs. The system information is normally repeated on a regular basis. This function supports broadcast of higher layer (above RRC) information. This information may be cell specific or not. As an example RRC may broadcast Core Network location service area information related to some specific cells.
- **Broadcast of information related to the access stratum.** The RRC layer performs system information broadcasting from the network to all Ues This function supports broadcast of typically cell-specific information.
- **Broadcast of ODMA relay node neighbour information.** The RRC layer performs probe information broadcasting to allow ODMA routeing information to be collected.
- **Establishment, maintenance and release of an RRC connection between the UE and UTRAN.** The establishment of an RRC connection is initiated by a request from higher layers at the UE side to establish the first Signalling Connection for the UE. The establishment of an RRC connection includes an optional cell re-selection, an admission control, and a layer 2 signalling link establishment. The release of an RRC connection can be initiated by a request from higher layers to release the last Signalling Connection for the UE or by the RRC layer itself in case of RRC connection failure. The RRC layer detects loss of RRC connection and releases resources assigned for the RRC connection in case of connection failure.
- **Collating ODMA neighbour list and gradient information.** The ODMA relay node neighbour lists and their respective gradient information will be maintaining by the RRC.
- **Maintenance of number of ODMA relay node neighbours.** The RRC will adjust the broadcast powers used for probing messages to maintain the desired number of neighbours.
- **Establishment, maintenance and release of a route between ODMA relay nodes.** The establishment of an ODMA route and RRC connection based upon the routeing algorithm.
- **Interworking between the Gateway ODMA relay node and the UTRAN.** The RRC layer will control the interworking with the standard TDD or FDD communication link between the Gateway ODMA relay node and the UTRAN.
- **Establishment, reconfiguration and release of Radio Access Bearers.** The RRC layer can, on request from higher layers, perform the establishment, reconfiguration and release of radio access bearers in the user plane. A number of radio access bearers can be established to an UE at the same time. At establishment and reconfiguration, the RRC layer performs admission control and selects parameters describing the radio access bearer processing in layer 2 and layer 1, based on information from higher layers.
- **Assignment, reconfiguration and release of radio resources for the RRC connection.** The RRC layer handles the assignment of radio resources (e.g. codes, CPCH channels) needed for the RRC connection including needs from both the control and user plane. The RRC layer may reconfigure radio resources during an established RRC

connection. This function includes coordination of the radio resource allocation between multiple radio bearers related to the same RRC connection. RRC controls the radio resources in the uplink and downlink such that UE and UTRAN can communicate using unbalanced radio resources (asymmetric uplink and downlink). RRC signals to the UE to indicate resource allocations for purposes of handover to GSM or other radio systems.

- **RRC connection mobility functions.** The RRC layer performs evaluation, decision and execution related to RRC connection mobility during an established RRC connection, such as handover, preparation of handover to GSM or other systems, cell re-selection and cell/paging area update procedures, based on e.g. measurements done by the UE**.**
- **Paging/notification.** The RRC layer can broadcast paging information from the network to selected UEs. Paging and notification can be requested by higher layers on the network side. The RRC layer can also initiate paging during an established RRC connection.
- **Routing of higher layer PDUs.** This function performs at the UE side routing of higher layer PDUs to the correct higher layer entity, at the UTRAN side to the correct RANAP entity.
- **Control of requested QoS**. This function shall ensure that the QoS requested for the radio access bearers can be met. This includes the allocation of a sufficient number of radio resources. The exact requirements on RRC to support this function are ffs.
- **UE measurement reporting and control of the reporting.** The measurements performed by the UE are controlled by the RRC layer, in terms of what to measure, when to measure and how to report, including both UMTS air interface and other systems. The RRC layer also performs the reporting of the measurements from the UE to the network.
- **Outer loop power control.** The RRC layer controls setting of the target of the closed loop power control.
- **Control of ciphering.** The RRC layer provides procedures for setting of ciphering (on/off) between the UE and UTRAN.
- **Slow DCA**. Allocation of preferred radio resources based on long-term decision criteria. It is applicable only in TDD mode.
- **Contention resolution**. The RRC handles reallocations and releases of radio resources in case of collisions indicated by lower layers in TDD mode. Applicability of contention resolution in FDD mode is ffs.
- **Arbitration of radio resources on uplink DCH**. This function controls the allocation of radio resources on uplink DCH on a fast basis, using a broadcast channel to send control information to all involved users. *[Note: This function is implemented in the CRNC. Details are ffs.]*
- **Initial cell selection and re-selection in idle mode.** Selection of the most suitable cell based on idle mode measurements and cell selection criteria.

