# TSG-RAN Meeting #11 *RP-010019*
# Palm Springs, CA, USA, 13 - 16 March 2001

**Title:** **Agreed CRs (Release ’99) to TS 25.301**

**Source:** **TSG-RAN WG2**

**Agenda item:** **5.2.3**

| Doc-1st- | Status- | Spec | CR | Rev | Phase | Subject | Cat | Version | Versio |
|---|---|---|---|---|---|---|---|---|---|
| R2-010527 | agreed | 25.301 | 043 | 1 | R99 | Correction for RACH/CPCH | F | 3.6.0 | 3.7.0 |
| R2-010723 | agreed | 25.301 | 044 | 2 | R99 | Correction to Signalling Radio Bearer | F | 3.6.0 | 3.7.0 |
| R2-010528 | agreed | 25.301 | 045 | 1 | R99 | Editorial update for Release’99 | F | 3.6.0 | 3.7.0 |
| R2-010481 | agreed | 25.301 | 046 | | R99 | Removal of FAUSCH | F | 3.6.0 | 3.7.0 |
| R2-010529 | agreed | 25.301 | 047 | 1 | R99 | Removal of ODMA channels | F | 3.6.0 | 3.7.0 |
| R2-010668 | agreed | 25.301 | 048 | 1 | R99 | UE Model Channel numbering | F | 3.6.0 | 3.7.0 |
| R2-010602 | agreed | 25.301 | 049 | | R99 | Renaming of Dynamic Transport Channel Type Switching | F | 3.6.0 | 3.7.0 |
| R2-010657 | agreed | 25.301 | 050 | | R99 | Removal of payload unit concept | F | 3.6.0 | 3.7.0 |

**3GPP TSG-R2 Meeting #19** **_R2-010527_**
**Sophia-Antipolis, FR, February 19-23, 2001**

*CR-Form-v3*

# CHANGE REQUEST

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ⌘ | **25.301** | **CR** | **043** | ⌘ rev | **r1** | ⌘ Current version: | **3.6.0** ⌘ |

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

| | | | | |
|---|---|---|---|---|
| ***Title:*** | ⌘ | Correction for RACH/CPCH | | |
| ***Source:*** | ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** | ⌘ | | ***Date:*** ⌘ | 20 Feb 2001 |
| ***Category:*** | ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | Current wording is ambiguous and does not clearly indicate that RACH is always an option for UE in Cell-FACH state. |
| ***Summary of change:*** | ⌘ | Corrected text to unambiguously indicate that RACH may always be used. |
| ***Consequences if not approved:*** | ⌘ | Some UE or UTRAN implementations may be incompatible with other UEs and UTRAN implementations which assume RACH may always be used. |

| | | | |
|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.3.1.1.2 | |
| ***Other specs affected:*** | ⌘ | [ ] Other core specifications<br>[ ] Test specifications<br>[ ] O&M Specifications | ⌘ |
| ***Other comments:*** | ⌘ | | |

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5.3.1.1.2 Mapping between logical channels and transport channels

5.3.1.1.2.1 Mapping in Uplink

In Uplink, the following connections between logical channels and transport channels exist:

- CCCH can be mapped to RACH;
- DCCH can be mapped to RACH;
- DCCH can be mapped to CPCH (in FDD mode only);
- DCCH can be mapped to DCH;
- DCCH can be mapped to USCH (in TDD mode only);
- DTCH can be mapped to RACH;
- DTCH can be mapped to CPCH (in FDD mode only);
- DTCH can be mapped to DCH;
- DTCH can be mapped to USCH (in TDD mode only);
- SHCCH can be mapped to RACH (in TDD mode only);
- SHCCH can be mapped to USCH (in TDD mode only).

5.3.1.1.2.2 Mapping in Downlink

In Downlink, the following connections between logical channels and transport channels exist:

- BCCH can be mapped to BCH;
- BCCH can be mapped to FACH;
- PCCH can be mapped to PCH;
- CCCH can be mapped to FACH;
- DCCH can be mapped to FACH;
- DCCH can be mapped to DSCH;
- DCCH can be mapped to DCH;
- DTCH can be mapped to FACH;
- DTCH can be mapped to DSCH;
- DTCH can be mapped to DCH;
- CTCH can be mapped to FACH;
- SHCCH can be mapped to FACH (in TDD mode only).
- SHCCH can be mapped to DSCH (in TDD mode only).

The following connections between logical channels and transport channels exist:

- BCCH is connected to BCH and may also be connected to FACH;
- PCCH is connected to PCH;
- CCCH is connected to RACH and FACH;
- SHCCH is connected to RACH and USCH/FACH and DSCH;
- DTCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) or to USCH (TDD only);
- CTCH is connected to FACH;
- DCCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) to FAUSCH, CPCH (FDD only), or to USCH (TDD only).

The mappings as seen from the UE and UTRAN sides are shown in Figure 4 and Figure 5 respectively. Figure 6 illustrates the mapping from the UE in relay operation. Note that ODMA logical channels and transport channels are employed only in relay link transmissions (i.e. not used for uplink or downlink transmissions on the UE-UTRAN radio interface).

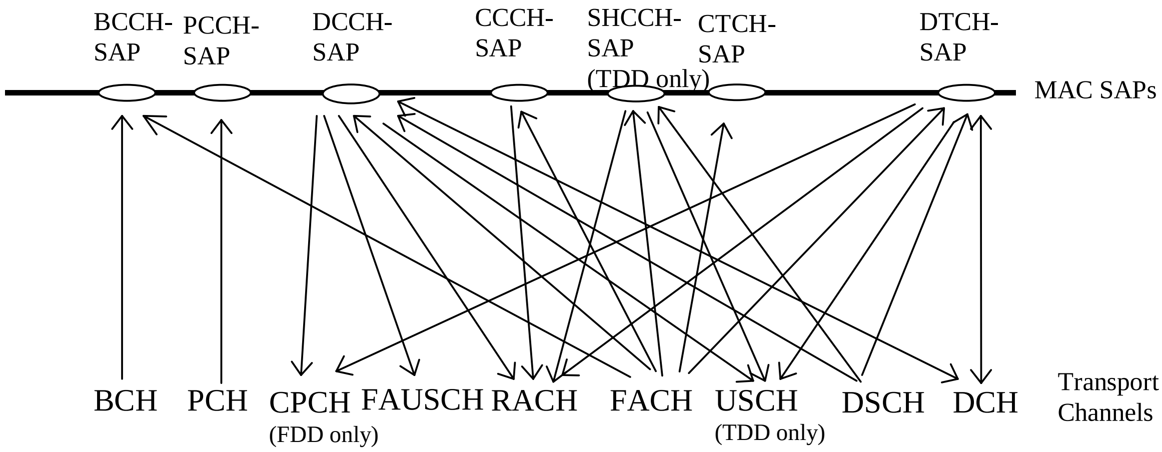


**Figure 4: Logical channels mapped onto transport channels, seen from the UE side**

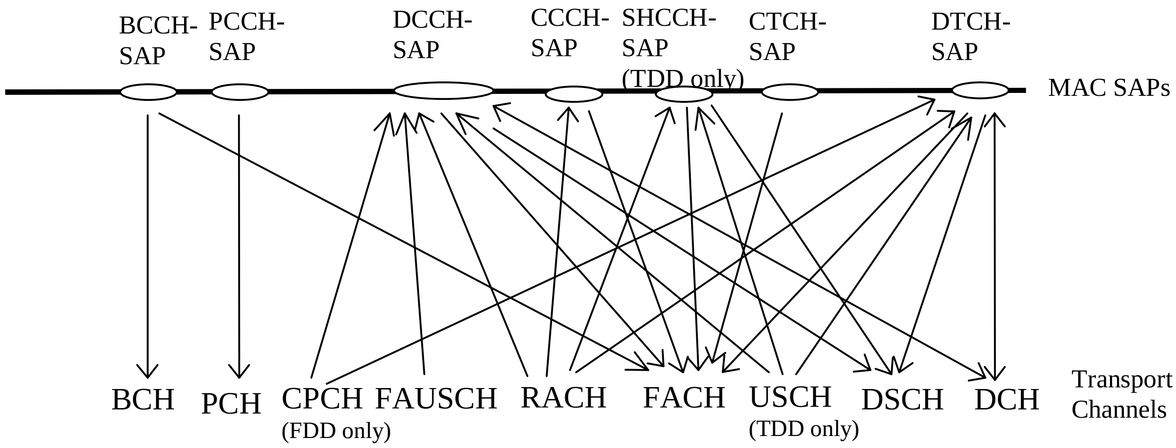


**Figure 5: Logical channels mapped onto transport channels, seen from the UTRAN side**

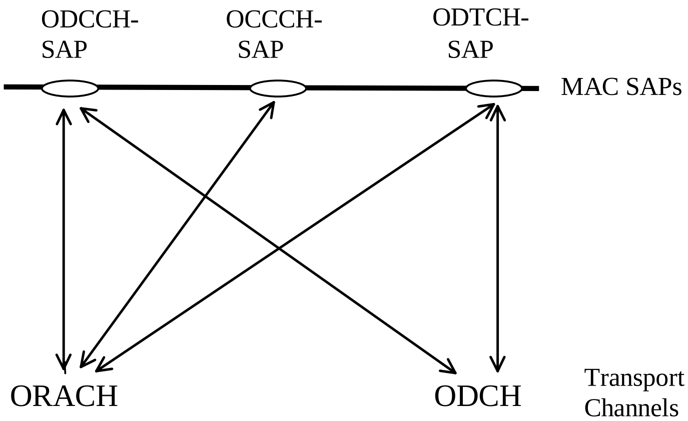


**Figure 6: Logical channels mapped onto transport channels, seen from the UE side (relay only)**

**3GPP TSG-RAN WG2 Meeting #19**
**Sophia Antipolis, France, 19 - 23 Feb. 2001** ***R2-010723***

*CR-Form-v3*

# CHANGE REQUEST

| ⌘ | **25.301 CR 044** | ⌘ rev | **r2** | ⌘ Current version: | **3.6.0** | ⌘ |
|---|---|---|---|---|---|---|

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***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

| | | | |
|---|---|---|---|
| ***Title:*** ⌘ | Correction to Signalling Radio Bearer | | |
| ***Source:*** ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** ⌘ | | ***Date:*** ⌘ | 31 Jan. 2001 |
| ***Category:*** ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | |
|---|---|
| ***Reason for change:*** ⌘ | ~~As the decision of RAN2 #18 meeting (R2-010086),~~ Signalling Radio Bearer ~~identity~~ for DCCH TM is needed. |
| ***Summary of change:*** ⌘ | The description of new RB is inserted. |
| ***Consequences if not approved:*** ⌘ | |

| | | | |
|---|---|---|---|
| ***Clauses affected:*** ⌘ | 5.1 | | |
| ***Other specs Affected:*** ⌘ | [ ] Other core specifications<br>[ ] Test specifications<br>[ ] O&M Specifications | ⌘ | |
| ***Other comments:*** ⌘ | | | |

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

## 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 following sublayers: Medium Access Control (MAC), Radio Link Control (RLC), Packet Data Convergence Protocol (PDCP) and Broadcast/Multicast Control (BMC).

Layer 3 and RLC are divided into Control (C-) and User (U-) planes. PDCP and BMC exist in the U-plane only.

In the C-plane, Layer 3 is partitioned into sublayers where the lowest sublayer, denoted as Radio Resource Control (RRC), interfaces with layer 2 and terminates in the UTRAN. The next sublayer provides 'Duplication avoidance' functionality as specified in [13]. It terminates in the CN but is part of the Access Stratum; it provides the Access Stratum Services to higher layers. 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. 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. subclause 5.2.1.1). The SAPs between RLC and the MAC sublayer provide the logical channels (cf. subclause 5.3.1.1.1). In the C-plane, the interface between 'Duplication avoidance' 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, between RRC and the PDCP sublayer and between RRC and BMC 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 (PDCP, RLC, MAC, and L1).

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 relies on 'Duplication avoidance' functions in the CN.

There are primarily two kinds of signalling messages transported over the radio interface - RRC generated signalling messages and NAS messages generated in the higher layers. On establishment of the signalling connection between the peer RRC entities three ~~or four~~ ~~to five~~ or four UM/AM signalling radio bearers may be set up. Two of these bearers are set up for transport of RRC generated signalling messages - one for transferring messages through an unacknowledged mode RLC entity [see section 5.3.2. for details on RLC modes] and the other for transferring messages through an acknowledged mode RLC entity. One signalling radio bearer is set up for transferring NAS messages set to "high priority" by the higher layers. ~~An~~~~The~~An optional signalling radio bearers may be set up for transferring NAS messages set to "low priority" by the higher layers~~ or for transferring the RRC message on the DCCH using RLC transparent mode~~. Subsequent to the establishment of the signalling connection ~~a further~~ zero to several TM signalling radio bearers may be set up for transferring RRC ~~generated~~ signalling messages using transparent mode RLC.

