**TSG-RAN WG2#4**
**Berlin Germany**
**May 25 - 28, 1999**

*TSGR#4(99) 444*

**Agenda Item:** **6.7**

**Source:** **Golden Bridge Tech**

**Title:** **S25.201, Change Request for CPCH related modification**

**Document for:** **Approval**

---

**TSG-RAN Meeting #3**
**Yokohama (Japan), 21 - 23 April 1999**

*TSGR#3(99) 259*

**Agenda Item:** 6.2

**Source:** TSG RAN WG2

**Title:** TS RAN S2.01, Radio Interface Protocol Architecture, V0.2.0

**Document for:** Approval

---

This document was approved by TSG RAN WG2 at meeting #3 on 16 April 1999 in Yokohama (issued as Td R2-99337). It is proposed for approval by TSG RAN.

# Intellectual Property Rights

# Foreword

# 1. Scope

# 2. References

# 3. Definitions and Abbreviations

## 3.1 Definitions

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

## ~~1.2~~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 |
| CPCH | Common Packet channel |
| CPCCH | Common Packet Control Channel |
| CN | Core Network |
| CRC | Cyclic Redundancy Check |

# 4. Assumed UMTS Architecture

# 5. Radio interface protocol architecture

## 5.1 Overall protocol structure

### ~~1.1.1~~5.1.1 Service access points and service primitives

### ~~1.2~~5.2 Layer 1 Services and Functions

#### ~~1.1.1~~5.2.1 L1 Services

##### ~~1.1.1.1~~5.2.1.1 Transport channels

- **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.

- Common Packet channel (CPCH)

A contention based channel used for transmission of bursty data traffic. This channel only exists in FDD 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.

- Common Packet Control Channel (CPCCH)

A downlink control channel associated with a particular CPCH used for power control, and L23 downlink signaling for ARQ and other control messages.

#### ~~1.1.2~~5.2.2 L1 Functions

### ~~1.3~~5.3 Layer 2 Services and Functions

## 5.3.1 MAC Services and Functions

#### ~~1.1.1.1~~5.3.1.1 MAC Services to upper layers

5.3.1.1.1 Logical channels

##### ~~1.1.1.1.1~~5.3.1.1.1.1 Control Channels

##### ~~1.1.1.1.2~~5.3.1.1.1.2 Traffic Channels

### ~~1.1.1.1.2~~5.3.1.1.2 Mapping between logical channels and transport channels

The following connections between logical channels and transport channels exist:

- SCCH is connected to SCH
- BCCH is connected to BCH
- PCCH is connected to PCH
- CCCH is connected to RACH and FACH
- DTCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, CPCH, or to USCH (TDD only)
- CTCH can be connected to DSCH, FACH ~~or~~ BCH. (ffs.)

  *[Editor´s note: Above potential mappings are proposed by the editor. This channel type will be included into the Figures below when the mappings have been agreed.]*

- DCCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, to FAUSCH, CPCH, or to USCH (TDD only).

The mappings as seen from the UE and UTRAN sides are shown in Figure 1 and Figure 2 respectively. **Error! Reference source not found.** illustrates the mapping from the UE in relay operation. Note that ODMA logical channels and transport channels are employed only in relaylink transmissions (i.e. not used for uplink or downlink transmissions on the UE-UTRAN radio interface).