The following functions are regarded as further study items:

- **Arbitration of the radio resource allocation between the cells**. This function shall ensure optimal performance of the overall UTRAN capacity.

  [Note: Some clarification should be provided what exact requirements this function implies on the RRC protocol, beyond general radio resource optimization.]
- **Congestion control.** Further study item**.**

5.4.2 L3CE Services and Functions

This section provides an overview on services and functions provided by the L3CE sublayer. A detailed description of the L3CE protocol is given in 3GPP TS 25.3xx.

5.4.2.1 L3CE Services

- Transmission and reception of Network PDUs in acknowledged, unacknowledged and transparent RLC mode.

5.4.2.2 L3CE Functions

- Mapping of Network PDUs from one network protocol to an appropriate RLC entity.
- Compression in the transmitting entity and decompression in the receiving entity of redundant Network PDU control information (header compression/ decompression). This may include TCP/IP header compression and decompression.

5.5 Interactions between RRC and lower layers in the C plane

The RRC protocol controls and signals the allocation of radio resources to the UE. RRC allows MAC to arbitrate between users and radio access bearers within the radio resource allocation. The RRC uses the measurements done by the lower layers to determine which radio resources that are available. Therefore it is a need for a measurement report from the UE RRC to the UTRAN RRC. Figure 3 illustrates the principle. The local control and local measurements reporting is handled through the control SAPs between RRC and the lower layers.