**3GPP TSG-RAN WG2 Meeting #19**
**Sofia Antipolis, France, 19-23 February**

***R2-010528***

*CR-Form-v3*

# CHANGE REQUEST

| | |
|---|---|
| ⌘ **25.301 CR 045** ⌘ rev **r1** ⌘ Current version: **3.6.0** ⌘ | |

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***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

| | | | |
|---|---|---|---|
| ***Title:*** ⌘ | Editorial update for Release'99 | | |
| ***Source:*** ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** ⌘ | | ***Date:*** ⌘ | 2001-02-19 |
| ***Category:*** ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | |
|---|---|
| ***Reason for change:*** ⌘ | Editorial corrections for completion of this document for Release 99 |
| ***Summary of change:*** ⌘ | - Correction of references, addition of abbreviations.<br>- Editorial simplification of assumed UTRAN architecture, Sec. 4. Figures 1a, 1b and 1c have been merged into a single figure.<br>- Figure 1 on radio interface protocol architecture redrawn (editorial changes).<br>- Removal of informative Annex A. |
| ***Consequences if not approved:*** ⌘ | none |

| | | |
|---|---|---|
| ***Clauses affected:*** ⌘ | 2, 3.2, 4, 5.1, Annex A | |
| ***Other specs Affected:*** ⌘ | [ ] Other core specifications ⌘<br>[ ] Test specifications<br>[ ] O&M Specifications | |
| ***Other comments:*** ⌘ | | |

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.


[1] 3GPP TS 23.110: "UMTS Access Stratum; Services and Functions".

[2] 3GPP TS 25.401: "RAN Overall Description".

[3] 3GPP TR ~~25.990~~21.905: "Vocabulary for ~~the UTRAN~~3GPP Specifications".

[4] 3GPP TS 25.302: "Services provided by the Physical Layer".

[5] 3GPP TS 25.303: "Interlayer Procedures in Connected Mode".

[6] 3GPP TS 25.304: "UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[7] 3GPP TS 25.321: "MAC Protocol Specification".

[8] 3GPP TS 25.322: "RLC Protocol Specification".

[9] 3GPP TS 25.323: "PDCP Protocol Specification".

[10] 3GPP TS 25.324: "BMC Protocol Specification".

[11] 3GPP TS 25.331: "RRC Protocol Specification".

[12] 3GPP TS 25.224: "Physical Layer Procedures (TDD)".

[13] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[14] 3GPP TS 33.105: "Cryptographic Algorithm Requirements".

[15] 3GPP TS 33.102: "Security Architecture".


## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ARQ Automatic Repeat Request
AS Access Stratum
ASC Access Service Class
BCCH Broadcast Control Channel
BCH Broadcast Channel
BMC Broadcast/Multicast Control
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) |
| LAC | Link Access Control |
| LAI | Location Area Identity |
| MAC | Medium Access Control |
| MM | Mobility Management |
| NAS | Non-Access Stratum |
| 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 |
| PDCP | Packet Data Convergence Protocol |
| PDU | Protocol Data Unit |
| PHY | Physical layer |
| PhyCH | Physical Channels |
| PU | Payload Unit |
| RAB | Radio Access Bearer |
| RACH | Random Access Channel |
| RB | Radio Bearer |
| 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 |
| SDU | Service Data Unit |
| SHCCH | Shared Channel Control Channel |
| 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 |
| UuS | Uu (Radio Interface) Stratum |

# 4 Assumed UMTS Architecture

Figure 1a 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 1a.

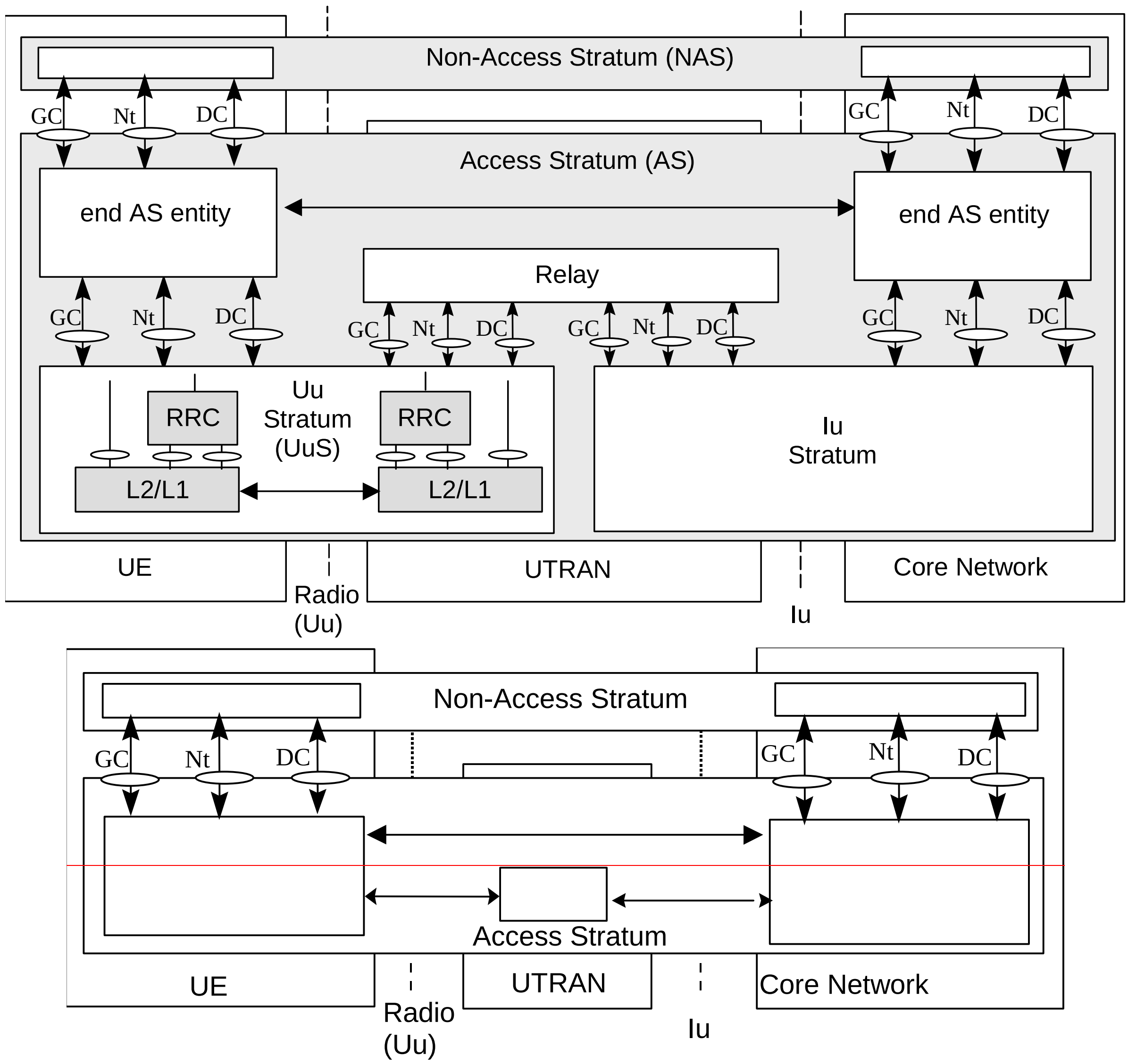



**Figure 1a: Assumed UMTS Architecture**

Theeis model Figure 1 ~~can be further refined to~~ distinguishes the end AS entities [1], which provide the services to higher layers, from the local entities, which provide services over respectively the Uu and the Iu reference points. ~~Figure 1b presents the refined model.~~

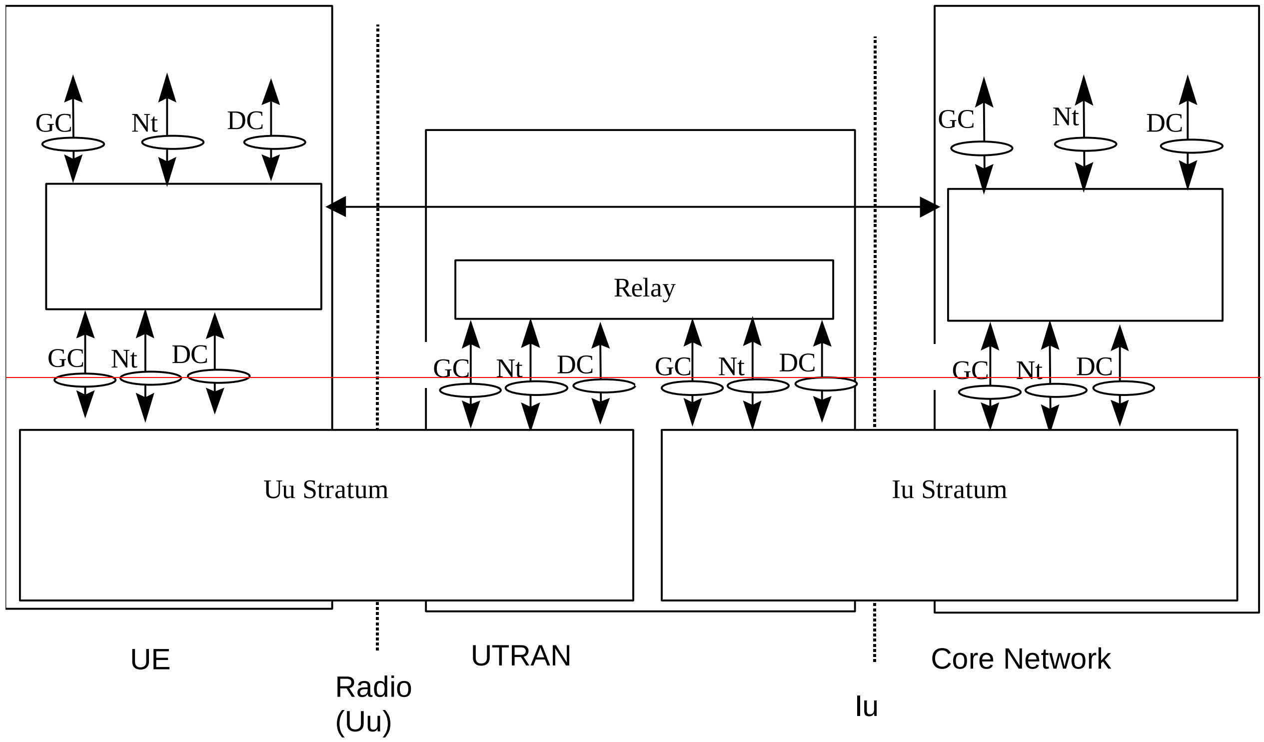



Figure 1b: Assumed UTRAN Model

The Uu Stratum (UuS) block includes the radio interface protocol stack described in subclause 5.1- can be further refined as shown in Figure 1c.

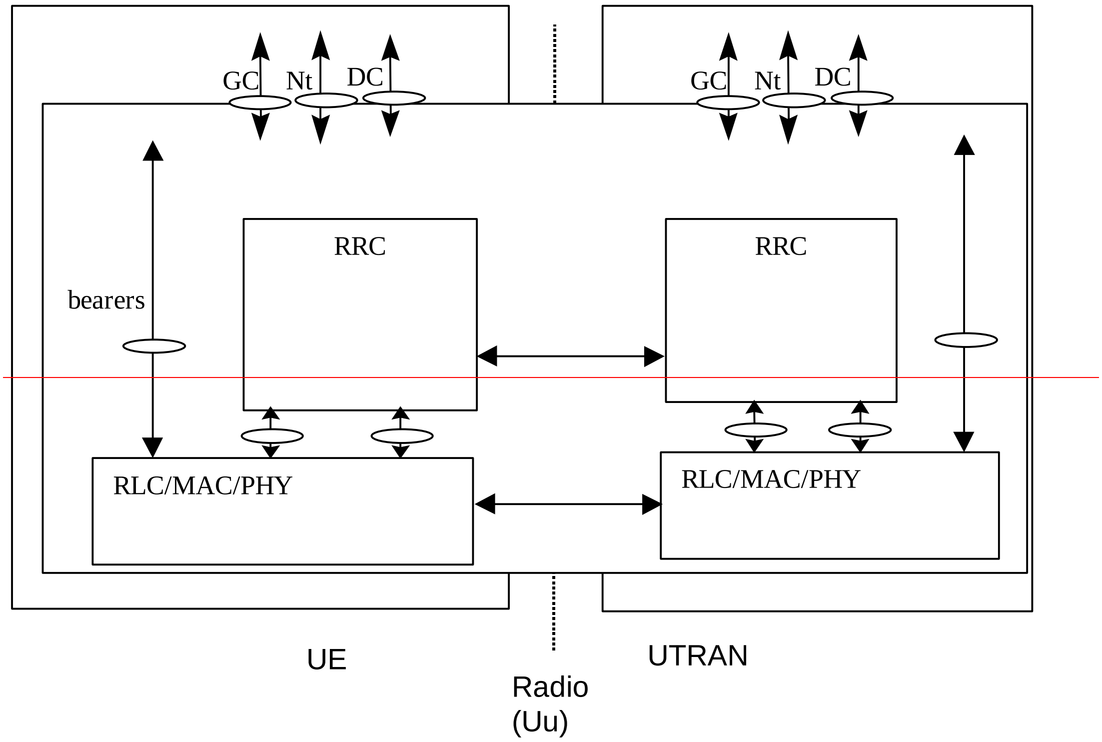



Figure 1c: Assumed Uu Stratum Model

# 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 following sublayers: Medium Access Control (MAC), Radio Link Control (RLC), Packet Data Convergence Protocol (PDCP) and Broadcast/Multicast Control (BMC).