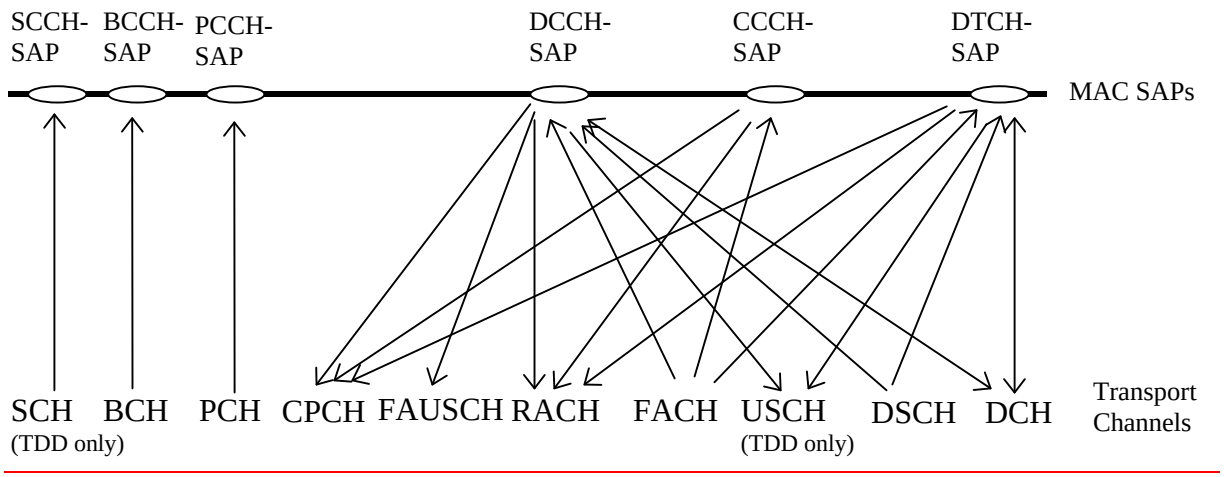



**Figure 1: Logical channels mapped onto transport channels, seen from the UE side**

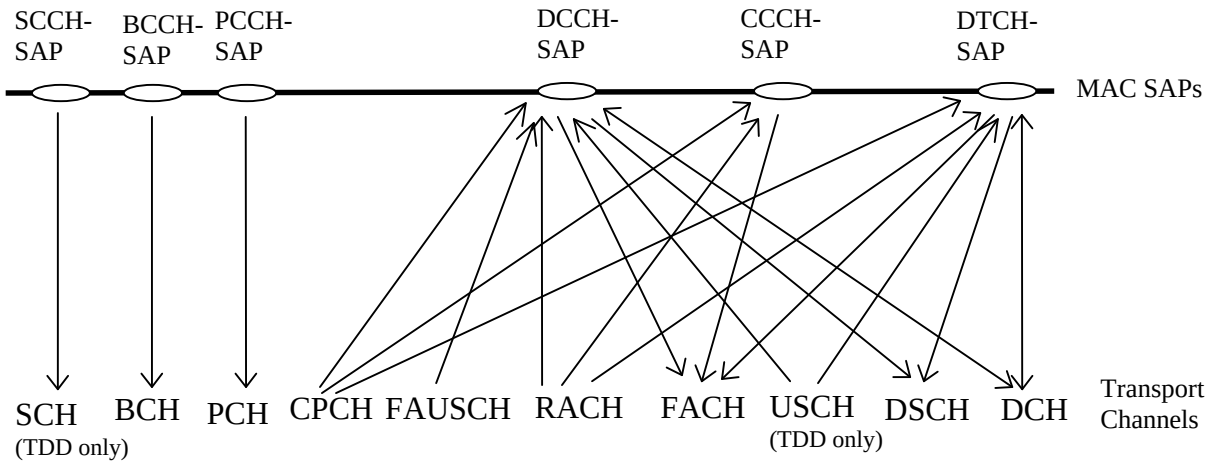



**Figure 2: Logical channels mapped onto transport channels, seen from the UTRAN side**

## ~~1.1.1.2~~5.3.1.2 MAC functions

The functions of MAC include:

- **Access Service Class selection for RACH transmission**. The RACH resources (i.e. access slots and preamble signatures) may be divided between different Access Service Classes in order to provide different priorities of RACH usage. This function selects, based upon the type of data to be transmitted, the RACH parameters in accordance with the Service Access Class assignment.

  *[Editor's note: This function may support admission control. Its impact on BCCH capacity and its effects on RACH interference, retransmission and back-off time remains ffs.]*

- **Packet building for CPCH**

The MAC entity will construct a maximum capacity packet appropriate for transmission on the highest rate resource. The duration of this packet will be NF ~~-~~max pkt ~~-~~(in frames). The highest priority packets coming from higher priority users and applications will be service multiplexed first. The data for this uplink priority based mulitplexing ~~The following order of priority applies~~may come from several sources: previously buffered MAC packets, the Retransmission packets, the ARQ packets, packets in the RLC buffers with stringent delay requirements. The packet construction will be based assigned preiority consistent with ~~on~~ the ~~acceptable~~ RAB parameters such as allowed TFS for each logical channel. The MAC will construct and deliever the packet on a when avaialable~~frame by frame~~ basis. Each frame may consist of several transport blocks. Each transport block might belong to different~~various~~ logical channels and thus different~~various~~ services. Each transport block will have a MAC header with UE id, logical channel ID. If the MAC is unsuccessful in capturing the highest capacity CPCH, then it might have to transmit in a lower capacity CPCH~~at lower rate~~ and buffer some of the transport blocks (on frame boundaries only)~~frames~~ for the next transmission. ~~The MAC buffered packets will have the highest priority in the next round of packet building.~~