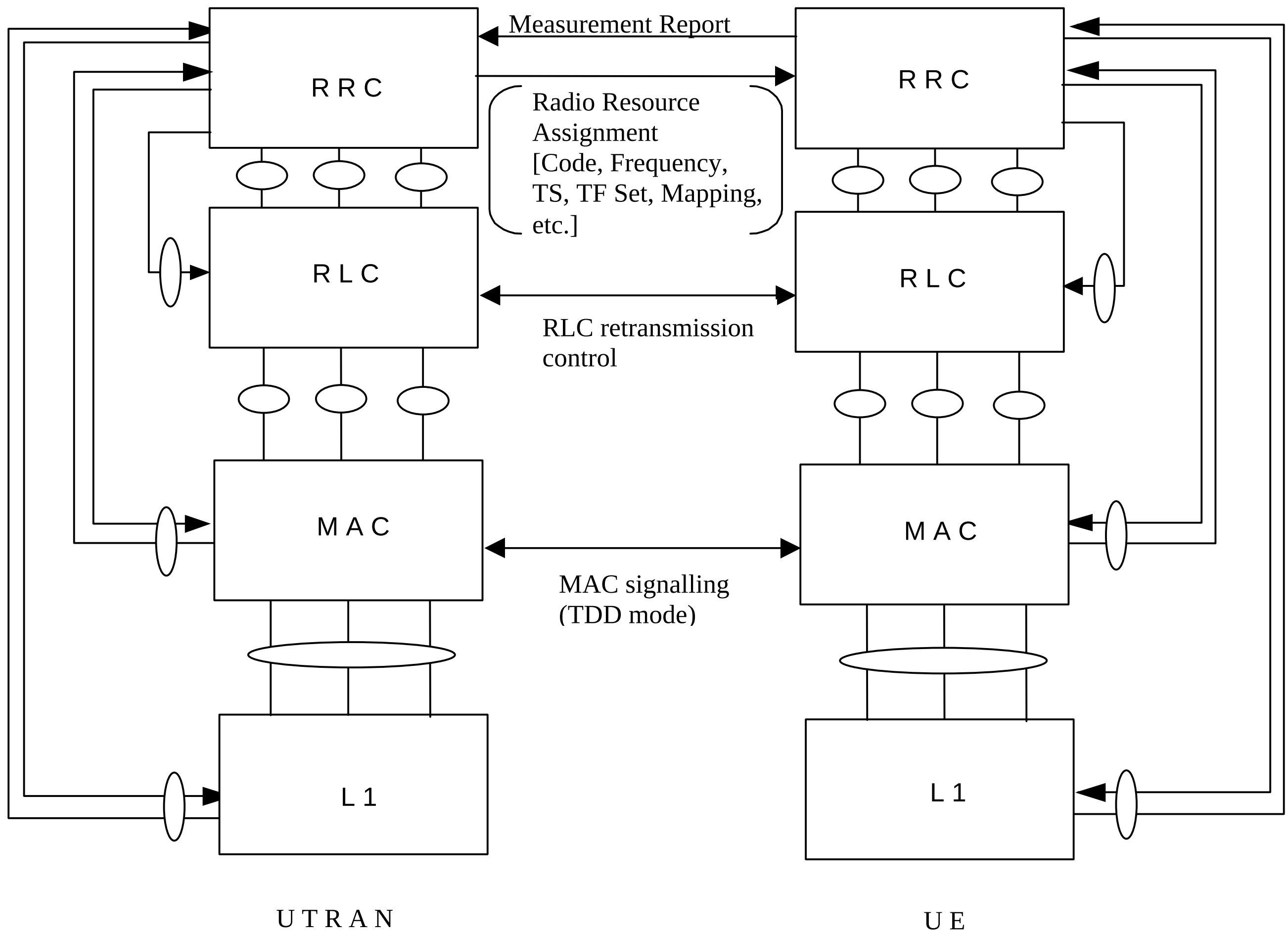


Figure 3: Interactions between RRC and lower layers

5.6 Protocol termination

This section specifies in which node of the UTRAN the radio interface protocols are terminated, i.e. where within UTRAN the respective protocol services are accessible. Dashed lines indicate those protocols whose presence is dependant on the service provided to upper layers.

5.6.1 Protocol termination for DCH

Figure 4 and Figure 5 show the protocol termination for DCH for the control and user planes, respectively. The part of physical layer terminating in the Serving RNC is the topmost macro-diversity combining and splitting function for the FDD mode. If no macrodiversity applies, the physical layer is terminated in Node B.

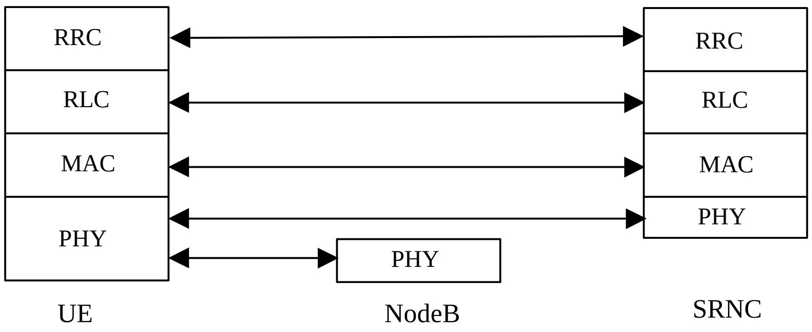


Figure 4: Protocol Termination for DCH, control plane

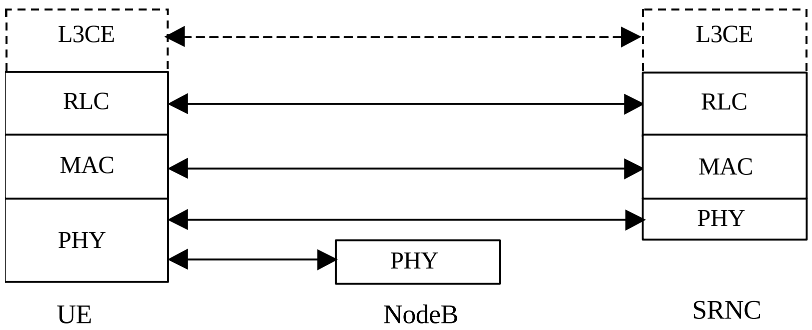


Figure 5: Protocol Termination for DCH, user plane

5.6.2 Protocol termination for RACH/FACH

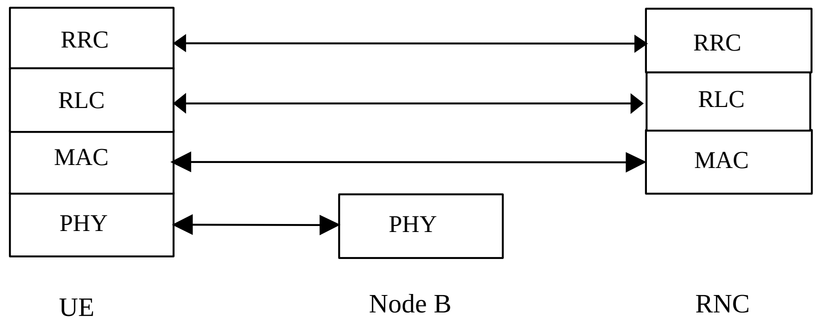
Figure 6 and Figure 7 show the protocol termination for RACH/FACH for the control and user planes, respectively. Control plane termination refers to the case where RACH/FACH carry dedicated or common control information (i.e. CCCH or DCCH). User plane termination refers to the case where RACH/FACH carry user data (DTCH) (two alternatives cases, referred to as case B and C, are described in the Annex).