Layer 3 and RLC are divided into Control (C-) and User (U-) planes. PDCP and BMC exist in the U-plane only.

In the C-plane, Layer 3 is partitioned into sublayers where the lowest sublayer, denoted as Radio Resource Control (RRC), interfaces with layer 2 and terminates in the UTRAN. The next sublayer provides 'Duplication avoidance' functionality as specified in [13]. It terminates in the CN but is part of the Access Stratum; it provides the Access Stratum Services to higher layers. 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. 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. subclause 5.2.1.1). The SAPs between RLC and the MAC sublayer provide the logical channels (cf. subclause 5.3.1.1.1). The RLC layer provides three types of SAPs, one for each RLC operation mode (UM, AM, and TM, see [8]). PDCP and BMC are accessed by PDCP and BMC SAPs, respectively. The service provided by layer 2 is referred to as the radio bearer. The C-plane radio bearers, which are provided by RLC to RRC, are denoted as signalling radio bearers. In the C-plane, the interface between 'Duplication avoidance' and higher L3 sublayers (CC, MM) is defined by the General Control (GC), Notification (Nt) and Dedicated Control (DC) SAPs. Note that the SAPs shown in Figure 2 are examples. For details on the definition of SAPs refer to the respective radio interface protocol specification.

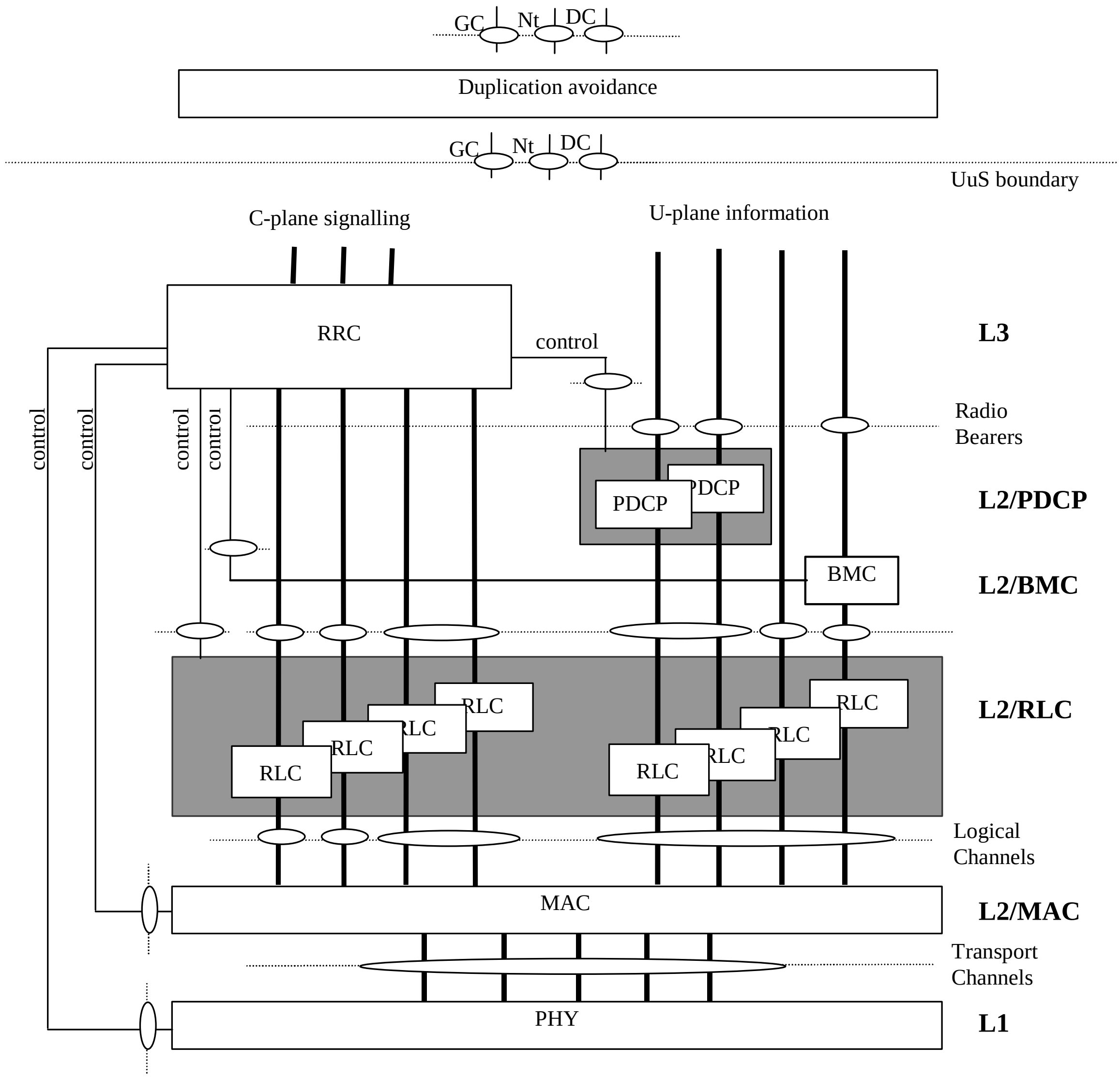
Also shown in the figure are connections between RRC and MAC as well as RRC and L1 providing local inter-layer control services. An equivalent control interface exists between RRC and the RLC sublayer, between RRC and the PDCP sublayer and between RRC and BMC sublayer. These interfaces allow the RRC to control the configuration of the lower layers. For this purpose separate Control SAPs are defined between RRC and each lower layer (PDCP, RLC, MAC, and L1).

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 relies on 'Duplication avoidance' functions in the CN.

There are primarily two kinds of signalling messages transported over the radio interface - RRC generated signalling messages and NAS messages generated in the higher layers. On establishment of the signalling connection between the peer RRC entities three or four signalling radio bearers may be set up. Two of these bearers are set up for transport of RRC generated signalling messages - one for transferring messages through an unacknowledged mode RLC entity (~~[~~see ~~section~~ subclause 5.3.2. for details on RLC modes)~~]~~ and the other for transferring messages through an acknowledged mode RLC entity. One signalling radio bearer is set up for transferring NAS messages set to "high priority" by the higher layers. An optional signalling radio bearer may be set up for transferring NAS messages set to "low priority" by the higher layers. Subsequent to the establishment of the signalling connection a further signalling radio bearer may be set up for transferring RRC generated signalling messages using transparent mode RLC.


GC
Nt
DC
Duplication avoidance
UuS boundary
C-plane signalling
U-plane information
RRC
control
L3
Radio
Bearers
PDCP
PDCP
L2/PDCP
BMC
L2/BMC
RLC
RLC
RLC
RLC
RLC
RLC
RLC
RLC
L2/RLC
Logical
Channels
MAC
L2/MAC
Transport
Channels
PHY
L1

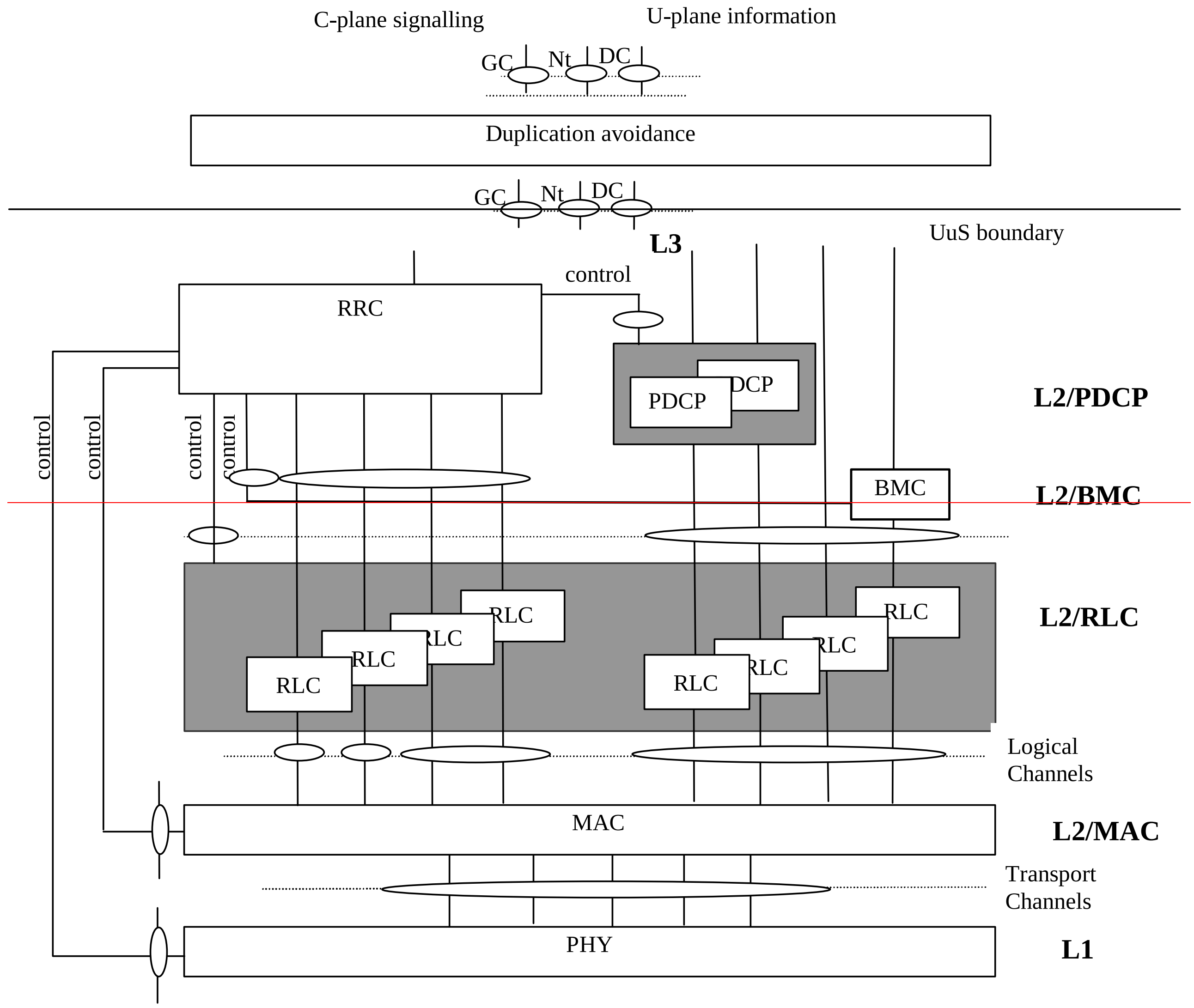



**Figure 2: Radio Interface protocol architecture (Service Access Points marked by circles)**

# ~~Annex A (informative):~~<br>~~Protocol termination~~

~~This Annex describes protocol termination cases, which have been excluded from the initial UMTS release. These cases are captured here for information. They potentially may be considered for future releases.~~

## ~~A.1 Alternative protocol termination for DCH~~

~~Figure A.1 and Figure A.2 show an alternative protocol termination case for DCH for the control and user planes, respectively, referred to as Case B. This case would be applicable when macrodiversity at RNC level is not applied, i.e. especially for DCH in the TDD mode.~~

**Case B:**

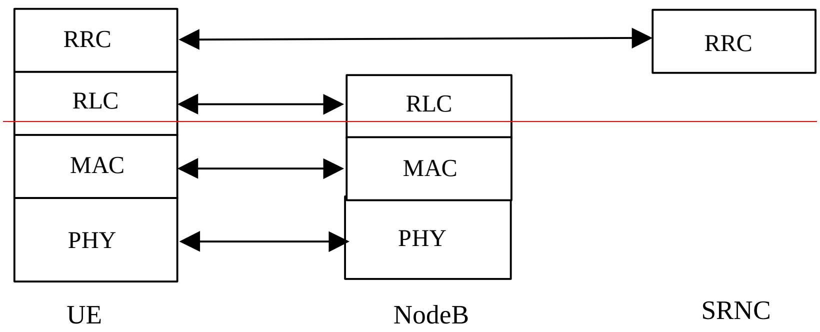



**Figure A.1: Protocol Termination for DCH, control plane**

**Case B:**

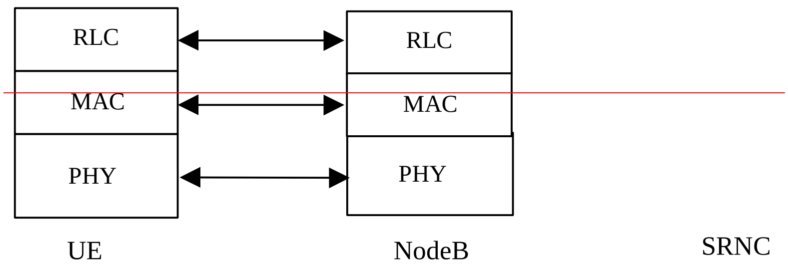



**Figure A.2: Protocol Termination for DCH, user plane**

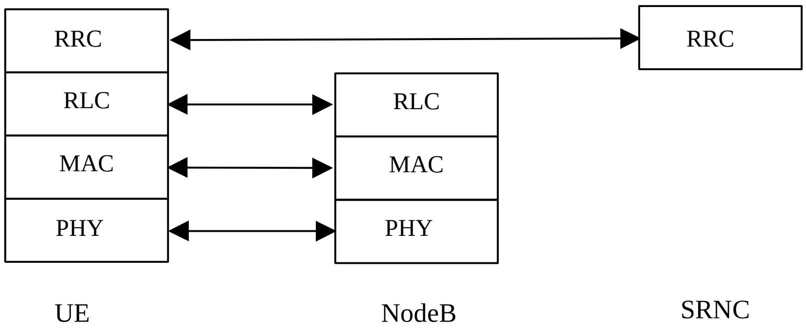
# A.2 Protocol termination for RACH/FACH

Figure A.3 and Figure A.4 show two alternative protocol termination cases for RACH/FACH for the control and user planes, respectively, referred to as Case B and Case C.