- **Packet scheduling and transmission on CPCH**

The packet scheduling and transmission is somewhat similar to transmission on RACH. However, the choice of signature code and the associated downlink and uplink codes is related to the CPCH channel capacity and availability of the CPCH resources~~data rate~~. Also, there is an additional collision detection functionality and stage similar to the preamble ramp-up stage in the CPCH transmission. The MAC schedules the transmission of the Access Preambles (AP) and CD preambles and the PC preambles prior to transmission of the actual packet.

### ~~1.1.2~~5.3.2 RLC Services and Functions

#### ~~1.1.1.1~~5.3.2.1 Services provided to the upper layer

#### ~~1.1.1.2~~5.3.2.2 RLC Functions

### ~~1.1.3~~5.3.3 Data flows through Layer 2

#### ~~1.1.1.1~~5.3.3.1 Data flow for BCCH mapped to BCH (ffs.)

#### ~~1.1.1.2~~5.3.3.2 Data flow for PCCH mapped to PCH (ffs.)

#### ~~1.1.1.3~~5.3.3.3 Data flow for SCCH mapped to SCH (ffs.)

#### ~~1.1.1.4~~5.3.3.4 Data flow for CCCH mapped to FACH/RACH (ffs)

#### 5.3.3.5 Data flow for DCCH mapped to CPCH

For DCCH mapped to CPCH, unacknowledged or acknwledged transmission modes on RLC are employed. The MAC header may not be needed for UE identification. However, the MAC header is needed for logical channel service multiplexing. So, Figure 10 is the applicable data flow to this case.

#### ~~1.1.1.7~~5.3.3.6 Data flow for DTCH (non-transparent RLC) mapped to FACH/RACH

#### ~~1.1.1.8~~5.3.3.7 Data flow for DTCH (non-transparent RLC) mapped to DSCH

#### 5.3.3.8 Data flow for DTCH (non-transparent RLC) mapped to CPCH.

This case requires both non-tranaparent RLC and MAC operations. The data flwo shown in Figure 10 is applicable.

#### ~~1.1.1.9~~5.3.3.9 Data flow for DTCH (transparent RLC) mapped to DCH

#### ~~1.1.1.10~~5.3.3.10 Data flow for DTCH (non-transparent RLC) mapped to DCH

#### ~~1.1.1.11~~5.3.3.11 Data flow for DCCH mapped to DCH

.

## ~~1.4~~5.4 Layer 3 - RRC Services and Functions

### ~~1.1.1~~5.4.1 RRC services

#### 5.4.1.1 General Control

#### 5.4.1.2 Notification

### ~~1.1.2~~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:

- **Assignment, reconfiguration and release of radio resources for the RRC connection.** The RRC layer handles the

assignment of radio resources (e.g. codes) 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.

- **Assignment, reconfiguration and release of Common Radio Resources for the RRC connections within a cell.** The RRC layer handles the assignment of radio resources (e.g. codes) needed for the RRC connections within a cell including needs from both the control and user plane. The RRC layer assigns the resources to the Base Node on a periodic basis. The RRC layer receives traffic volume measurements, RLC buffer status from the UEs, and throughput measurements from the Base Nodes. The RRC layer computes the persistecy parameters for the common radio resources and broadcasts that over the air interface. The RRC layer may reconfigure the dedicated radio resources during an established RRC connection. This function includes coordination of the dedicated 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).