It is assumed that macrodiversity/soft handover is not applied for RACH/FACH. Therefore, the physical layer terminates in Node B. For RACH/FACH carrying DCCH, MAC is split between Controlling and Serving RNC. RLC, and in the C plane also RRC terminate in the Serving RNC. Since Iur can support common channel data streams, the users of that common channel can depend on different SRNCs. However, they depend on the same Controlling RNC. Therefore, for a given user, the Controlling RNC and the Serving RNC can be separate RNCs.

For RACH/FACH carrying CCCH, MAC, RLC and RRC are terminated in the RNC.

[Note: It is currently an open issue whether or not there are CCCH messages that need to be routed between Controlling and Serving RNC over Iur. If it is only the initial access message that is defined for CCCH, C-RNC and S-RNC are always identical and no routing would be needed. If messages such as “URA update”, “Cell update” and “RRC connection re-establishment” would be signalled on CCCH, routing of these messages on RRC level would need to be performed]

CCCH:



DCCH:

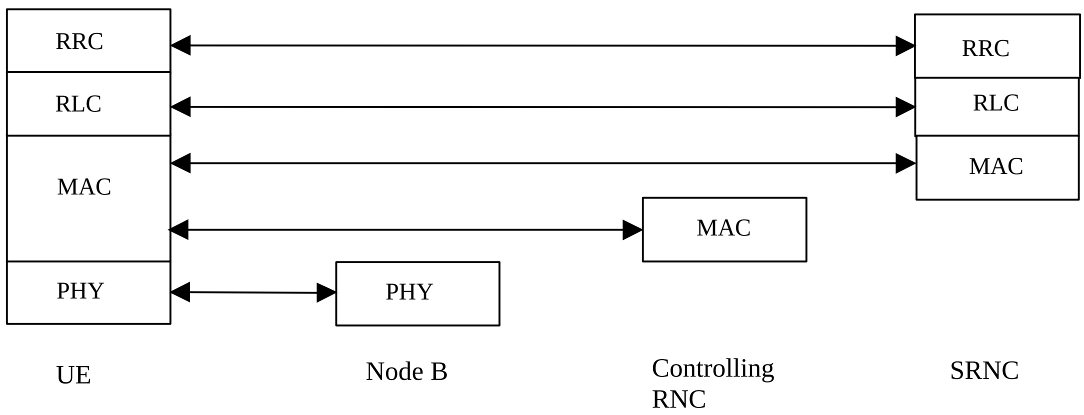


Figure 6: Protocol Termination for RACH/FACH, control plane

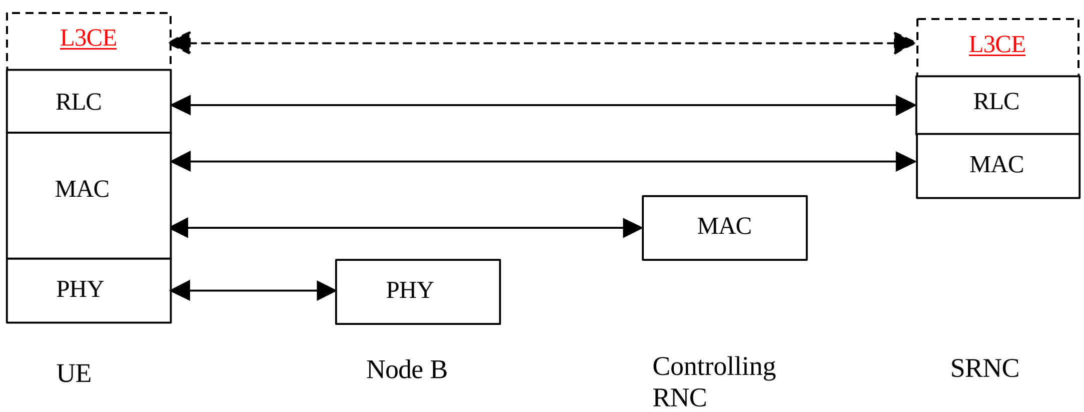


Figure 7: Protocol Termination for RACH/FACH, user plane

5.6.3 Protocol termination for FAUSCH

Protocol termination for the FAUSCH is the same as for the RACH in the control plane (see Figure 6), since FAUSCH is for control purposes only.