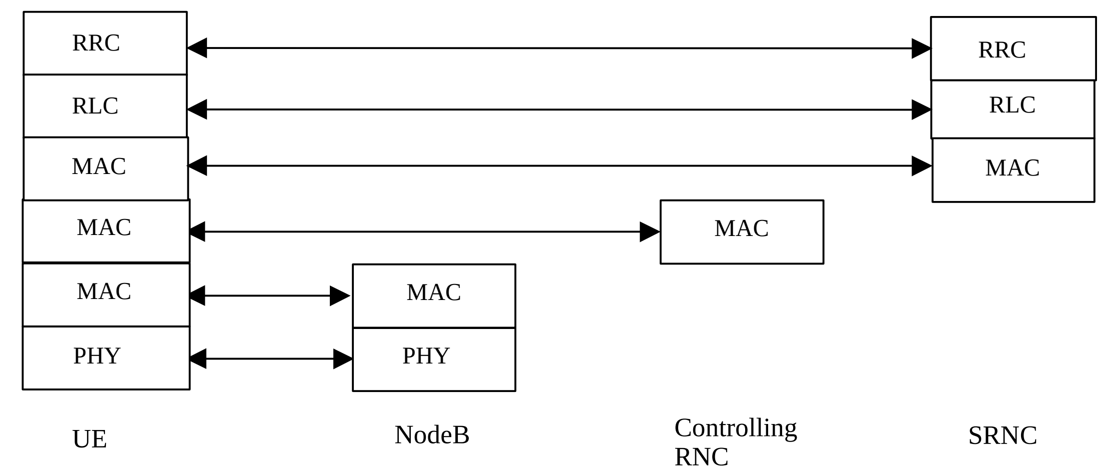
In case B, the physical layer, MAC and RLC terminate in Node B.

In case C, the MAC sublayer is split between Node B, Controlling and Serving RNC. This would be the preferred solution when MAC in Node B shall provide acknowledgements to RACH messages and perform scheduling of FACH transmissions.

**Case B:**

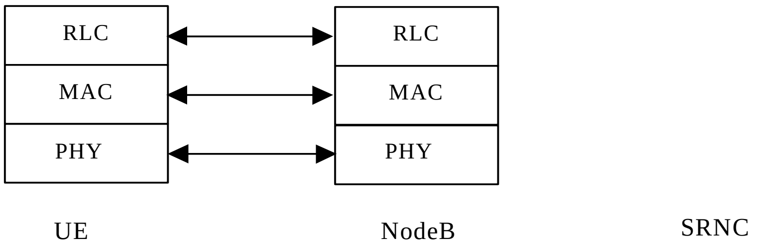



**Case C:**

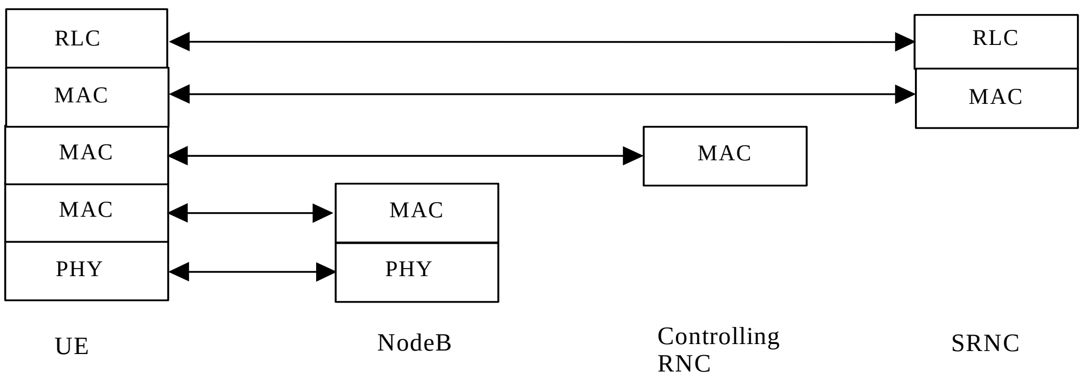



~~**Figure A.3: Protocol Termination for RACH/FACH, control plane**~~

**Case B:**




**Case C:**




~~**Figure A.4: Protocol Termination for RACH/FACH, user plane**~~

**3GPP TSG-RAN WG2 Meeting #19** **_R2-010481_**
**Sofia Antipolis, France, 19-23 February**

*CR-Form-v3*

# CHANGE REQUEST

| | | | | |
|---|---|---|---|---|
| ⌘ **25.301** | **CR 046** | ⌘ rev **-** | ⌘ Current version: **3.6.0** | ⌘ |

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

| | | | |
|---|---|---|---|
| ***Title:*** ⌘ | Removal of FAUSCH | | |
| ***Source:*** ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** ⌘ | | ***Date:*** ⌘ | 2001-02-15 |
| ***Category:*** ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | |
|---|---|
| ***Reason for change:*** ⌘ | FAUSCH is not supported in Release'99 |
| ***Summary of change:*** ⌘ | The Fast Uplink Signalling Channel (FAUSCH) is proposed to be removed in order to restrict the scope of this version of the specification to features supported in Release'99. |
| ***Consequences if not approved:*** ⌘ | none |

| | | |
|---|---|---|
| ***Clauses affected:*** ⌘ | 1, 3.2, 5.2.1.1, 5.3.1.1.2, 5.6.3, 6.2 | |
| ***Other specs Affected:*** ⌘ | [ ] Other core specifications ⌘<br>[ ] Test specifications<br>[ ] O&M Specifications | |
| ***Other comments:*** ⌘ | | |

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

# 1 Scope

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UMTS Release 99 shall support the features and functions described in this document generally. However, some specific logical channels and transport channels which initially were considered for Release 99, but which were deferred to a future UMTS release, have been kept in this specification.

The channels that are not considered for Release 99 are listed as follows:

- ~~Fast Uplink Signalling Channel (FAUSCH);~~
- ODMA Random Access Channel (ORACH);
- ODMA Dedicated Channel (ODCH);
- ODMA Common Control Channel (OCCCH);
- ODMA Dedicated Control Channel (ODCCH);
- ODMA Dedicated Traffic Channel (ODTCH).

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| ARQ | Automatic Repeat Request |
| ASC | Access Service Class |
| BCCH | Broadcast Control Channel |
| BCH | Broadcast Channel |
| BMC | Broadcast/Multicast Control |
| 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) |
| 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 |
| PDCP | Packet Data Convergence Protocol |
| PDU | Protocol Data Unit |
| PHY | Physical layer |
| PhyCH | Physical Channels |
| PU | Payload Unit |
| RAB | Radio Access Bearer |
| RACH | Random Access Channel |
| RB | Radio Bearer |
| 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 |
| SDU | Service Data Unit |
| SHCCH | Shared Channel Control Channel |
| 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 |

### 5.2.1.1 Transport channels

A general classification of transport channels is into two groups:

- common transport channels (where there is a need for inband identification of the UEs when particular UEs are addressed); and

- dedicated transport channels (where the UEs are identified by the physical channel, i.e. code and frequency for FDD and code, time slot and frequency for TDD).

Common transport channel types are (a more detailed description can be found in [4]):

- **Random Access Channel (RACH)**

  A contention based uplink channel used for transmission of relatively small amounts of data, e.g. for initial access or non-real-time dedicated control or traffic data.

- **ODMA Random Access Channel (ORACH)**

A contention based channel used in relay link.

- **Common Packet Channel (CPCH)**

  A contention based channel used for transmission of bursty data traffic. This channel only exists in FDD mode and only in the uplink direction. The common packet channel is shared by the UEs in a cell and therefore, it is a common resource. The CPCH is fast power controlled.

- **Forward Access Channel (FACH)**

  Common downlink channel without closed-loop power control used for transmission of relatively small amount of data.

- **Downlink Shared Channel (DSCH)**

  A downlink channel shared by several UEs carrying dedicated control or traffic data.

- **Uplink Shared Channel (USCH)**

  An uplink channel shared by several UEs carrying dedicated control or traffic data, used in TDD mode only.

- **Broadcast Channel (BCH)**

  A downlink channel used for broadcast of system information into an entire cell.

- **Paging Channel (PCH)**

  A downlink channel used for broadcast of control information into an entire cell allowing efficient UE sleep mode procedures. Currently identified information types are paging and notification. Another use could be UTRAN notification of change of BCCH information.

Dedicated transport channel types are:

- **Dedicated Channel (DCH)**

  A channel dedicated to one UE used in uplink or downlink.

- ~~**Fast Uplink Signalling Channel (FAUSCH)**~~

  ~~An uplink channel used to allocate dedicated channels in conjunction with FACH.~~

- **ODMA Dedicated Channel (ODCH)**

A channel dedicated to one UE used in relay link.

To each transport channel ~~(except for the FAUSCH, since it only conveys a reservation request)~~, there is an associated Transport Format (for transport channels with a fixed or slow changing rate) or an associated Transport Format Set (for transport channels with fast changing rate). A Transport Format is defined as a combination of encodings, interleaving, bit rate and mapping onto physical channels (see 3GPP TS 25.302 [4] for details). A Transport Format Set is a set of Transport Formats. E.g., a variable rate DCH has a Transport Format Set (one Transport Format for each rate), whereas a fixed rate DCH has a single Transport Format.

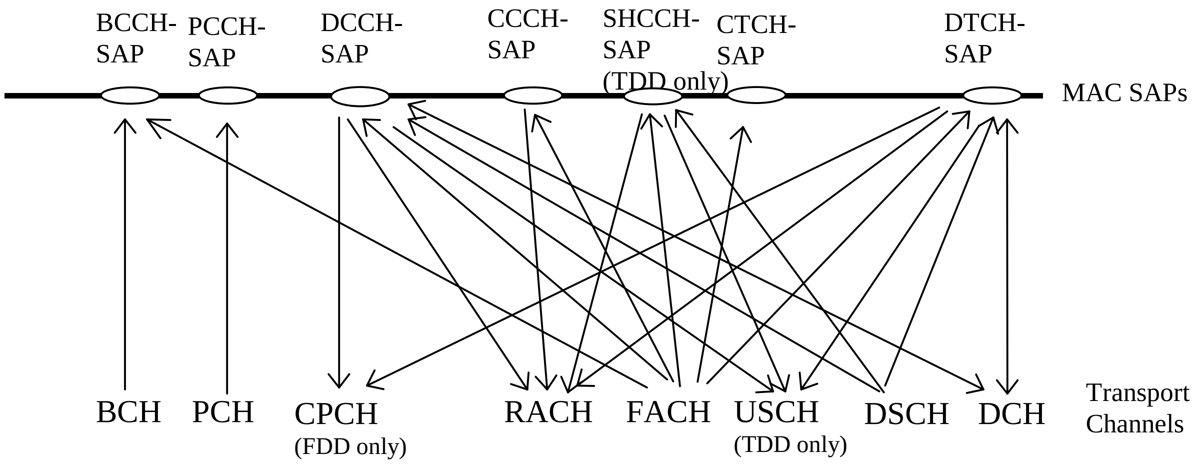
#### 5.3.1.1.2 Mapping between logical channels and transport channels

The following connections between logical channels and transport channels exist:

- BCCH is connected to BCH and may also be connected to FACH;

- PCCH is connected to PCH;
- CCCH is connected to RACH and FACH;
- SHCCH is connected to RACH and USCH/FACH and DSCH;
- DTCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) or to USCH (TDD only);
- CTCH is connected to FACH;
- DCCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only)~~ to FAUSCH~~, CPCH (FDD only), or to USCH (TDD only).

The mappings as seen from the UE and UTRAN sides are shown in Figure 4 and Figure 5 respectively. Figure 6 illustrates the mapping from the UE in relay operation. Note that ODMA logical channels and transport channels are employed only in relay link transmissions (i.e. not used for uplink or downlink transmissions on the UE-UTRAN radio interface).