## 1.55.5 Interactions between RRC and lower layers in the C plane

## 1.65.6 Protocol termination

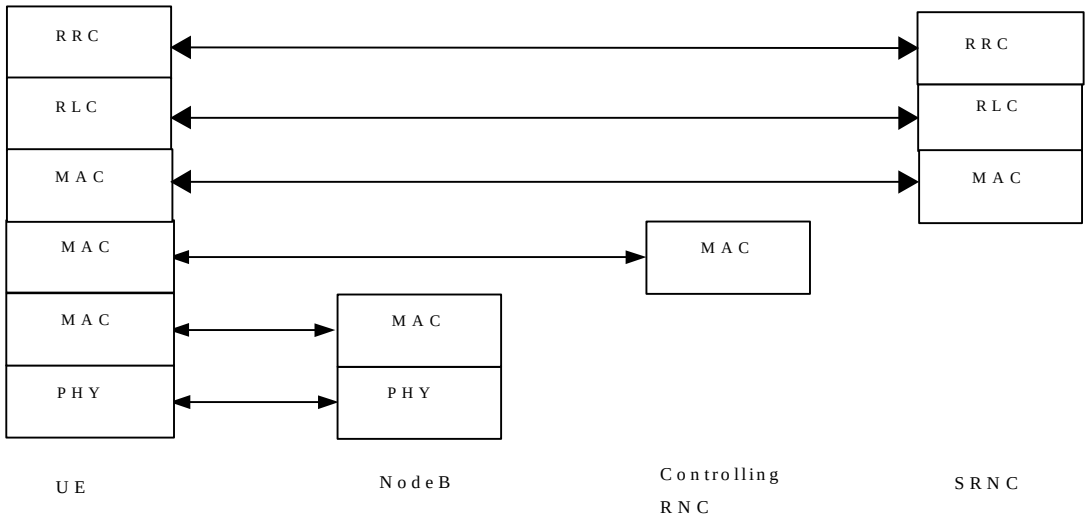
### 1.1.15.6.1 Protocol termination for DCH

### 1.1.25.6.2 Protocol termination for RACH/FACH

### 1.1.35.6.3 Protocol termination for FAUSCH

### 5.6.4 Protocol termination for CPCH

The protocol termination for CPCH is similar to the termination for RACH/FACH. Figure 16 presents ~~The following figure is for~~ the control plane protocol termination.~~-~~ Figure 17 presents the user plane protocol termination.~~[need figure for the user plane termination which requires removal of the RRC layer in the UE and UTRAN~~. The key issue here is that the Base Node performs functions such as generation of AICH, ~~and~~ Collision detection/resolution, and CPCH assignment which occurs within the RNC's common resource assignment. This necessitates addition of the MAC entity to the Base Node.




~~1.1.4~~

Figure 16. Protocol Termination for CPCH, control plane

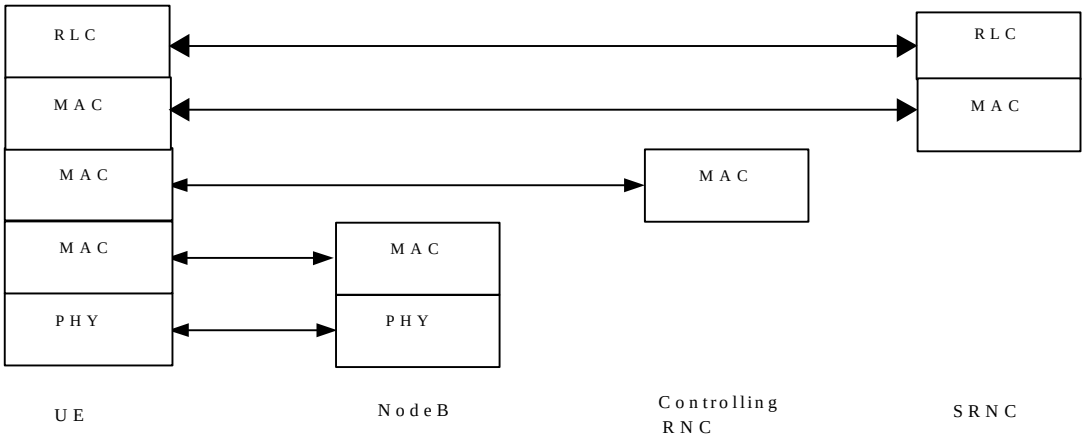



Figure 17. Protocol Termination for CPCH, user plane

## 5.6.5 Protocol termination for DSCH

~~1.1.1.1~~5.6.3.1.1.1.1 DSCH definition

# 6. User Identification and RRC Connection Mobility

## 6.1 UE identification within UTRAN

A Radio Network Temporary Identity (RNTI) is used as an UE identifier on RACH/FACH or CPCH/DSCH, CPCH/FACH by the MAC protocol, or on PCH by the RRC, when a RRC connection exists.

## ~~1.2~~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.