5.6.4 Protocol termination for CPCH

The protocol termination for CPCH is identical to the termination for RACH. Figure 14 (for DCCH) presents the control plane protocol termination. Figure 15 presents the user plane protocol termination.

5.6.5 Protocol termination for DSCH

5.6.5.1 DSCH definition

The DSCH is a resource that exists in downlink only. It has only impact on the physical and transport channel levels, so there is no definition of shared channel in the logical channels provided by MAC.

The DSCH is a transport channel shared dynamically between several UEs. The DSCH is mapped to one or several physical channels such that a specified part of the downlink code tree is employed. For the DSCH no macrodiversity is applied, i.e. a specific DSCH is transmitted in a single cell only.

The following two DSCH cases are presently considered, in the following denoted as cases A and B:

Case A: The DSCH is defined is an extension to DCH transmission. DSCH related resource allocation is signalled utilizing the transport format indication field (TFI) that will be mapped to the TFCI of the associated DCH.

Case B: The DSCH is defined as a shared downlink channel for which resource allocation, including UE identification, is signalled on another common downlink channel, referred to as DSCH Control Channel.

[Note: It is considered ffs. whether the DSCH Control Channel requires a new type of transport channel or whether a specific FACH transport channel can be used for this purpose. It is assumed that the DSCH control channel is supported on the PSCCCH (Physical Shared Common Control Channel) if it carries TPC information. It needs to be confirmed by TSG RAN WG1 that this channel will be specified.]

Note: For case B it is assumed that DSCH and DSCH Control Channel employ individual channelization codes each. Time multiplexing of user data (DSCH) and control information (DSCH Control Channel) is not considered.

Note also that a third case of DSCH definition, where the DSCH was defined as a stand-alone channel providing in-band UE identification is not considered any more. This case has been identified as being equivalent to a FACH and is as such already included in the radio interface specification.

Interleaving for the DSCH may be applied over a multiplicity of radio frames. Nevertheless, here the basic case is considered where the interleaving is rectangular for a given MAC PDU, and equal to one radio frame (10 ms). The framing is synchronised on the SCH.

In every radio frame, one or several codes can be used in the downlink. Therefore, the DSCH supports code multiplexing. MAC multiplexing shall not be applied within a radio frame, i.e. the whole radio frame for one code is assigned to a single UE. However, MAC multiplexing is allowed on a frame by frame basis, i.e. one code may be allocated to different UEs at each frame.

Transport blocks on the DSCH may be of constant size, so that the Transport Block Set may be derived from the code allocated to each UE on the DSCH.

5.6.5.2 Resource allocation and UE identification on DSCH

The principles of capacity allocation and UE identification on the DSCH are described in more detail below.

[Note: The two resource allocation methods of the cases A and B might be used simultaneously for one DSCH, i.e. some UEs may use an associated DSCH Control Channel and some UEs may use an associated DCH for resource allocation while transmitting data on the same DSCH. This option is ffs.]

5.6.5.2.1 Case A (UE requires a downlink TFCI on a DPCCH)

The TFCI of the dedicated physical channel may carry the information that a given code of the DSCH must be listened to by the UE. Fast power control can be applied per code based on the dedicated physical control channel, DPCCH.

Alternatively, a UE may be requested on the DCH to listen to a DSCH for a given period of time, and to decode the data so that the address of the destination UE can be decoded. This does not require more TFCI values because signalling is done in layers 2 and 3.

5.6.5.2.2 Case B (UE requires a downlink DSCH Control Channel)

The information which DSCH code to listen to and when is sent on an additional downlink channel to the UE (essentially a broadcast channel). This channel, is referred to as *DSCH Control Channel*. It is code multiplexed on the downlink and should convey the following information, which is modified every radio frame:

- Layer 1 information
    - TPC bits for each UE which would have an uplink DCH without downlink DCH. The location of TPC bits on the PSCCCH of each cell is allocated to each UE when a RAB is mapped onto a DSCH.
    - Channelisation code allocated to each UE indicated relatively to the DSCH code entry point
- Layer 2 information
    - Identity of the UEs who should receive information on the DSCH. The UE ID is allocated when a RAB is mapped onto a DSCH. Which UE ID is used to identify UE on the DSCH of each cell is ffs.