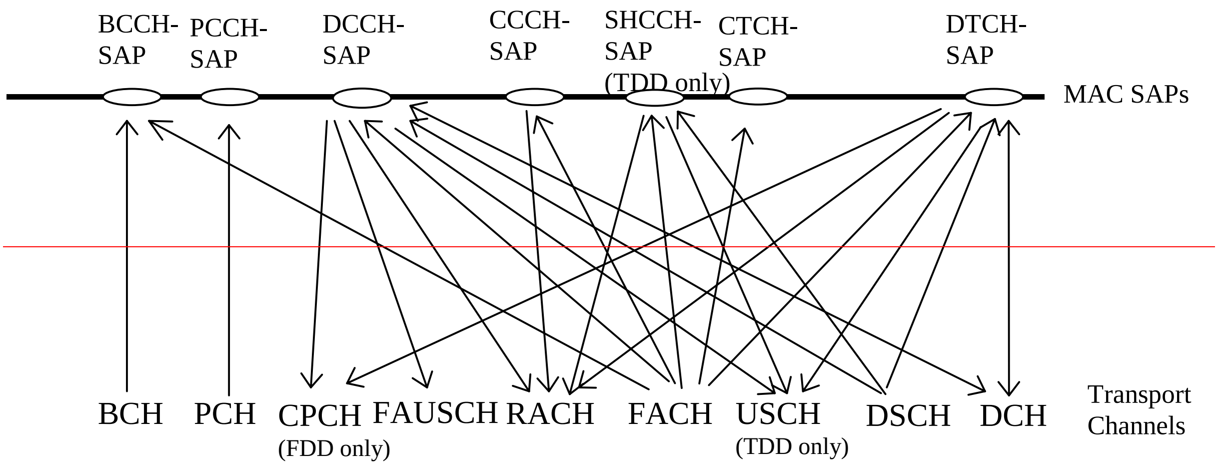




**Figure 4: Logical channels mapped onto transport channels, seen from the UE side**

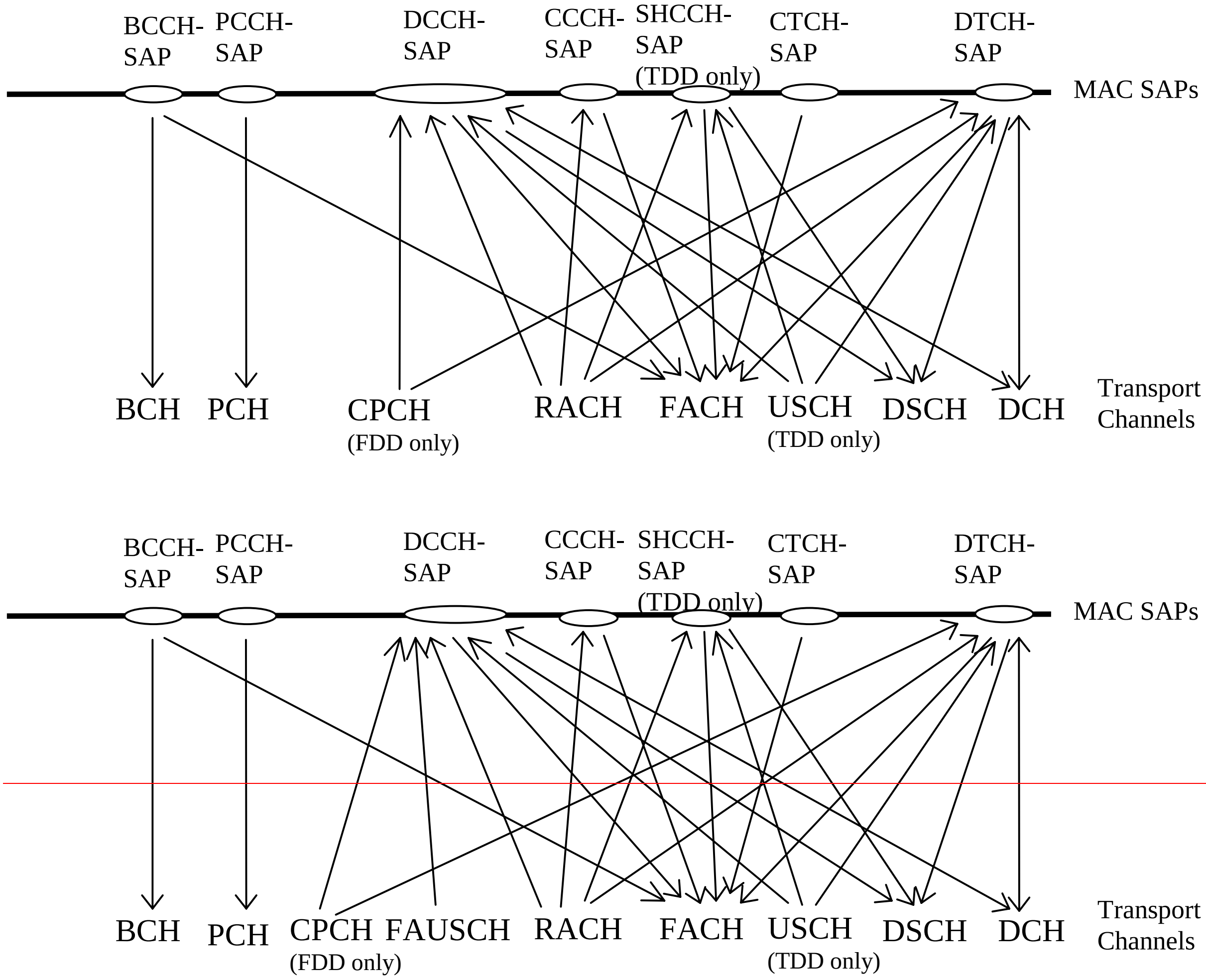



**Figure 5: Logical channels mapped onto transport channels, seen from the UTRAN side**

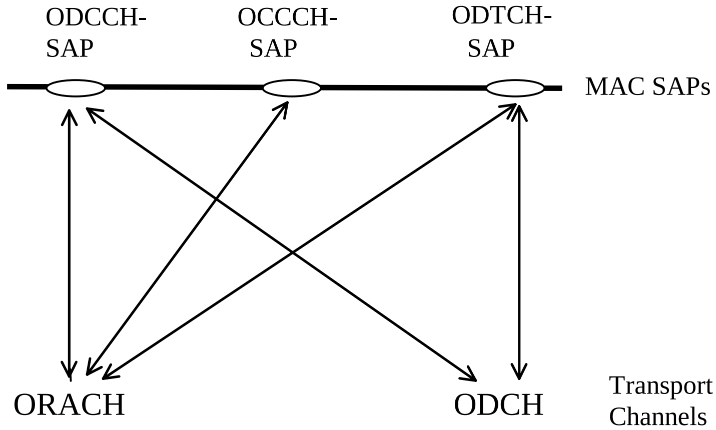



**Figure 6: Logical channels mapped onto transport channels, seen from the UE side (relay only)**

### 5.6.3 Void~~Protocol termination for FAUSCH~~

~~Protocol termination for the FAUSCH is the same as for the RACH in the control plane (see Figure 14), since FAUSCH is for control purposes only.~~

## 6.2 UE connection to UTRAN

The different levels of UE connection to UTRAN are listed below:

- No signalling connection exist
  The UE has no relation to UTRAN, only to CN. For data transfer, a signalling connection has to be established.
- Signalling connection exist
  There is a RRC connection between UE and UTRAN. The UE position can be known on different levels:
  - UTRAN Registration Area (URA) level
    The UE position is known on UTRAN registration area level. URA is a specified set of cell, which can be identified on the BCCH.
  - Cell level
    The UE position is known on cell level. Different channel types can be used for data transfer:
    - Common transport channels (RACH, FACH, CPCH, DSCH);
    - Dedicated transport channels (DCH).; ~~note that FAUSCH can be used to allocate a dedicated channel for data transmission.~~

**3GPP TSG-RAN WG2 Meeting #19**
**Sofia Antipolis, France, 19-23 February**

***R2-010529***

*CR-Form-v3*

# CHANGE REQUEST

| | | | | | | |
|---|---|---|---|---|---|---|
| ⌘ **25.301** | **CR 047** | ⌘ rev | **r1** | ⌘ Current version: | **3.6.0** | ⌘ |

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

| | | | |
|---|---|---|---|
| ***Title:*** ⌘ | Removal of ODMA channels | | |
| ***Source:*** ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** ⌘ | | ***Date:*** ⌘ | 2001-02-23 |
| ***Category:*** ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | |
|---|---|
| ***Reason for change:*** ⌘ | ODMA is not supported in Release'99 |
| ***Summary of change:*** ⌘ | The ODMA channels are proposed to be removed in order to restrict the scope of this version of the specification to features supported in Release'99.<br><br>The information removed from this specification should however be captured in the ODMA report, TR 25.924.<br><br>Changes in r1: Removal of UEr in abbreviations. |
| ***Consequences if not approved:*** ⌘ | none |

| | | |
|---|---|---|
| ***Clauses affected:*** ⌘ | 1, 3.2, 5.2.1.1, 5.3.1.1.1, 5.3.1.1.2, 5.4.2, 5.6.9, 5.6.10 | |
| ***Other specs Affected:*** ⌘ | [ ] Other core specifications ⌘<br>[ ] Test specifications<br>[ ] O&M Specifications | |
| ***Other comments:*** ⌘ | | |

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| | |
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| RNS | Radio Network Subsystem |
| RNTI | Radio Network Temporary Identity |
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| SRNC | Serving Radio Network Controller |
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| 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~~ |
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| UMTS | Universal Mobile Telecommunications System |
| URA | UTRAN Registration Area |
| USCH | Uplink Shared Channel |
| UTRA | UMTS Terrestrial Radio Access |
| UTRAN | UMTS Terrestrial Radio Access Network |

#### 5.2.1.1 Transport channels

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- **Downlink Shared Channel (DSCH)**

  A downlink channel shared by several UEs carrying dedicated control or traffic data.

- **Uplink Shared Channel (USCH)**

  An uplink channel shared by several UEs carrying dedicated control or traffic data, used in TDD mode only.

- **Broadcast Channel (BCH)**

  A downlink channel used for broadcast of system information into an entire cell.

- **Paging Channel (PCH)**

  A downlink channel used for broadcast of control information into an entire cell allowing efficient UE sleep mode procedures. Currently identified information types are paging and notification. Another use could be UTRAN notification of change of BCCH information.

Dedicated transport channel types are:

- **Dedicated Channel (DCH)**

  A channel dedicated to one UE used in uplink or downlink.

- **Fast Uplink Signalling Channel (FAUSCH)**

  An uplink channel used to allocate dedicated channels in conjunction with FACH.

- ~~**ODMA Dedicated Channel (ODCH)**~~

~~A channel dedicated to one UE used in relay link.~~

To each transport channel (except for the FAUSCH, since it only conveys a reservation request), there is an associated Transport Format (for transport channels with a fixed or slow changing rate) or an associated Transport Format Set (for transport channels with fast changing rate). A Transport Format is defined as a combination of encodings, interleaving, bit rate and mapping onto physical channels (see 3GPP TS 25.302 [4] for details). A Transport Format Set is a set of Transport Formats. E.g., a variable rate DCH has a Transport Format Set (one Transport Format for each rate), whereas a fixed rate DCH has a single Transport Format.

##### 5.3.1.1.1 Logical channels

The MAC layer provides data transfer services on logical channels. A set of logical channel types is defined for different kinds of data transfer services as offered by MAC. Each logical channel type is defined by what type of information is transferred.

A general classification of logical channels is into two groups:

- Control Channels (for the transfer of control plane information);
- Traffic Channels (for the transfer of user plane information).

The configuration of logical channel types is depicted in Figure 3.

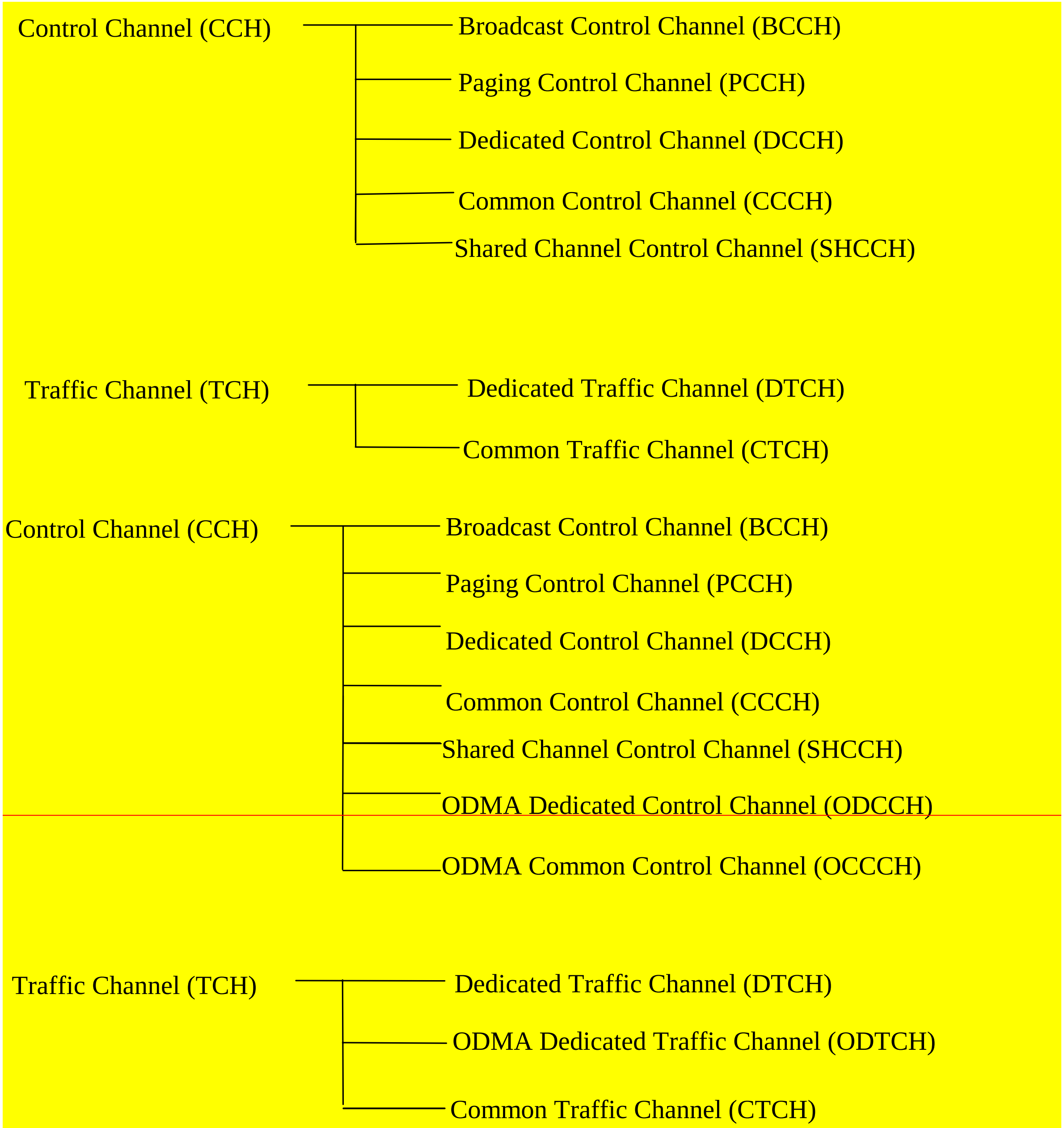


**Figure 3: Logical channel structure**

### Control Channels

Control channels are used for transfer of control plane information only.