This concept allows to perform power control on the DSCH, whereas the DSCH Control Channel would be less efficient in terms of power control efficiency (need to power control on the farthest UE).

5.6.5.3 Model of DSCH in UTRAN

Figure 8 captures the working assumption on the Downlink Shared Channel (DSCH). The two RLCs point to logical channel (DTCH) specific RLC-entities of specific users while MAC refers to the provision of MAC sublayer functions for all users.

The MAC sublayer of a DSCH is split between the Controlling RNC and SRNC. For a given user, the RLC sublayer is terminated in its SRNC. Since Iur can support DSCH data streams, the users on that DSCH can depend on different SRNCs. For a given user, the Controlling RNC and the Serving RNC can be separate RNCs. The MAC in the network takes care of mapping downlink data either to a common channel (FACH, not shown in this figure), DCH or the DSCH.

Figure 8 also includes the DSCH Control Channel, needed for case B of DSCH definition only. See 3GPP TS 25.321 [8] for details on MAC architecture. In this example, the resource allocation on the DSCH is signalled on the DSCH control channel for UE 1 and on the associated DCH for UE 2.

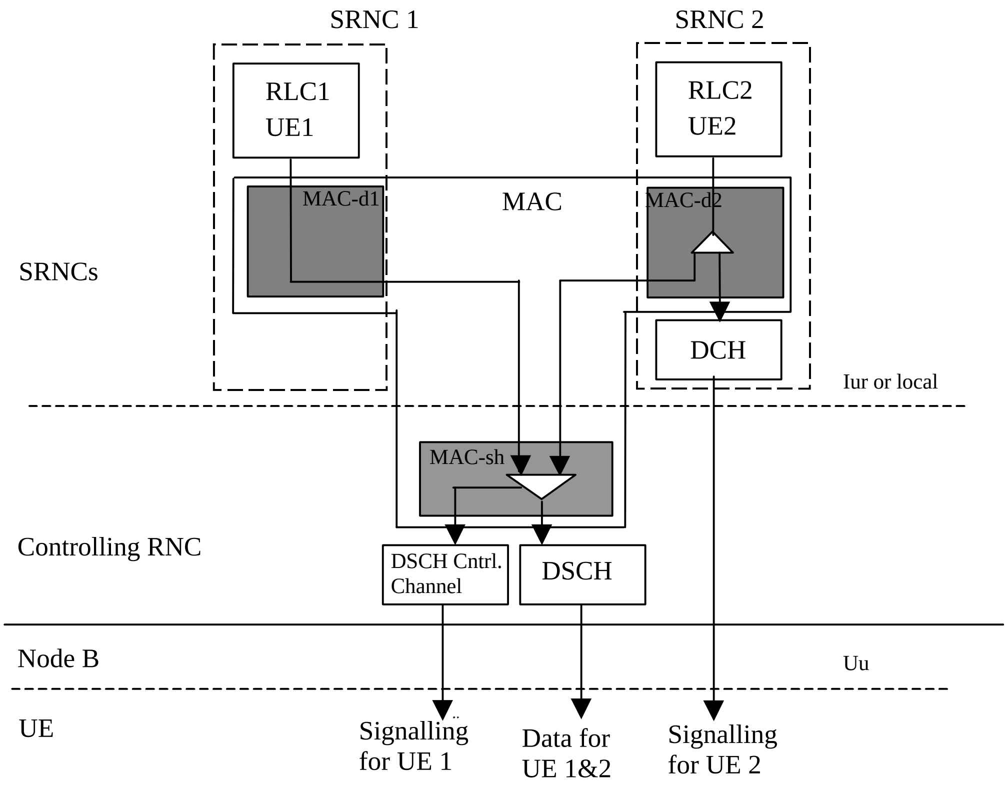


Figure 8: Model of downlink shared channel (DSCH) in UTRAN

5.6.5.4 Protocol termination

The protocol termination points for DSCH in control and user planes are presented in Figure 9 and Figure 10, respectively.

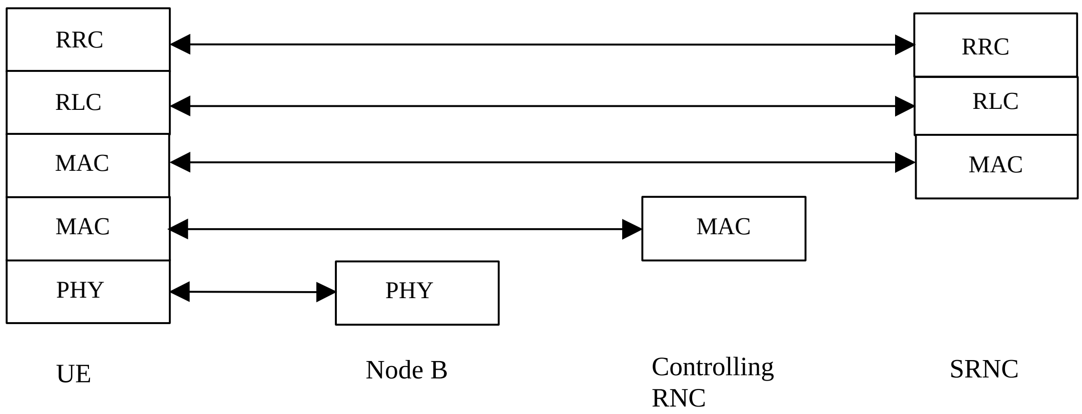


Figure 9: Protocol termination points for DSCH, control plane.

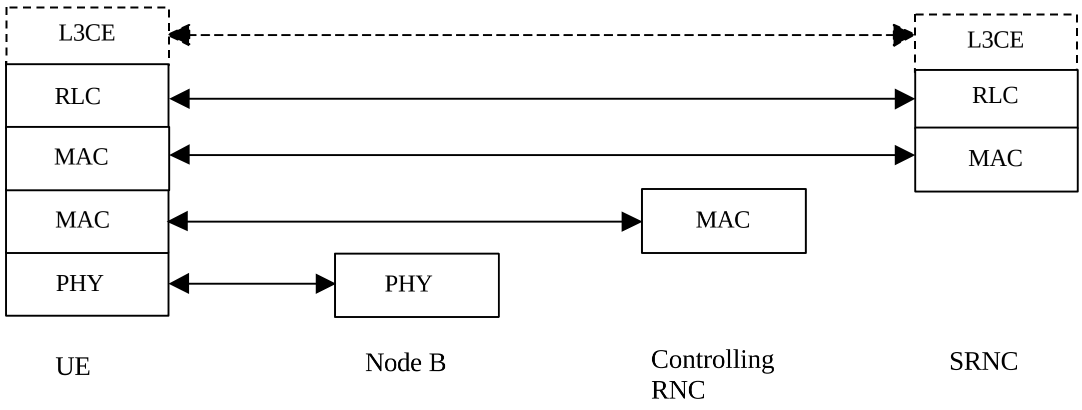


Figure 10: Protocol termination points for DSCH, user plane.

5.6.6 Protocol termination for transport channel of type BCH

System information on BCH can include information which is available only in Node B, and need to be updated very frequently (each 10-100 ms), such as uplink interference in the cell. Also, for the system information originating from the RNC, it is assumed that the updating of system information is at least one magnitude less (minutes) than the repetition frequency on the BCH (in the order of 1s). Protocol termination for the BCH shall therefore reside in the Node B, resulting in less signalling on Iub and lower processor load. Note that the RLC sublayer is transparent for this transport channel type.

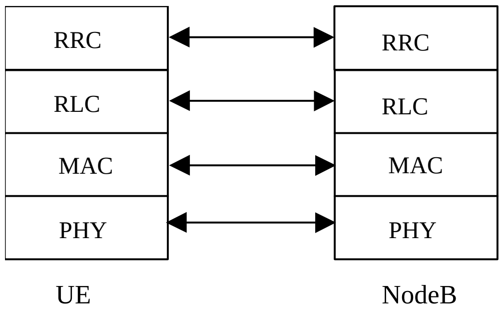


Figure 11: Protocol termination for BCH.

5.6.7 Protocol termination for transport channel of type PCH

In order to enable coordinated scheduling between PCH and FACH/DSCH the corresponding MAC scheduling functions shall be allocated in the same node (co-location of MAC-p, MAC-c and MAC-sh entities). Both MAC-sh and MAC-c are terminated in CRNC. Consequently, the MAC termination of PCH shall also be in CRNC. A natural implication is that RLC and RRC also are terminated in CRNC.

Note that the RLC sublayer is transparent for this channel.

[Note: Above termination of PCH has been agreed as working assumption. Some WG2 members however requested some more time for further consideration. The above assumption shall be confirmed before or at the next WG2 meeting. The previous solution is kept in the Annex as alternative PCH termination option.]