**Broadcast Control Channel (BCCH)**

A downlink channel for broadcasting system control information.

**Paging Control Channel (PCCH)**

A downlink channel that transfers paging information. This channel is used when the network does not know the location cell of the UE, or, the UE is in the cell connected state (utilising UE sleep mode procedures).

**Common Control Channel (CCCH)**

Bi-directional channel for transmitting control information between network and UEs. This channel is commonly used by the UEs having no RRC connection with the network and by the UEs using common transport channels when accessing a new cell after cell reselection.

**Dedicated Control Channel (DCCH)**

A point-to-point bi-directional channel that transmits dedicated control information between a UE and the network. This channel is established through RRC connection setup procedure.

**Shared Channel Control Channel (SHCCH)**

Bi-directional channel that transmits control information for uplink and downlink shared channels between network and UEs. This channel is for TDD only.

~~**ODMA Common Control Channel (OCCCH)**~~

~~Bi-directional channel for transmitting control information between UEs.~~

~~**ODMA Dedicated Control Channel (ODCCH)**~~

~~A point-to-point bi-directional channel that transmits dedicated control information between UEs. This channel is established through RRC connection setup procedure.~~

Traffic Channels

Traffic channels are used for the transfer of user plane information only.

**Dedicated Traffic Channel (DTCH)**

A Dedicated Traffic Channel (DTCH) is a point-to-point channel, dedicated to one UE, for the transfer of user information. A DTCH can exist in both uplink and downlink.

~~**ODMA Dedicated Traffic Channel (ODTCH)**~~

~~An ODMA Dedicated Traffic Channel (ODTCH) is a point-to-point channel, dedicated to one UE, for the transfer of user information between UEs. An ODTCH exists in relay link.~~

**Common Traffic Channel (CTCH)**

A point-to-multipoint unidirectional channel for transfer of dedicated user information for all or a group of specified UEs.

#### 5.3.1.1.2 Mapping between logical channels and transport channels

The following connections between logical channels and transport channels exist:

- BCCH is connected to BCH and may also be connected to FACH;
- PCCH is connected to PCH;
- CCCH is connected to RACH and FACH;
- SHCCH is connected to RACH and USCH/FACH and DSCH;
- DTCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) or to USCH (TDD only);
- CTCH is connected to FACH;
- DCCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) to FAUSCH, CPCH (FDD only), or to USCH (TDD only).

The mappings as seen from the UE and UTRAN sides are shown in Figure 4 and Figure 5 respectively. ~~Figure 6 illustrates the mapping from the UE in relay operation. Note that ODMA logical channels and transport channels are employed only in relay link transmissions (i.e. not used for uplink or downlink transmissions on the UE-UTRAN radio interface).~~

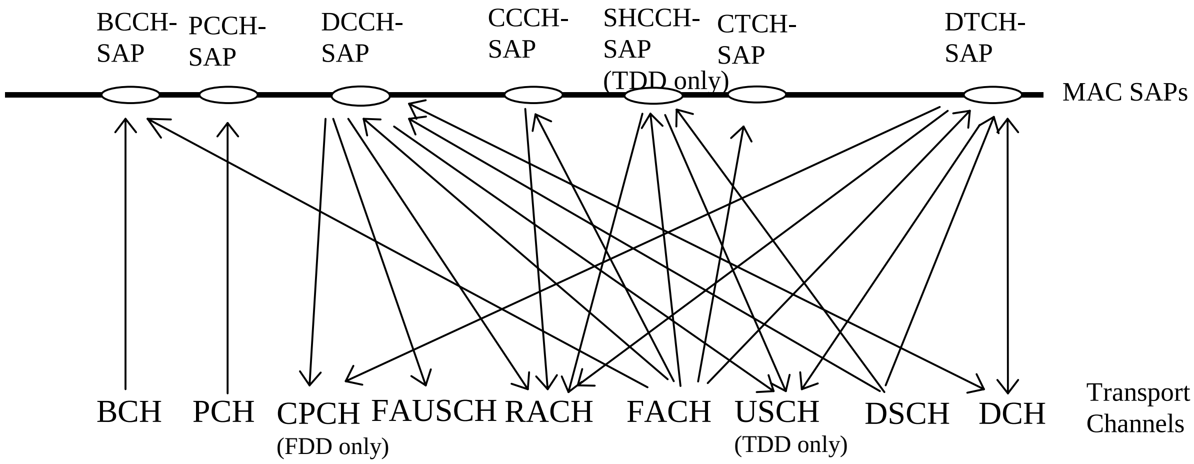


**Figure 4: Logical channels mapped onto transport channels, seen from the UE side**

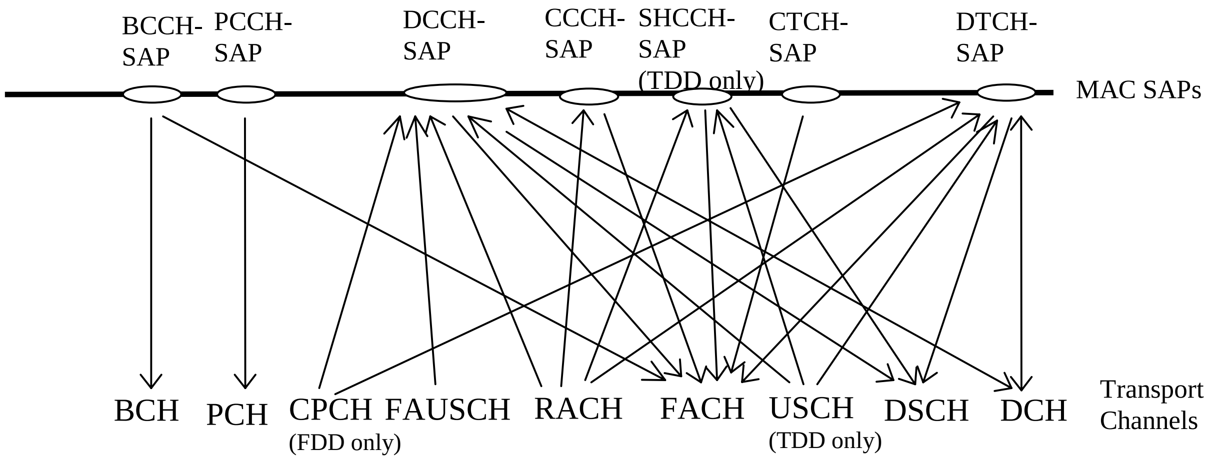


**Figure 5: Logical channels mapped onto transport channels, seen from the UTRAN side**

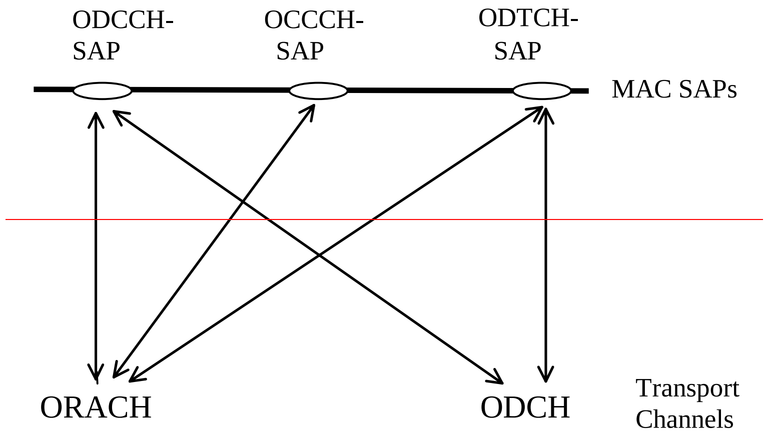


Figure 6: Logical channels mapped onto transport channels, seen from the UE side (relay only)

### 5.4.2 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. The RRC layer performs the scheduling, segmentation and repetition. 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. The system information is normally repeated on a regular basis. The RRC layer performs the scheduling, segmentation and repetition. 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, re-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. In case of connection loss, the UE requests re-establishment of the RRC connection. In case of RRC connection failure, RRC releases resources associated with the RRC connection.

- **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 Bearers.** The RRC layer can, on request from higher layers, perform the establishment, reconfiguration and release of Radio Bearers in the user plane. A number of Radio 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 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. Higher layers on the network side can request paging and notification. 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 Bearers can be met. This includes the allocation of a sufficient number of radio resources.

- **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. Details of the security architecture are specified in [15].

- **Slow DCA**. Allocation of preferred radio resources based on long-term decision criteria. It is applicable only in TDD mode.

- **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.

- **Initial cell selection and re-selection in idle mode.** Selection of the most suitable cell based on idle mode measurements and cell selection criteria.

- **Integrity protection.** This function adds a Message Authentication Code (MAC-I) to those RRC messages that are considered sensitive and/or contain sensitive information. The mechanism how the MAC-I is calculated is described in TS 33.105 [14].

- **Initial Configuration for CBS**
  This function performs the initial configuration of the BMC sublayer.

- **Allocation of radio resources for CBS**
  This function allocates radio resources for CBS based on traffic volume requirements indicated by BMC. The radio resource allocation set by RRC (i.e. the schedule for mapping of CTCH onto FACH/S-CCPCH) is indicated to BMC to enable generation of schedule messages. The resource allocation for CBS shall be broadcast as system information.

- **Configuration for CBS discontinuous reception**
  This function configures the lower layers (L1, L2) of the UE when it shall listen to the resources allocated for CBS based on scheduling information received from BMC.

- **Timing advance control.** The RRC controls the operation of timing advance. It is applicable only in TDD mode.

## 5.6.9 Protocol termination for ODCH

Figure 24 and Figure 25 show the protocol termination for ODCH in the control and user planes, respectively.

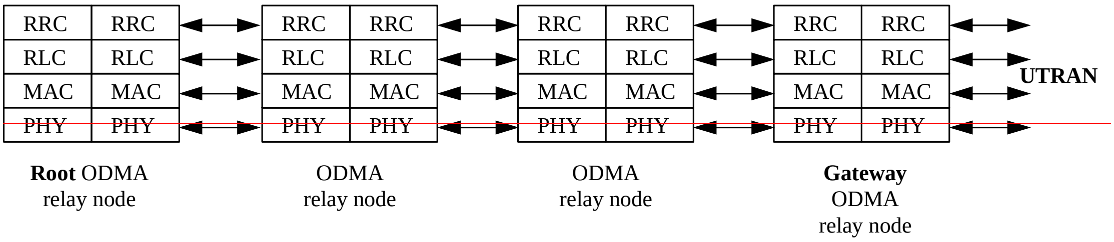


**Figure 24: Protocol Termination for the ODCH in the Control Plane**

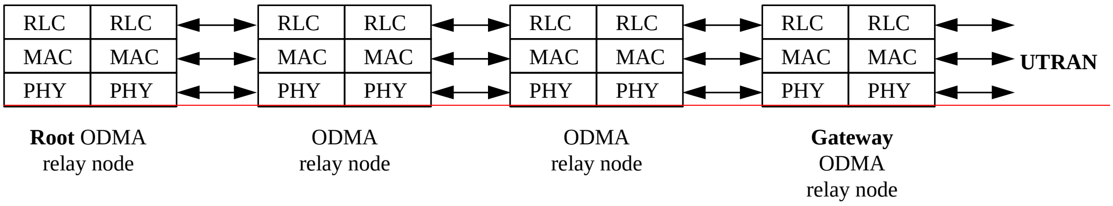


**Figure 25: Protocol Termination for the ODCH in the User Plane**

NOTE: The current mechanisms and procedures carried out by the RLC and the MAC for the DCH will require 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 is illustrated in Figure 26 and Figure 27, respectively. The shown ODMA relay nodes may be either $UE_R$, Seed, Root, or Gateway.

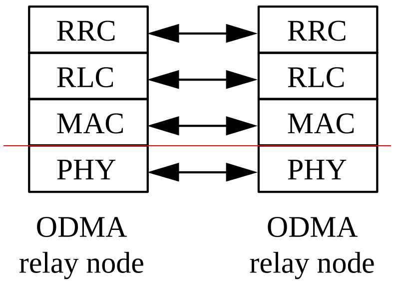


**Figure 26: Protocol Termination for ORACH control plane**

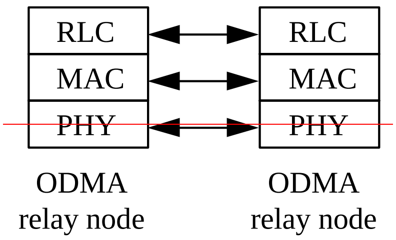


**Figure 27: Protocol Termination for ORACH user plane**

**3GPP TSG-RAN WG2 Meeting #19** ***Tdoc R2-010668***
**Sophia Antipolis, France, 19-23 February 2001**

*CR-Form-v3*

# CHANGE REQUEST

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ⌘ | **25.301** | **CR** | **048** | ⌘ | rev | **r1** | ⌘ | Current version: | **3.6.0** ⌘ |

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***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

| | | | | |
|---|---|---|---|---|
| ***Title:*** | ⌘ | UE model channel numbering | | |
| ***Source:*** | ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** | ⌘ | | ***Date:*** ⌘ | 22/02/2001 |
| ***Category:*** | ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | | |
|---|---|---|
| ***Reason for change:*** | ⌘ | Insertion of channel numbering model as discussed during RAN2#19. |
| ***Summary of change:*** | ⌘ | New sub-section added to section 5.3 titled 'Transport channel and logical channel numbering' |
| ***Consequences if not approved:*** | ⌘ | The model for channel number will be unclear and can only be inferred from structure of RRC IEs. |

| | | | | |
|---|---|---|---|---|
| ***Clauses affected:*** | ⌘ | 5.3.x (new) | | |
| ***Other specs affected:*** | ⌘ | [ ] Other core specifications | ⌘ | |
| | | [ ] Test specifications | | |
| | | [ ] O&M Specifications | | |
| ***Other comments:*** | ⌘ | | | |

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

## 5.3.x Transport Channel and Logical Channel Numbering

The UE model for transport channel and logical channel numbering is defined by the following:

- For FACH transport channels:
  - A transport channel identity is associated with each FACH transport channel. Each identity is unique within the downlink FACHs mapped onto the same physical channel.
  - Transport channel identities can be allocated non sequentially.
  - Transport channel identity is not used to determine the radio bearer mapping. The transport channels that can be used are determined from the available physical channels.
  - Each downlink DCCH and DTCH has a unique logical channel identity.
- For RACH and CPCH transport channels:
  - A transport channel identity is associated with each RACH transport channel. Each identity is unique within the RACHs mapped onto the same PRACH.
  - A transport channel identity is associated with each CPCH transport channel. Each identity is unique within the CPCHs mapped onto the same CPCH set.
  - Transport channel identities can be allocated non sequentially.
  - Transport channel identity is not used to determine the radio bearer mapping. The transport channels that can be used are determined from the available physical channels.
  - Each uplink DCCH and DTCH has a unique logical channel identity.
- For downlink DCH and DSCH transport channels:
  - A transport channel identity is associated with each downlink DCH transport channel. Each identity is unique within the downlink DCHs configured in the UE;
  - Transport channel identities can be allocated non sequentially.
  - A transport channel identity is associated with each DSCH transport channel. Each identity is unique within the DSCHs configured in the UE;
  - A logical channel identity is associated with each logical channel that is multiplexed with other logical channels before being mapped to a transport channel. Each identity is unique within the logical channels mapped to the same transport channel.
  - A logical channel that is mapped to DCH and DSCH simultaneously has one logical channel identity.
- For uplink DCH and USCH transport channels:
  - A transport channel identity is associated with each downlink DCH transport channel. Each identity is unique within the DCHs configured in the UE;
  - Transport channel identities can be allocated non sequentially.
  - A transport channel identity is associated with each USCH transport channel. Each identity is unique within the USCHs configured in the UE;
  - A logical channel identity is associated with each logical channel that is multiplexed with other logical channels before being mapped to a transport channel. Each identity is unique within the logical channels mapped to the same transport channel.

**3GPP TSG-RAN WG2 Meeting #19**
**Sophia Antipolis, France, 19 - 23 February 2001**

***Tdoc R2-010602***

*CR-Form-v3*

# CHANGE REQUEST

⌘ **25.301 CR 049** ⌘ rev ⌘ Current version: **3.6.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

| | | | |
|---|---|---|---|
| ***Title:*** ⌘ | Renaming of Dynamic Transport Channel Type Switching | | |
| ***Source:*** ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** ⌘ | | ***Date:*** ⌘ | 2001-02-20 |
| ***Category:*** ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | |
|---|---|
| ***Reason for change:*** ⌘ | In RAN2 WG2 Meeting #19 User Plan Ad-Hoc, it was decided to change the name Dynamic Transport Channel Type Switching to Dynamic Transport Channel Type Switching in 25.301 and 25.321. |
| ***Summary of change:*** ⌘ | Remaining of Dynamic Transport Channel Type Switching to Dynamic Transport Channel Type Switching- |
| ***Consequences if not approved:*** ⌘ | Inconsistency in with the name given in 25.321. |

| | |
|---|---|
| ***Clauses affected:*** ⌘ | 5.3.1.2 |
| ***Other specs affected:*** ⌘ | [ ] Other core specifications ⌘<br>[ ] Test specifications<br>[ ] O&M Specifications |
| ***Other comments:*** ⌘ | |

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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

### 5.3.1.2 MAC functions

The functions of MAC include:

- **Mapping between logical channels and transport channels.** The MAC is responsible for mapping of logical channel(s) onto the appropriate transport channel(s).

- **Selection of appropriate Transport Format for each Transport Channel depending on instantaneous source rate**. Given the Transport Format Combination Set assigned by RRC, MAC selects the appropriate transport format within an assigned transport format set for each active transport channel depending on source rate**.** The control of transport formats ensures efficient use of transport channels.

- **Priority handling between data flows of one UE**. When selecting between the Transport Format Combinations in the given Transport Format Combination Set, priorities of the data flows to be mapped onto the corresponding Transport Channels can be taken into account. Priorities are e.g. given by attributes of Radio Bearer services and RLC buffer status. The priority handling is achieved by selecting a Transport Format Combination for which high priority data is mapped onto L1 with a "high bit rate" Transport Format, at the same time letting lower priority data be mapped with a "low bit rate" (could be zero bit rate) Transport Format. Transport format selection may also take into account transmit power indication from Layer 1.

- **Priority handling between UEs by means of dynamic scheduling**. In order to utilise the spectrum resources efficiently for bursty transfer, a dynamic scheduling function may be applied. MAC realises priority handling on common and shared transport channels. Note that for dedicated transport channels, the equivalent of the dynamic scheduling function is implicitly included as part of the reconfiguration function of the RRC sublayer.

NOTE: In the TDD mode the data to be transported are represented in terms of sets of resource units.

- **Identification of UEs on common transport channels**. When a particular UE is addressed on a common downlink channel, or when a UE is using the RACH, there is a need for inband identification of the UE. Since the MAC layer handles the access to, and multiplexing onto, the transport channels, the identification functionality is naturally also placed in MAC.

- **Multiplexing/demultiplexing of higher layer PDUs into/from transport blocks delivered to/from the physical layer on common transport channels**. MAC should support service multiplexing for common transport channels, since the physical layer does not support multiplexing of these channels.

- **Multiplexing/demultiplexing of higher layer PDUs into/from transport block sets delivered to/from the physical layer on dedicated transport channels**. The MAC allows service multiplexing for dedicated transport channels. This function can be utilised when several upper layer services (e.g. RLC instances) can be mapped efficiently on the same transport channel. In this case the identification of multiplexing is contained in the MAC protocol control information.

- **Traffic volume monitoring**. Measurement of traffic volume on logical channels and reporting to RRC. Based on the reported traffic volume information, RRC performs transport channel switching decisions.

- ~~**Dynamic**~~ **Transport Channel type switching.** Execution of the switching between common and dedicated transport channels based on a switching decision derived by RRC**.**

- **Ciphering**. This function prevents unauthorised acquisition of data. Ciphering is performed in the MAC layer for transparent RLC mode. Details of the security architecture are specified in [15].

- **Access Service Class selection for RACH transmission**. The RACH resources (i.e. access slots and preamble signatures for FDD, timeslot and channelisation code for TDD) may be divided between different Access Service Classes in order to provide different priorities of RACH usage. In addition it is possible for more than one ASC or for all ASCs to be assigned to the same access slot/signature space. Each access service class will also have a set of back-off parameters associated with it, some or all of which may be broadcast by the network. The MAC function applies the appropriate back-off and indicates to the PHY layer the RACH partition associated to a given MAC PDU transfer.

**3GPP TSG-RAN WG2 Meeting #19** ***Tdoc R2-010657***

**Sophia Antipolis, France, 19-23 February 2001**

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# CHANGE REQUEST

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ⌘ | **25.301** | **CR** | **050** | ⌘ | rev | | ⌘ | Current version: **3.6.0.** ⌘ |

*For* ***HELP*** *on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

***Proposed change affects:*** ⌘ (U)SIM [ ] ME/UE [X] Radio Access Network [ ] Core Network [ ]

| | | | |
|---|---|---|---|
| ***Title:*** ⌘ | Removal of payload unit concept | | |
| ***Source:*** ⌘ | TSG-RAN WG2 | | |
| ***Work item code:*** ⌘ | | ***Date:*** ⌘ | 21th February 01 |
| ***Category:*** ⌘ | **F** | ***Release:*** ⌘ | R99 |
| | *Use one of the following categories:*<br>***F*** *(essential correction)*<br>***A*** *(corresponds to a correction in an earlier release)*<br>***B*** *(Addition of feature),*<br>***C*** *(Functional modification of feature)*<br>***D*** *(Editorial modification)*<br>Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | *Use one of the following releases:*<br>*2 (GSM Phase 2)*<br>*R96 (Release 1996)*<br>*R97 (Release 1997)*<br>*R98 (Release 1998)*<br>*R99 (Release 1999)*<br>*REL-4 (Release 4)*<br>*REL-5 (Release 5)* |

| | |
|---|---|
| ***Reason for change:*** ⌘ | In RAN2#19 it was decided to eliminate the PU concept from RLC. Therefore all references to PUs have to be replaced by references to PDUs. |
| ***Summary of change:*** ⌘ | The term payload unit is replaced by PDU where appropriate, and text portions only refering to the payload unit concept are removed. |
| ***Consequences if not approved:*** ⌘ | Inconsistent description. Not all parts of the current text seem to be valid if the PDU contains more than one PU. |

| | | |
|---|---|---|
| ***Clauses affected:*** ⌘ | 3.2, 5.3.2.2, 5.3.5 | |
| ***Other specs affected:*** ⌘ | [ ] Other core specifications ⌘<br>[ ] Test specifications<br>[ ] O&M Specifications | |
| ***Other comments:*** ⌘ | | |

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| ARQ | Automatic Repeat Request |
| ASC | Access Service Class |
| BCCH | Broadcast Control Channel |
| BCH | Broadcast Channel |
| BMC | Broadcast/Multicast Control |
| 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) |
| 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 |
| PDCP | Packet Data Convergence Protocol |
| PDU | Protocol Data Unit |
| PHY | Physical layer |
| PhyCH | Physical Channels |
| ~~PU~~ | ~~Payload Unit~~ |
| RAB | Radio Access Bearer |
| RACH | Random Access Channel |
| RB | Radio Bearer |
| 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 |
| SDU | Service Data Unit |
| SHCCH | Shared Channel Control Channel |
| 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 |

# […]

### 5.3.2.2 RLC Functions

- **Segmentation and reassembly.** This function performs segmentation/reassembly of variable-length higher layer ~~PDUs~~ SDUs into/from smaller RLC ~~Payload Units (PUs)~~PDUs. The RLC PDU size is adjustable to the actual set of transport formats.

~~NOTE: Multiple PUs in a RLC PDU is not supported in Release 99. For Release 99 an RLC PDU will include only a single RLC PU.~~

- **Concatenation.** If the contents of an RLC SDU ~~do not fill an integer number of RLC Pus~~cannot be carried by one RLC PDU, the first segment of the next RLC SDU may be put into the RLC PDU in concatenation with the last segment of the previous RLC SDU.

- **Padding.** When concatenation is not applicable and the remaining data to be transmitted does not fill an entire RLC PDU of given size, the remainder of the data field shall be filled with padding bits.

- **Transfer of user data.** This function is used for conveyance of data between users of RLC services. RLC supports acknowledged, unacknowledged and transparent data transfer. QoS setting controls transfer of user data.

- **Error correction.** This function provides error correction by retransmission (e.g. Selective Repeat, Go Back N, or a Stop-and-Wait ARQ) in acknowledged data transfer mode.