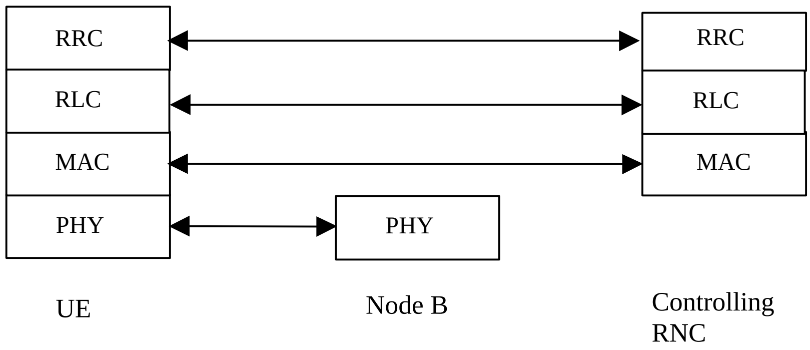


Figure 12: Protocol termination for PCH

5.6.8 Protocol termination for transport channel of type SCH

The SCH transport channel is used in TDD mode only. Protocol termination for SCH is the same as for BCH as shown in Figure 11.

5.6.9 Protocol termination for ODCH

Figure 13 and Figure 14 show the protocol termination for ODCH in the control and user planes, respectively.

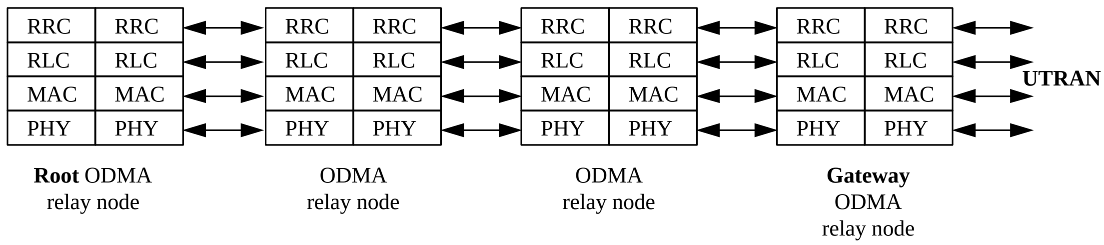


Figure 13: Protocol Termination for the ODCH in the Control Plane

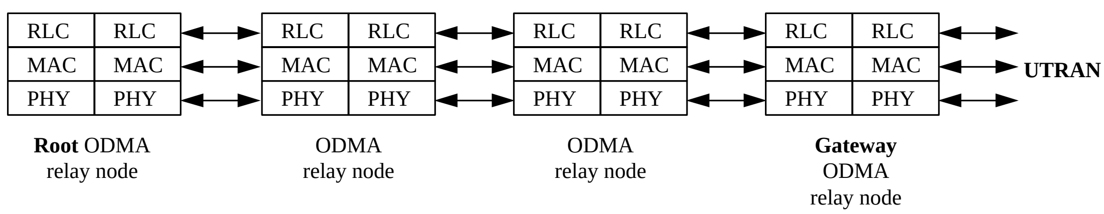


Figure 14: Protocol Termination for the ODCH in the User Plane

Note: The current mechanisms and procedures carried out by the RLC and the MAC for the DCH will require minor, subtle modifications to enable them to handle the ODCH.

5.6.10 Protocol termination for ORACH

The protocol termination for ORACH for the control and user planes are illustrated in Figure 15 and Figure 16, respectively. The shown ODMA relay nodes may be either UE_R, Seed, Root, or Gateway.

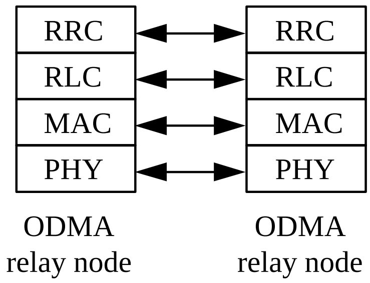


Figure 15: Protocol Termination for ORACH control plane

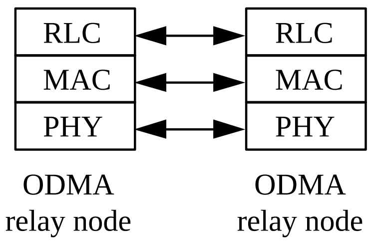


Figure 16: Protocol Termination for ORACH user plane