- **In-sequence delivery of higher layer PDUs**. This function preserves the order of higher layer PDUs that were submitted for transfer by RLC using the acknowledged data transfer service. If this function is not used, out-of-sequence delivery is provided.

- **Duplicate Detection.** This function detects duplicated received RLC PDUs and ensures that the resultant higher Layer PDU is delivered only once to the upper layer.

- **Flow control**. This function allows an RLC receiver to control the rate at which the peer RLC transmitting entity may send information.

- **Sequence number check (Unacknowledged data transfer mode).** This function guarantees the integrity of reassembled PDUs and provides a mechanism for the detection of corrupted RLC SDUs through checking sequence number in RLC PDUs when they are reassembled into a RLC SDU. A corrupted RLC SDU will be discarded.

- **Protocol error detection and recovery**. This function detects and recovers from errors in the operation of the RLC protocol.

- **Ciphering**. This function prevents unauthorised acquisition of data. Ciphering is performed in RLC layer for non-transparent RLC mode. Details of the security architecture are specified in [15].

- **Suspend/resume function**. Suspension and resumption of data transfer as in e.g. LAPDm (cf. GSM 04.05).

# […]

### 5.3.5 Data flows through Layer 2

Data flows through layer 2 are characterised by the applied data transfer modes on RLC (acknowledged, unacknowledged and transparent transmission) in combination with the data transfer type on MAC, i.e. whether or not a MAC header is required. The case where no MAC header is required is referred to as "transparent" MAC transmission. Acknowledged and unacknowledged RLC transmissions both require a RLC header. In unacknowledged transmission, only one type of unacknowledged data PDU is exchanged between peer RLC entities. In acknowledged transmission, both (acknowledged) data PDUs and control PDUs are exchanged between peer RLC entities.
The resulting different data flow cases are illustrated in Figures 7 - 10. On the level of detail presented here, differences between acknowledged and unacknowledged RLC transmission are not visible. Acknowledged and unacknowledged RLC transmission is shown as one case, referred to as non-transparent RLC.

NOTE: The term "transparent transmission" is used here to characterise the case where a protocol, MAC or RLC, does not require any protocol control information (e.g. header). In transparent transmission mode, however, some protocol functions may still be applied. In this case an entity of the respective protocol must be present even when the protocol is transparent. For the RLC protocol the segmentation/reassembly function may be applied. This can be performed without segmentation header when a given higher layer PDU fits into a fixed number of RLC PDUs to be transferred in a given transmission time interval. In this case segmentation/reassembly follows predefined rules known to sending and receiving RLC entities. For instance in the user plane, the segmentation/reassembly function is needed for the case of real-time services using high and possibly variable bit rates. For such services higher layer PDUs shall be segmented into reasonably sized RLC PDUs of fixed length allowing efficient FCS error detection on the physical layer. The higher layer PDU can be reassembled by simply concatenating all RLC PDUs included in a transport block set as implied by the used transport format.

Figure 7 and Figure 8 illustrate the data flows for transparent RLC with transparent and non-transparent MAC transmission, respectively.
Figure 9 and Figure 10 illustrate the data flows for non-transparent RLC with transparent and non-transparent MAC transmission, respectively.
~~For acknowledged RLC transmission mode, a single RLC PDU may include more than one segment (referred to as Payload Unit, cf. TS 25.322 [8]) of RLC SDU. The feature of including multiple PUs into a PDU is not shown here in the data flow, as it is not supported for Release 99.~~
A number of MAC PDUs shown in the figures shall comprise a transport block set. Note, however, that in all cases a transport block set must not necessarily match with a RLC SDU. The span of a transport block set can be smaller or larger than an RLC SDU.
Each mapping between a logical channel and a transport channel as defined in Figure 4 and Figure 5 in combination with the respective RLC transmission mode implies a certain data flow which is specified on a general level in the following.

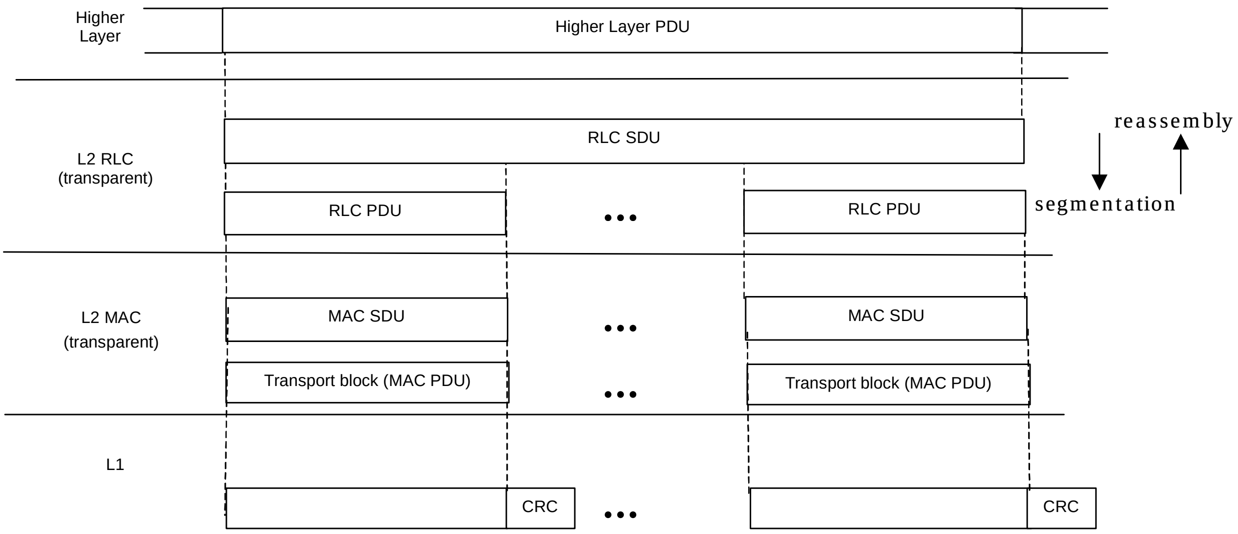


**Figure 7: Data flow for transparent RLC and MAC**

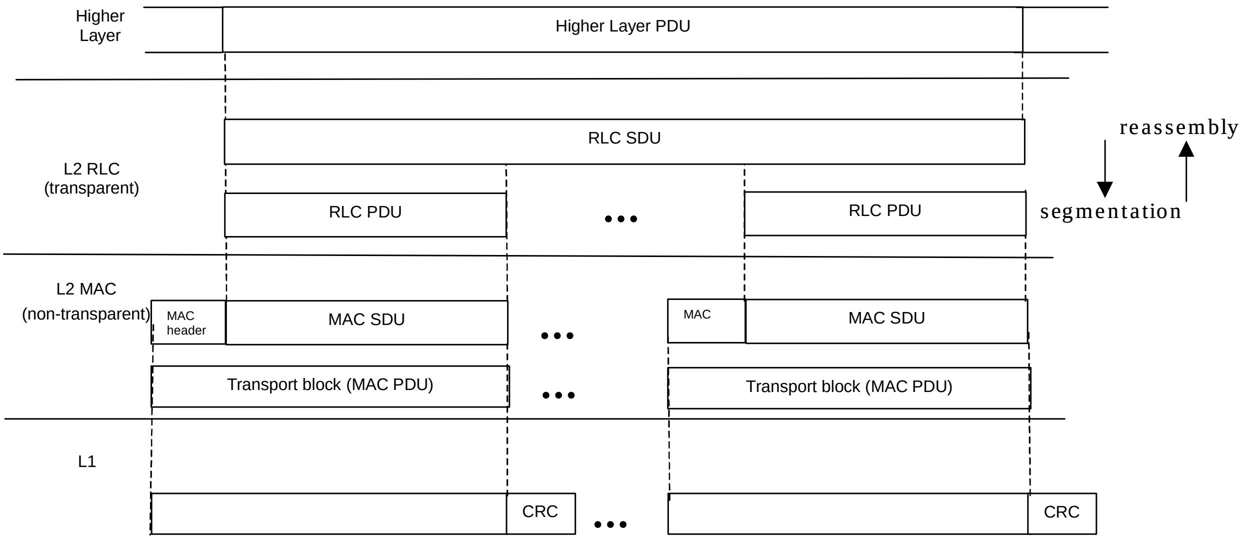


**Figure 8: Data flow for transparent RLC and non-transparent MAC**

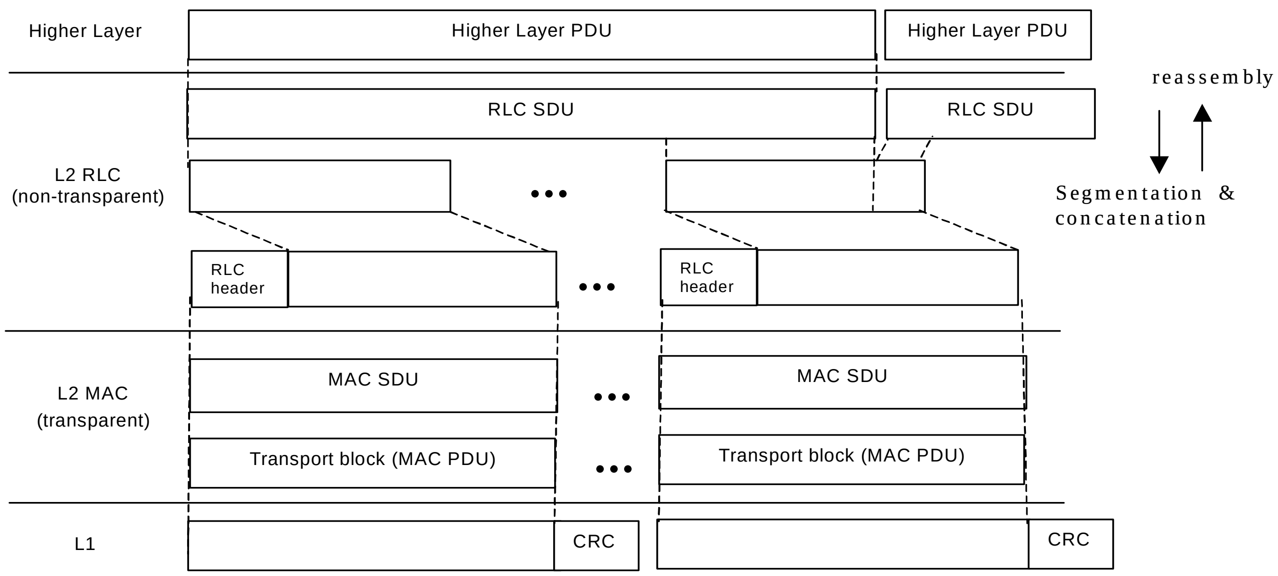


**Figure 9: Data flow for non-transparent RLC and transparent MAC**

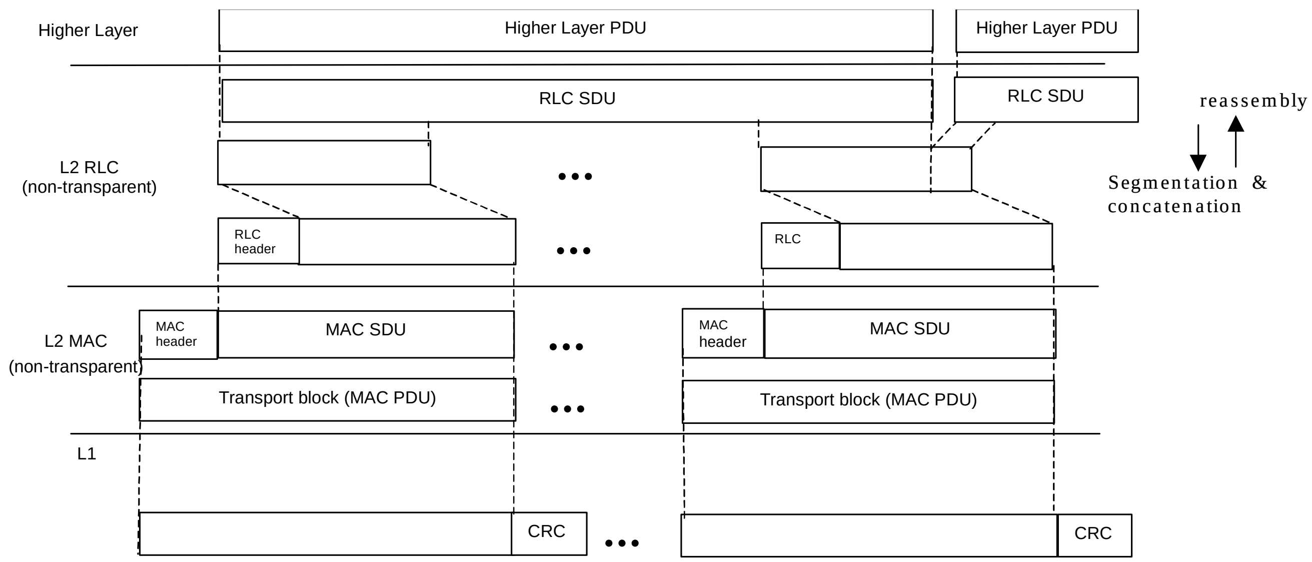


**Figure 10: Data flow for non-transparent RLC and MAC**